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COPING WITH LIFE STRESS

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Screening for Postpartum Depression and Associated Factors Among Women in China: A Cross-Sectional Study

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Objectives: This study examined what percentage of Chinese mothers during a three-year postpartum period were screened for postpartum depression and explored the correlation between postpartum depression and various socio-demographic, psychological, and cultural factors.

Study design: Cross-sectional survey.

Methods: A total of 506 mothers 23 years of age and older who were within three years postpartum completed the online survey. The survey collected information such as family economic status, a history of depression, preparation for pregnancy, relationships with husbands, and family members, adult attachment types (Adult Attachment Scale, AAS), and depression (The Center for Epidemiologic Studies Depression Scale, CESD).

Results: Approximately 30% of mothers 1–3 years postpartum reported symptoms above the CESD cut-off score (≥16 scores) associated with the risk for depression (28.0% in the first year, 30.8% in the second year, and 31.8% in the third year). Factors significantly associated with depression in participants in the correlation analysis were education level; family income; preparation for pregnancy; a history of depression; amount of time spent with their husbands; relationships with husbands, parents, and parents-in-law; and a close, dependent, and/or anxious attachment style. Multiple regression analyses revealed that a history of depression; less preparation for pregnancy; poorer relationships with husbands, parents, and parents-in-law; and a more anxious attachment style were strongly related to a higher risk of postpartum depression.

Conclusion: The overall percentage of mothers after delivery who were vulnerable to depression in China remains high. Various factors were significant predictors of postpartum depression. The research findings have several valuable implications for intervention practices. For example, attachment styles and depression history in the

assessments of perinatal depression could improve screenings and the design of interventions. Additionally, improving the family relationships and family environments of women post-delivery may be promising approach for postpartum depression prevention or intervention.

Keywords: postpartum depression, postnatal depression, prevalence, correlates, adult attachment

INTRODUCTION

Depression is one of the most prominent mental disorders in women post-delivery; it is correlated with adverse consequences for mothers, children, and families (e.g., poor maternal mental health and adverse cognitive development in children) (Glasheen et al., 2010; Martini et al., 2015). Maternal postpartum depression has become a significant public concern. Although there are numerous studies examining the prevalence and correlates of postpartum depression in mothers from many countries, to date, such investigations have been inadequate in China. As such, the present research was designed to investigate what percentage of Chinese mothers during a three-year postpartum period were screened for postpartum depression and potential correlates of postpartum depression. This will help to more precisely target prevention and intervention for mothers and children at risk.

Prior studies based in Western countries have examined the prevalence of postpartum depression. Prevalence rates varied widely across countries and regions. For example, a review study found the mean prevalence of postpartum depression was 15.4% in the United States, 38.1% in Italy, 17.1% in Germany, and 22.5% in Ireland (Halbreich and Karkun, 2006). In a study involving 6,421 women between five and 14 months postpartum in Canada, the overall prevalence of postpartum depression was 8.0% in the 12 weeks prior to the study (Simone Vigod, 2012). Another study of 100 primiparous women in Australia found that at 12 months postpartum, 30% of all mothers reported clinically significant levels of depressive symptomatology (McMahon et al., 2005).

In the Asian context, several important prevalence studies have been conducted. In Japan, of 70 Japanese mothers who were assessed by psychiatrists, Ueda et al. (2006) found that 27% mothers at 12 months postpartum were diagnosed as having experienced a new onset of depression. In Taiwan, Wang et al. (2003) conducted a study with 315 mothers six weeks post-delivery and found that about 31 and 12.9% mothers had experienced mild-to-moderate and moderate-to-severe depression, respectively. In a recent study including 2,072 postpartum women in Malaysia, Yusuff et al. (2015) reported that 14.3% of mothers were categorized as having depression within the first 6 months postpartum. A study done in Tianjin, China indicated that the prevalence of postpartum depression was 10.2% among 463 mothers 35–60 days post-delivery (Zhang et al., 2001).

Regarding factors associated with maternal postpartum depression, existing studies have examined predictors from socio-demographic, psychological, and cultural perspectives. For example, Schmied et al. (2013) reported that mothers' past depression or existing mental disorders were associated with an increased risk of postpartum depression. Prior researchers have also found that lower maternal education level and poor family economic status were related to a higher prevalence of postpartum depression (Schmied et al., 2013). Empirical literature has consistently demonstrated that poor relationships with husbands or family members (i.e., relationships with mothers and/or mothers-in-law) are linked to a greater likelihood of women experiencing postpartum depressive symptoms post-delivery (Leung et al., 2005; Saligheh et al., 2014; Martini et al., 2015). Furthermore, studies have shown that a lack of psychological preparedness for pregnancy and insecure attachment styles to partners (i.e., avoidance and anxiety) are associated with a higher risk of postpartum depression (Sabuncuoğlu and Berkem, 2006; Martin et al., 2014). Moreover, there is a preference for giving birth to a boy in some Asian societies, and the association between infant's sex and postpartum depression has attracted scholars' interest. Several studies based in Asian contexts (e.g., India, Hong Kong, Vietnam) have shown that the delivery of a baby girl led to a greater risk of postpartum depression among women compared to the delivery of a baby boy (Rodrigues et al., 2003; Xie et al., 2007).

Although prior studies provide valuable information, most were conducted in highly developed countries and regions (e.g., USA and Taiwan) and there is little research examining what percentage of women during a three-year postpartum period were screened for postpartum depression is in developing countries, such as China. In addition, the majority of studies to date were carried out on women in their first year postpartum, so what percentage of women were vulnerable to depression remains unknown after the first year of the postpartum period. Some researchers have noted that postpartum depression can continue or occur in the second and third years post-delivery (Garthus-Niegel et al., 2015). Third, while various correlates of postpartum depression are well established, research on factors that contribute to postpartum depression is still scarce in China. Fourth, most prior studies investigated selected correlates from only one or two main categories (e.g., socio-demographic); factors from multiple categories (e.g., socio-demographic, psychological and cultural) have rarely been examined in a single study. These gaps in previous studies of postpartum depression signal a need for research that can shed light on what percentage of Chinese mothers during a three-year postpartum period were screened for depression and multiple predictors of postpartum depression.

The present study was thus designed to address two primary research questions: (a) How prevalent is depression in Chinese mothers during their first three years postpartum? (b) what correlates (i.e., mothers' education, family economic status, preparation for pregnancy, past depression experience, relationship with family members, and babies' age, sex, number

and health, and adult attachment) are associated with depression in mothers during this three-year postpartum period?

MATERIALS AND METHODS

Participants

Data for the current study were collected online in China from July to October 2015. A total of 550 mothers 23 years of age and over with children from 0 to 3 years old (0–36 months) voluntarily participated in the survey. In total, 506 mothers completed the survey. Further socio-demographic information for the participants is presented in **Table 1**.

Procedure

The survey was conducted via an online mental health questionnaire system at Anhui University of Architecture. During the survey period, the link to the questionnaire was repeatedly distributed via multiple chat platforms popular with women after delivery, including QQ chat groups, Wechat groups[1], and the bulletin board system (BBS) about mothers, birth, and childrearing. We invited mothers with children from 0 to 3 years old to respond to the online questionnaire. Before responding to the questionnaire, participants had to register and obtain a name and password. Subsequently, they used their name and password to log in to the system to complete the questionnaire. The registration system designation ensured that participants felt that their data would be kept confidential and that they would only participate in the survey once. The purposes of the survey and the confidentiality of the data collected were thoroughly highlighted in the instructions. Clear directions on how to complete the questionnaire were also provided at the beginning of the survey. After the mothers completed the online survey, their data were saved automatically in the database of the Information Technology System (ITS). Meanwhile, upon completion of the questionnaire, an online payment of 15 RMB was automatically sent to them as remuneration.

Ethics Statement

This study was approved by the Human Research Ethics Committee at Anhui University of Architecture. Informed written consent was obtained from participants before the assessment. Participants were also told that they were free to withdraw from the study at any time during the data collection.

Measures

Depression

The Center for Epidemiologic Studies Depression Scale (CES-D) was used to measure participants' depression symptoms and to detect people at risk of experiencing a depressive disorder. The 20-item CES-D asked participants to respond on a four-point Likert scale (0 = "rarely or none of the time," 3 = "most or all of the time") indicating whether they had experienced the listed depression symptoms in the prior week. The sum of the response scores ranged from 0 to 60; higher scores indicated more severe depressive symptoms. Participants who scored less than 16 were classified as non-depressed, and those who scored

TABLE 1 | Socio-demographic characteristics of the study.

Variables	*N*	%
Education		
>9 years	465	91.9
≤9 years	41	8.1
Residence		
Village	198	39.1
Town	110	21.7
City	198	39.1
Family income		
Lower than average level	17	3.4
Average level	355	70.2
Higher than middle level	134	26.5
Preparation for parenthood		
None	124	24.5
Not enough	254	50.2
Enough	128	25.3
Depression experience(≥3 months)		
No	253	50.0
Maybe	136	26.9
Yes	117	23.1
Babies' sex*		
Male	251	49.6
Female	255	50.4
Babies' age		
≤1 year old	193	38.1
1∼2 years old	175	34.6
2∼3 years old	138	27.3
Numbers of babies	400	79.1
One child	106	20.9
Two and more children		
Babies' health		
Not good	15	3.0
Good	491	97
Enough time with you husband spent		
Yes	308	60.9
No	198	39.1
Marital relationship satisfaction		
Very satisfied	117	23.1
Somewhat satisfied	241	47.6
Neither satisfied nor dissatisfied	105	20.8
Dissatisfied	26	5.1
Very dissatisfied	17	3.4
Relationship with parents		
Very satisfied	204	40.3
Somewhat satisfied	184	36.4
Neither satisfied nor dissatisfied	92	18.2
Dissatisfied	22	4.3
Very dissatisfied	4	0.8
Relationship with parents in law		
Very satisfied	75	14.8
Somewhat satisfied	188	37.2
Neither satisfied nor dissatisfied	172	34.0
Dissatisfied	48	9.5
Very dissatisfied	23	4.5

**If more than two children, "sex" for the youngest.*
Mothers (N = 506).

[1]QQ and Wechat are the two most popular instant messaging service tools in China. People can chat one-on-one or within groups with up to 500 persons, using a computer or a smartphone. The Internet software is similar to MSN or Facebook.

over 16 (CES-D $\geq$ 16) were classified as depressed (Feng et al., 2010; Jewkes et al., 2010). Prior studies on peripartum depression have shown that the CES-D has good psychometric properties (Tandon et al., 2012; Park et al., 2015). The Cronbach's alpha and Spearman-Brown coefficients of CES-D scores for the present sample were 0.72 and 0.81, respectively, which indicate good internal consistency and reliability.

Correlates

Participants were asked to report on their education level (0 $\leq$ *9 years*, 1 $\geq$ *9 years*), residence (0 = *village*, 1 = *town*, 2 = *city*), and family income (0 = *lower than average level,* 1 = *average level,* 2 = *higher than average level*). They reported whether they had sufficient preparation for pregnancy (0 = *none*, 1 = *not enough*, 2 = *enough*), and whether they had a history of depression (≥3 months) (0 = *no*, 1 = *maybe*, 2 = *yes*). Participants also reported babies' sex (0 = male, 1 = female), babies' age (0 = *0–1 year old*, 1 = *1–2 years old*, 2 = *2–3 years old*), their total number of children (0 = *one child*, 1 = *two or more children*), and babies' health (0 = *not good*, 1 = *good*). In addition, participants reported whether their husbands had sufficient time to stay with them during their pregnancy and birth (0 = *yes*, 1 = *no*), whether they were satisfied with their relationships with their husbands, parents, and parents-in-law (0 = *very satisfied*, 1 = *somewhat satisfied*, 2 = *neither satisfied and nor dissatisfied*, 3 = *dissatisfied*, 4 = *very dissatisfied*).

Adult Attachment Styles

Participants' adult attachment styles, considered one of the correlates, were investigated using Collins and Read's (1990) adult attachment scale (AAS), with 18 items assessing three attachment dimensions (closeness, dependence, and anxiety). The closeness dimension measures the extent to which a person is comfortable with closeness and intimacy. The dependence subscale measures the extent to which a person feels s/he can depend on others to be available when needed. The anxiety subscale measures the extent to which a person is worried about being abandoned or unloved. These items were answered using five-point scales ranging from 1 ("not at all characteristic of me") to 7 ("very characteristic of me"). Existing research showed that the AAS has sound psychometric properties (Collins and Feeney, 2004; Mallinckrodt and Wei, 2005; Kane et al., 2007). For the current sample, the Cronbach's alpha and Spearman-Brown coefficients of the AAS for the present sample were 0.72 and 0.77, respectively, which indicate good internal consistency and reliability.

Data Analysis Plan

First, frequencies and percentages were computed for all independent variables and participants' reported depression levels (see **Table 1**). Second, bivariate correlation analyses were carried out to examine how the multiple factors correlated with the participants' reported levels of depression. Third, multiple regression analyses were performed to explore the predictive effects of participants' factors on their depression levels. The variables that were significantly associated with depression in bivariate correlation analyses were treated as the independent variables, and participants' reported depression levels were considered the dependent variables. All ordinal-level and continuous independent variables were standardized with *z*-transformation. Categorical variables were dummy-coded as 0 (male) and 1 (female). All analyses were performed using SPSS for Windows, version 22.0. In the interpretation of the results, the statistical significance was set at $p < 0.05$ (two-tailed).

RESULTS

Screening for Postpartum Depression

The overall percentage of mothers who were found to be at risk of experiencing depressive symptoms during the 3-year postpartum period was 30% (152/506). Specifically, for the first year postpartum, the percentage of mothers who were detected at risk of experiencing depressive symptoms was 28.0% (54/193); for the second year postpartum it was 30.8% (54/175), and for the third year postpartum it was 31.8% (44/138).

Correlates with Postpartum Depression

In bivariate correlation analysis, 11 variables were observed to be significantly correlated with higher levels of depression ($p < 0.01$): lower education level; lower family income; less preparation for pregnancy; a history of depression; less time spent with their husbands; worse relationships with husbands, parents, and parents-in-law; and more close, dependent, and anxious attachment styles. The other variables, including residence, babies' sex, babies' health and age, and total number of children were non-significant factors for depression ($p > 0.05$) (**Table 2**).

Predictors of Postpartum Depression

As can be seen in **Table 3**, the above 11 significant variables were selected to be included in a multiple regression model.

TABLE 2 | Bivariate correlation analysis of various independent variables and depression.

	Depression (CESD)
Education level	−0.127**
Residence	−0.030
Family income	−0.153**
Preparation for parenthood	−0.191**
Depression experience (>=3 months)	0.437**
Babies' sex	−0.29
Babies' health	−0.043
Babies' age	−0.007
Number of babies	−0.043
Enough time with you husband spent	0.235**
Marital relationship satisfaction	0.423**
Relationship with parents	0.362**
Relationship with parents in law	0.362**
Close attachment	0.163**
Dependent attachment	0.326**
Anxious attachment	0.581**

**$p < 0.01$

TABLE 3 | Multiple lineal regression of various independent variables on depression.

Independent variables	*B*	*SE*	β	*t*	ΔR^2
Total explanatory power					0.449***
Education level	−1.86	1.32	−0.49	−1.40	
Family income	−0.26	0.74	−0.01	−0.35	
Preparation for parenthood	−1.03	0.52	−0.07	−2.00*	
Depression experience (≥3 months)	2.96	0.47	0.23	6.26***	
Depression experience of own mothers (≥3 months)	0.08	1.29	0.01	0.07	
Enough time with you husband spent	−0.89	0.84	−0.04	−1.05	
Marital relationship	1.46	0.49	0.14	3.01**	
Relationship with parents	0.83	0.42	0.07	1.96*	
Relationship with parents in law	0.83	0.41	0.08	2.03*	
Close attachment	−0.08	0.93	−0.01	−0.09	
Dependent attachment	0.23	0.91	0.01	0.25	
Anxious attachment	4.82	0.58	0.39	8.32***	

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

Preparation for pregnancy; a history of depression; relationship with husbands, parents, and parents-in-law; and an anxious attachment style emerged as significant predictors of participants' postpartum depression. Specifically, mothers who had less preparation for pregnancy were more depressed than those who had sufficient preparation ($\beta = -0.07$, $p = 0.040$). Mothers who had a history of depression were also more depressed than mothers who had no prior history ($\beta = 0.23$, $p = 0.000$). Mothers who had poorer relationships with their husbands, parents, and parents-in-law were more depressed than those who had better relationships with their husbands ($\beta = 0.13$, $p = 0.003$), parents ($\beta = 0.09$, $p = 0.023$), and parents-in-law ($\beta = 0.08$, $p = 0.051$).

DISCUSSION

The purpose of the current study was to investigate what percentage of Chinese mothers during their first three years postpartum were screened for postpartum depression. The study also examined various socio-demographic, psychological, and cultural correlates of depression in these mothers. The results showed that an average of 30.0% (ranging from 28.0 to 31.8%) of the participating mothers experienced a high level of depression in the first three years postpartum, which indicates that the percentage of women post-delivery in China at risk for depression remains high. Our findings are similar to those of studies conducted in other regions, such as Australia (30.0%) (McMahon et al., 2005), Japan (27.0%) (Ueda et al., 2006), and Taiwan (31.0%) (Wang et al., 2003); however, we found a lower rate of depression than those prior researchers found in Tianjin (10.2%) (Zhang et al., 2001) and Henan province (20.9%) (Guo et al., 2003), China.

This may be due to the different sampling methods utilized in these studies. First, participants in the present study were drawn from various parts of China, not only one city or province, which may explain the higher prevalence rate in the present study. Second, we employed a web survey to collect data. This approach may reduce social desirability effects (Heerwegh, 2009), as in our online survey, participants were completely anonymous. This may have made it easier for them to find the appropriate time and place to complete the questionnaire alone. This could have made them feel safer and therefore more willing to express their true feelings and ideas (Wright, 2005). In addition, the different depression scales used in the various studies, including the CES-D, Beck Depression Inventory (BDI), Edinburgh Postnatal Depression Scale (EPDS), and Zung Self-Rating Depression Scale (SDS), may in part explain the variation between these studies because, as noted by Shafer (2006), there are fewer common specific depression symptom factors across these depression scales than expected. However, The Center for Epidemiologic Studies Depression Scale (CESD) has high discriminative and internal consistency based on a general population sample (Van Dam and Earleywine, 2011) compared to other depression scales, including multiple dimensions such as depressed mood, feelings of guilt and worthlessness, feelings of helplessness and hopelessness, psychomotor retardation, loss of appetite, and sleep disturbance (Radloff, 1977). Furthermore, an online questionnaire system was utilized for collecting data in this study. These features may make the findings relatively comparable.

As expected, most of the factors investigated in this study, including education attachment, family income, preparation for pregnancy, relationships with family members, and adult attachment style, were correlated with depression in mothers post-delivery. However, only some correlates showed significant predictive effects in our multiple regression model. A history of depression; less preparation for parenthood; lower satisfaction with their relationships with their husbands, parents, and parents-in-law; and more anxious attachment style were linked to more depressive symptoms.

First, we found that an anxious attachment style had the strongest association with a high level of postpartum depression in women. These findings are largely consistent with prior research (e.g., Robertson et al., 2004; Martin et al., 2014). There are two possible explanations for these findings. One is that an intimate relationship with one's baby in the postpartum period may evoke internal anxiety and conflicts, which are components of the insecure attachment style (i.e., anxious attachment) of the mother, and can thus result in depressive emotions (Sabuncuoğlu and Berkem, 2006). The other may be that the transition to parenthood can trigger mothers' feelings of anxiety, or lead to experiences such as receiving inadequate love and emotional support from husbands and family members, which may in turn increase the likelihood of depressive symptoms (Simpson et al., 2003). Our findings highlight the importance of maternal attachment styles in the postpartum period. A history of depression had the second strongest association with increased

depressive symptoms, which was consistent with evidence from existing research that a prior history of depression puts women at risk for postpartum depression (Johnstone et al., 2001). Our results indicate that women with a history of depression should be aware that this may potentially place them in a vulnerable group.

The quality of women's family relationships, specifically lower levels of satisfaction with their relationships with their husbands, parents, and parents-in-law, was significantly correlated with higher levels of postpartum depression. It is understandable that an unsupportive relationship with her husband can trigger stress and feelings of anxiety and helplessness in a woman post-delivery, which may incur an increased risk of postpartum depression. Moreover, in Chinese culture, when their son or daughter has a child of their own, it is common for parents to join their son/daughter's family to help take care of their daughter/daughter-in-law and grandchild, which can create conflicts between family members (Chan et al., 2002; Murray et al., 2015). This potential increase in family stress or conflict can increase depressive symptoms in postpartum women (Murray et al., 2015). Existing research has indicated that intergenerational conflicts, particularly in-law conflicts, are a risk factor for maternal postpartum depression in Asian families (Chan et al., 2002; Lee et al., 2004).

We also found that less preparation for parenthood was associated with increased depressive symptoms. Prior research has demonstrated that unplanned pregnancy and a lack of preparation for parenthood were significantly linked to higher levels of depression in postpartum mothers (Cox et al., 2008). The transition to parenthood is a stressful and difficult life event. Inadequate preparation for pregnancy, childbirth, and nursing may lead mothers to feel anxious and helpless and have less (or no) ability to cope with all the changes and challenges babies bring, which accordingly may increase the likelihood of depressive disorders in mothers (Spiteri et al., 2014). Our findings indicate that interventions or programs to help with the preparation for parenthood should be developed and implemented for Chinese women who plan to give birth.

Contrary to our expectations, our results indicated that the health, number, age, and sex of babies were not significant predictors of women's levels of postpartum depression. Notably, the finding that there was no association between the sex of their children and mothers' depression in this study was inconsistent with some prior studies (Lee et al., 2000; Patel et al., 2002). However, it was in line with a recent study showing that the preference for a boy was not linked to depressive symptoms in mothers (Murray et al., 2015). There are three possible reasons for this contradictory finding. First, it is possible that along with the influence of Western culture and the development of Asian societies, including China, people, particularly members of the younger generation, are gradually changing their attitude toward female children (Purewal, 2010). Another explanation may be the one-child policy that has been implemented throughout the past three decades in China. Each couple has only been allowed to have one child, no matter whether that child was a boy or a girl, which may have led to a decline in the preference for male children (Chi et al., 2013). The third reason could be our sample composition: only mothers with a computer or smartphone were able to participate in our online survey. Mothers in rural areas may have fewer electronic devices or less internet access than urban mothers, which may have resulted in more urban mothers and fewer rural mothers in our sample. This sampling bias may make this association insignificant, as prior research has found that the preference for having boys is stronger in rural areas (Hatlebakk, 2012). Future studies could be conducted specifically in rural areas to examine the possible associations between a child's sex and a mother's postpartum depression.

Another finding that was inconsistent with our expectations. Namely, the amount of time participants' husbands spent with them during their pregnancy and delivery was not significantly related to their postpartum depression levels. There are two potential explanations for this insignificant finding. First, the quality of women's family relationships, including their relationships with their husbands, parents, and parents-in-law, may be indeed stronger predictors than the amount of time participants' husbands spent with them during their pregnancy and delivery. While a variety of factors at familial levels were found to affect women's postnatal depression, positive family relationships have always been regarded as the first requisite for the prevention or/and intervention postnatal depression (Fisher et al., 2012). Second, it is likely that the quality of the marital relationship and the amount of time participants' husbands spent with them interactively correlate with participants' postnatal depression. For example, a good marital relationship often promotes the willingness of husbands to spend time, even more time, with their wives, which in turn promotes a healthy marital relationship. A virtuous cycle may develop between a good marital relationship and sufficient company, which may thus promote mothers' mental health level during postnatal period. Future research may focus on examining the interactive effects between family relationships, particularly the marital relationship, and the amount of time participants' husbands spent with them during their pregnancy and delivery to identify more familial factors associated with postnatal depression.

There were several limitations in this study. First, its cross-sectional design prevented us from identifying cause-and-effect associations; we could not determine whether poor relationships with family members increased depressive symptoms in mothers or whether maternal depression led to poor family relationships. Future studies may utilize longitudinal methods to track a single group of mothers to examine the causal relationships between depression and the risk factors identified in the present study. Second, because of the nature of our self-reporting methodology, the findings in this study must be interpreted with caution. However, participants in this study were recruited online, and it is known that a high degree of privacy can reduce the possibility of dishonesty. Third, although various socio-demographic, psychological, and cultural correlates were examined in this study, prior research has shown that biological factors such as oxytocin levels, personality traits, peer support, and education experience preparing parents for the transition into parenthood are also significantly correlated with maternal postpartum depression. More relational, personal, and biological predictors may be examined in future research.

Notwithstanding these limitations, our study has several valuable implications for intervention practices in China. First, the high percentage of Chinese women who experienced a high level of depression in their postpartum period indicates that there is urgent need for developing and implementing related interventions or psychoeducational programs among them. Second, the results of the present study suggest that women with a history of depression or insecure attachment styles (i.e., anxious attachment) may be a particularly important focus of Chinese intervention strategies that aim to prevent or/and reduce maternal postpartum depression. Third, our findings suggest that mothers' relationships with their family members, particularly the marital relationship, and their family environments are potential risk factors that should be considered in assessments of perinatal depression and the development of interventions. In addition, related intervention programs focused on improving family relationships may not only be developed targeting women having babies, but also their family members, such as husbands, parents, or parents-in law. Finally, the study suggests that in addition to face-to-face intervention programs, online intervention websites providing relevant information, education/courses, or training might also be a good choice for women and their family members to promote their well-being and foster a more positive family atmosphere.

AUTHOR CONTRIBUTIONS

XC designed the research, performed the statistical analysis. PZ and JW drafted manuscript. PZ and XC polished language of the manuscript. XC and HW revised the manuscript.

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Can Illness Perceptions Predict Lower Heart Rate Variability following Acute Myocardial Infarction?

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Objective: Decreased heart rate variability (HRV) has been reported to be a predictor of mortality after myocardial infarction (MI). Patients' beliefs and perceptions concerning their illness may play a role in decreased HRV. This study investigated if illness perceptions predict HRV at 3 months following acute MI.

Methods: 130 patients referred to a tertiary cardiology center, were examined within 48 h and 3 months following acute MI. At admission, patients' cognitive representations of their MI were assessed using the German version of the self-rated Brief Illness Perception Questionnaire (Brief IPQ). At admission and after 3 months (follow-up), frequency and time domain measures of HRV were obtained from 5-min electrocardiogram (ECG) recordings during stable supine resting.

Results: Linear hierarchical regression showed that the Brief IPQ dimensions timeline (β coefficient = 0.29; $p = 0.044$), personal control (β = 0.47; $p = 0.008$) and illness understanding (β = 0.43; p = 0.014) were significant predictors of HRV, adjusted for age, gender, baseline HRV, diabetes, beta-blockers, left ventricular ejection fraction (LVEF), attendance of cardiac rehabilitation, and depressive symptoms.

Conclusions: As patients' negative perceptions of their illness are associated with lower HRV following acute MI, a brief illness perception questionnaire may help to identify patients who might benefit from a specific illness perceptions intervention.

Keywords: heart rate variability, illness perceptions, myocardial infarction, longitudinal study, psychological stress

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INTRODUCTION

Myocardial infarction (MI) is the leading cause of morbidity and mortality in developed countries (Murray and Lopez, 1997). Heart rate variability (HRV) plays an important role in the risk of morbidity and mortality of cardiovascular disease (Darwin, 1998). HRV is a non-invasive tool to measure the cyclic variations of beat-to-beat (RR) intervals reflecting cardiac autonomic modulation (Akselrod et al., 1981). In one of the first studies investigating the relationship between indices of HRV and mortality, Kleiger et al. (1987) showed that decreased HRV was a significant

and independent predictor of mortality in post-MI patients. Further studies have since documented adverse prognostic implications of reduced HRV in MI patients (Cripps et al., 1991; Tsuji et al., 1996; Boskovic et al., 2014; Song et al., 2014). Psychosocial factors, such as stressful life events (Pieper et al., 2010; van Ockenburg et al., 2015), general stress (Kang et al., 2004; Brosschot et al., 2006; Chandola et al., 2010; Chida and Steptoe, 2010), hostility (Virtanen et al., 2003; Chida and Steptoe, 2009), depression (Stein et al., 2000; Gehi et al., 2005; Ha et al., 2015; Sgoifo et al., 2015) and anxiety (Friedman and Thayer, 1998; Alvares et al., 2013) have all been found to be associated with lowered HRV. In addition, individuals with stronger emotion regulation (Thayer et al., 2009; Patron et al., 2014; Gillie et al., 2015) and adaptive coping strategies have been shown to have higher levels of HRV (Appelhans and Luecken, 2008; Thayer and Lane, 2009). Moreover, low cardiac vagal tone, as reflected in the square root of the mean of the squared differences between adjacent normal RR intervals (rMSSD), is associated with poor self-regulation and lack of behavioral flexibility (Porges, 1992). Psychosocial factors in their own right have also been emerging as risk factors of incident MI and carry a poor prognosis of recovery from MI (Carney et al., 2005; Thayer et al., 2010).

Patients' cognitive representations and perceptions of their illness play an important role in different aspects of recovery from MI (Petrie and Weinman, 2006; Broadbent et al., 2006a). The construct of illness perceptions is based on the self-regulatory model (Leventhal, 1984; Leventhal and Steele, 1984). This model proposes that patients are active problem solvers who cope with their illness threats by personal cognition (Leventhal and Steele, 1984). Patients' negative beliefs and perceptions about their illness are associated with pre-hospital delay (decision-time) (Vidotto et al., 2013) lower adherence to therapy (French et al., 2005), delayed return to work (Foxwell et al., 2013), impaired functioning (Petrie et al., 1996), and emotional distress (Scharloo et al., 1998; Watkins et al., 2000). In cardiac patients, illness perceptions, including loss of perceived control, negative emotional responses and greater consequences have variously been shown to be associated with psychological distress, such as anxiety and depressive symptoms (Sherry et al., 2005). Moreover, a range of psychosocial factors, including depression (Stein et al., 2000; Gehi et al., 2005; Ha et al., 2015; Sgoifo et al., 2015) and anxiety (Friedman and Thayer, 1998; Alvares et al., 2013), but also stressful life events (Pieper et al., 2010; van Ockenburg et al., 2015), general stress (Kang et al., 2004; Brosschot et al., 2006; Chandola et al., 2010; Chida and Steptoe, 2010) and hostility have all been found to be associated with lowered HRV. In addition, negative illness perceptions are associated with maladaptive health behaviors, such as lack in physical activity, which in turn might contribute to lower HRV. Therefore, psychological distress and maladaptive coping with the cardiac disease might be mechanisms that contribute to the link between negative illness perceptions with HRV over time. While previous studies have explored the effect of illness perceptions on physical activity in patients suffering from cardiac illness (Petrie et al., 1996; Murray and Lopez, 1997; Petrie and Weinman, 2006), the relationship between illness perceptions and HRV has not been addressed so far, particularly in a longitudinal setting. Moreover, there are several studies that demonstrate the predictive value of HRV on health outcomes (Kleiger et al., 1987; Darwin, 1998). Through an evaluation of illness perception in relation to HRV over a longer time, patients with an increased cardiovascular risk could be identified and possibly treated to improve cardiovascular outcome. Therefore, the purpose of this exploratory study was to examine the association between HRV and illness perceptions in patients over a 3-month period after MI.

Abbreviations: BDI, Beck Depression Inventory; Brief IPQ, Brief Illness Perception Questionnaire; CCU, Coronary Care Unit; ECG, electrocardiogram; FU, follow-up; HR, heart rate; HRV, heart rate variability; HF, high frequency; IBI, inter-beat intervals; LF, low frequency; LVEF, left ventricular ejection fraction; MI, myocardial infarction; MI-SPRINT, Myocardial Stress Prevention Intervention; rMSSDm, square root of the mean of the squared differences between adjacent normal RR intervals.

METHODS

Study Participants and Design

One hundred and thirty consecutive acute MI patients admitted to the Coronary Care Unit (CCU) of a tertiary university center were enrolled in the Myocardial Stress Prevention Intervention (MI-SPRINT) randomized controlled trial aimed at reducing the incidence of posttraumatic stress by an early behavioral intervention. The research protocol was approved by the ethics committee of the State of Bern, Switzerland. The study protocol with detailed inclusion and exclusion criteria has been described elsewhere (Meister et al., 2013). In brief, eligible patients were 18 years and older, spoke German and had a positive distress screening at the time of hospital admission; i.e., they scored at least 5 for chest pain plus at least 5 for fear of dying and/or helplessness on numeric rating scales ranging from 0 (e.g., *no pain at all*) to 10 (e.g., *unbearable pain*). After informed consent had been obtained, patient's illness perceptions and HRV were assessed within 48 h after MI onset. At 3 months after enrolment in the study, all study participants were invited for a follow-up assessment.

Assessment of Medical Status

Patients' medical status was obtained with a structured medical history. Data on diabetes, hypertension, left ventricular ejection fraction (LVEF) and medical baseline (medication intake) at admission and at the 3-month of follow-up were assessed.

Psychometric Assessment

Illness Perceptions

Patients' cognitive representations were assessed with the German version of the self-rated Brief Illness Perception Questionnaire (Brief IPQ) (www.uib.no/ipq/html/b-ipq.html) (Broadbent et al., 2006b). The Brief IPQ consists of 9 questions and represents different dimensions of the illness. These dimensions are: 1 *consequences* (How much does your illness affect your life?), 2 *timeline* (How long do you think your illness will continue?), 3 *personal control* (How much control do you feel you have over your illness?), and 4 *treatment control* (How much do you think your treatment can help your illness?)

assess cognitive representations. Emotional representations are measured by dimension 6 *illness concern* (How concerned are you about your illness?) and 8 *emotions* (How much does your illness affect you emotionally?). Dimension 5 *identity* (How much do you experience symptoms from your illness?) represents individual intensity of symptoms, while dimension 7 *coherence* (How well do you feel you understand your illness?) assesses illness comprehension. Each dimension, except the causal item, is rated using a 0 to 10 response scale, with 10 indicating highest intensity. Assessment of the causal representation (item 9) is by an open-ended response item, which asks patients to list the three most important self-assumed causes of their MI. Brief IPQ showed moderate overall test-retest reliability (Leysen et al., 2015) and good concurrent and predictive validity (Broadbent et al., 2015).

Depressive Symptoms

The Beck Depression Inventory (BDI-II) (Ahrari et al., 2013) was used to measure depressive symptoms as an important factor potentially affecting HRV. In order to reduce the possible overlap between depressive and MI-associated physical symptoms, we only applied the cognitive/affective symptom subscale. The validated German version of the BDI-II (Kuhner et al., 2007) is a self-report questionnaire and comprises 13 items to be rated on a 4-point Likert scale. Total scores range from 0 to 39, with 0 to 3 representing no depressive symptoms, 4–6 mild and 7–9 moderate depressive symptoms. Scores of at least 10 indicate clinically relevant depressive symptoms. The reliability of the cognitive symptom subscale of the BDI-II was acceptable in our sample (Cronbach's $\alpha = 0.71$).

Analysis of HRV

Continuous electrocardiogram (ECG) recordings were performed in each patient for 5-min periods during stable supine resting (Agelink et al., 2001) using a Finometer device (TNO Biomedical Instrumentation, Amsterdam, The Netherlands). The Finometer records the beat-to-beat finger pulse contour and assesses short-term changes of blood pressure and its variability. All cardiovascular variables were stored digitally in result files on a hard disk. The Beatscope 1.1a software program integrates the subject's gender, age, BMI and is used to obtain HRV parameters (Wesseling et al., 1986). Using Beatscope 1.1a, inter-beat intervals (IBI in milliseconds) were exported to a single text file.

In a further step, IBIs were exported to an Excel sheet, where clear artifacts (IBI $>$ 1800 ms; $\leq$ 300 ms) were identified and manually removed. Time and frequency domain measures of the heart period power spectrum were analyzed and performed using the Kubios HRV analysis package 2.2 (Biosignal Analysis and Medical Imaging Group (BSAMIG); http://kubios.uef.fi/). We corrected artifacts with Kubios HRV by applying cubic spline interpolation to replace missing IBIs. We obtained spectral estimates of HRV power (in milliseconds squared per hertz). In the frequency domain methods, the heart rate (HR) time series is partitioning the HR variance into spectral components and quantifying their power (Wesseling et al., 1986). The power spectrum was calculated by using the autoregressive model (Thayer et al., 2002) to obtain total power of HRV and its main components: high frequency (HF, 0.15–0.4 Hz) and low frequency (LF, 0.04–0.15 Hz). Total power of HRV is an estimate of the global activity of the autonomic nervous system. The HF power is considered an indicator of cardiac parasympathetic activity. The LF component of HRV is mediated by both sympathetic and parasympathetic activities. The LF/HF ratio of HRV has been proposed an index of cardiac sympathovagal activity balance (1996; Thayer et al., 2002). The rMSSD was computed from time domain measures. Both indices, the HF power and rMSSD, are exclusively mediated by the vagus nerve (1996). Mean HR were analyzed to measure autonomic balance. Total power, HF power, LF power and rMSSD were logarithmically transformed (base 10) to achieve a normal distribution (Thayer et al., 2002).

Data Analysis

Statistical analysis was performed using SPSS software version 22.0 (Chicago, Illinois, USA). Results of statistical tests with $p < 0.050$ (two-tailed) were considered significant. Results were expressed as mean $\pm$ standard error of the mean. Data were verified for normal distribution using the Kolmogorov-Smirnov test. Group differences were calculated using Student's *t*-test for normally distributed variables and Mann-Whitney *U*-test for non-parametric variables. Bivariate correlations between two variables were estimated with Spearman coefficients. Hierarchical linear regression modeling explored the predictive value of illness perceptions for HRV indices with adjustment for age, gender, baseline HRV, diabetes, beta-blocker use, LVEF, cognitive depressive symptoms and attendance of cardiac rehabilitation. Data were checked for multicollinearity by Durban Watson statistics and linearity of residuals was verified by means of scatter plots.

RESULTS

Patient Characteristics

Table 1 shows the patient characteristics at the time of MI. The mean age of all participants was 60.3 $\pm$ 10.4 years. All participants were of European origin ($N = 130$), with the majority being male (81.4%). Nineteen participants were lost to the 3-month follow-up for different reasons, such as "no interest to participate anymore," death or loss of contact information. Therefore, from the original cohort of 130 persons, 111 were available for the 3-month follow-up investigation.

Associations and Differences between HRV and Covariates at Admission

Heart rate variability (HRV) indices did not significantly differ between men and women. Older patients showed significantly decreased HRV compared to younger patients in terms of total power ($r = -0.19$; $p = 0.037$) at admission. Patients with diabetes showed significantly lower total power (3.1 $\pm$ 0.53 vs. 2.7 $\pm$ 0.44, $p = 0.014$) at admission and higher HR (69.4 $\pm$ 9.6 vs. 62.4 $\pm$ 9.2, $p = 0.024$) at the 3-month follow-up compared to patients without diabetes. There was a significant difference neither between normotensive and hypertensive patients nor

TABLE 1 | Characteristics of study subjects (mean ± SD or %; N = 130).

Characteristics	Mean ± SD	%
Age	60.3 ± 10.4	
Male gender		81.4
MARITAL STATUS		
Married		63.8
Divorced		16.9
Widowed		5.4
Single		13.8
WORKING STATUS		
Full time		43.8
Part time		12.3
Retired/unemployment		43.8
HIGHEST LEVEL OF EDUCATION		
Lower than apprenticeship		11.8
Apprenticeship		70.1
High school		3.9
University		14.2
BMI, kg/m^2	27.8 ± 4.9	
Systolic blood pressure (mmHg)	139.5 ± 28.7	
Diastolic blood pressure (mmHg)	81.7 ± 14.9	
Diabetes		18.7
Hypertension		56.5
Hypercholesterolaemia		55.3
Beta-blockers		20.6
Antidepressants		8.1
Benzodiazepines		2.2
Smokers		42.3
Physical activity		47.7
Attendance at cardiac rehabilitation program		66.2
LVEF	48.4 ± 12.5	
Previous myocardial infarction		11.5
Total duration of stay in hospital	3.7 ± 2.9	

SD, standard deviation; BMI, body mass index; LVEF, left ventricular ejection fraction.

between smokers and non-smokers at admission and at the 3-month follow-up in HRV indices. Patients on beta-blockers showed significantly lower HR at admission (65.3 ± 10.6 vs. 72.3 ± 12.2 vs. $p = 0.039$) and lower LF power (2.3 ±0.55 vs. 2.8 ± 0.28, $p = 0.001$) at 3 months follow-up. LVEF was negatively correlated with HR at admission ($r = -0.20$; $p = 0.034$). HRV indices of patients who attended a cardiac rehabilitation program did not differ from those of patients who did not. There were no significant correlations between depressive symptoms (BDI-II) and HRV indices across time points.

Bivariate Associations of Brief IPQ Dimensions with HRV

At admission, HRV indices were significantly correlated with the dimensions *timeline* (total power: $r = 0.24$; $p = 0.024$; LF power: $r = 0.25$; $p = 0.028$; HF power: $r = -0.35$; $p = 0.002$; LF/HF ratio: $r = -0.29$; $p = 0.007$; rMSSD: $r = 0.38$; $p = 0.014$), *treatment control* (LF/HF ratio: $r = -0.21$; $p = 0.045$) and *emotional representation* (HF power: $r = 0.24$; $p = 0.034$). With the exception of mean resting HR, all HRV indices showed significant correlations with Brief IPQ dimension *timeline*. At 3 months follow-up, *timeline* (HR: $r = 0.24$; $p = 0.031$; rMSSD: $r = -0.34$; $p = 0.037$), *personal control* (rMSSD: $r = 0.44$; $p < 0.001$), *identity* (LF/HF ratio: $r = -0.29$; $p = 0.013$) and *illness coherence* (HF: $r = 0.43$, $p = 0.008$) showed significant associations with HRV indices. **Figure 1** shows the association of vagally-mediated HRV, expressed in rMSSD, and the assumption of higher *personal control* over the illness.

Mean HRV Differences within 3 Months

There were no significant changes over time in the HRV indices (total power, HF power, LF power, LF/HF power, rMSSD). Mean HR had significantly decreased from admission to the 3-month follow-up (71.66 ± 12.69 vs. 62.12 ± 9.18, $p < 0.001$).

Comparison of Different Predictors for HRV at 3-Months Follow-Up

Tables 2, 3 show the results of the hierarchical linear regression analysis with four models (1a–1d), in which four blocks of covariates were linked to HRV indices (HF power and resting HR). Beta-blockers, LVEF and depressive symptoms did not emerge as significant predictors for HF power and HR in any model, whereas gender and attendance of rehabilitation program showed significance in the adjusted final model (1d). Age and baseline HR emerged as significant predictors of resting HR in the final model (2d).

Regarding illness perceptions, HF power at 3 months follow-up was significantly predicted by the dimension *personal control* and the dimension *illness coherence* in the final model (1d). After taking into account all covariates, the illness perceptions dimensions *personal control*, *illness coherence* and *timeline* explained 24% of the total variance. As illustrated in **Table 3**, *timeline* emerged as an independent predictor of resting HR, explaining 5% of the total variance.

Similar results were obtained with rMSSD as the dependent variable and the dimension *personal control* as an independent variable adjusted for age, gender, baseline rMSSD, diabetes, LVEF, attendance at cardiac rehabilitation and depressive symptoms. Specifically, baseline rMSSD (standardized β coefficient = −0.37; $p = 0.033$) emerged as a significant predictor in the final model, explaining 10% of the total variance. None of the other covariates made a significant contribution to the predictive power in the final model.

Regarding illness perceptions, *personal control* (standardized β coefficient = 0.47; $p = 0.008$) emerged as a significant predictor in the final model, explaining 17% of the total variance.

Beta-blockers emerged as an independent predictor for LF power (standardized β coefficient = −0.40; $p = 0.004$) after taking into account all covariates.

Timeline, personal control and illness understanding did not show independent associations with LF power, LF/HF ratio and total power. Further, none of the other illness perception dimensions (consequences, treatment control, identity, illness

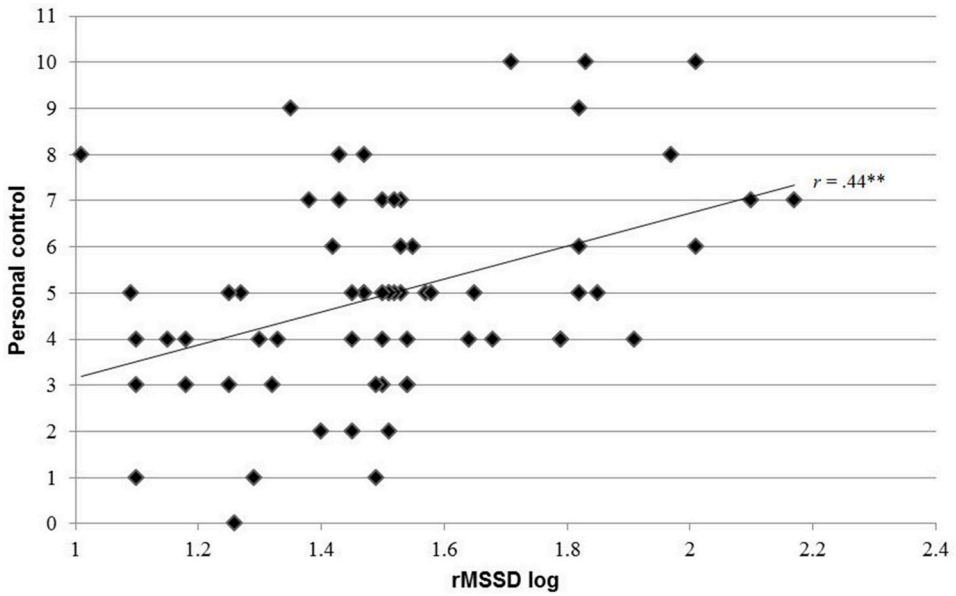

FIGURE 1 | Pearson correlation between personal control at admission and rMSSD 3 months post-MI; rMSSD, square root of the mean of the squared differences between adjacent normal RR intervals; MI, myocardial infarction; **$p < 0.001$.

concern and emotional representation) showed a significant association with all HRV indices in our regression model.

The adjusted R^2 value for the final models was 0.35 for the HF power, 0.55 for resting HR and 0.27 for rMSSD, indicating that roughly 40% of the variance in the selected HRV indices was accounted for by the entire set of covariates.

DISCUSSION

We found significant associations between Brief IPQ variables assessed within 48 h of an acute MI and HRV indices assessed at hospital admission as well as 3 months later. Five out of eight general illness perception factors showed a significant association with HRV indices. The results suggest that HRV may be affected by patients' understanding of the cardiac event, and their control over the MI and its emotional impact on their lives.

The main finding of this study was that personal control over the illness and coherence about the illness were significant predictors of vagally-mediated HRV at 3 months after acute MI. Moreover, patients' idea about how long the MI would last (dimension *timeline*) predicted resting HR at 3 months after MI. Interestingly, only purely vagally-mediated HRV indices (i.e., HF power and rMSSD) and resting HR were predicted from illness perception dimensions, whereas the other HRV indices (i.e., LF, total power, LF/HF) were not. It has to be pointed out that the dimension *timeline* is less meaningful for MI than the other dimensions, because it is a one-time event with irreversible damage.

To our knowledge, these results are novel and support the growing body of evidence that illness perceptions play a key role in recovery from MI. Research has shown that a brief illness perceptions intervention can change MI-related negative illness beliefs, and it also reduces illness anxiety in spouses of post-MI patients (Appelhans and Luecken, 2008; Thayer and Lane, 2009). Therefore, implementing prevention strategies, such as cognitive interventions targeting understanding of illness after acute MI might improve general functioning as well as HRV. Our results also support the notion that HRV indices, specifically those reflecting vagal function, are associated with emotional states (Brosschot et al., 2006) and maladaptive coping strategies (Appelhans and Luecken, 2008; Thayer and Lane, 2009).

Apart from understanding the illness and perceived control over the illness, gender, attendance of rehabilitation program and age also had a significant effect on HRV values measures at the 3-month follow-up. This is in line with previous research findings which showed that LF power was reported to be significantly lower in healthy women compared to healthy men (Ramaekers et al., 1998). Further, a significant increase of HF power and LF power in MI patients was found after 8 weeks of cardiac rehabilitation (Sandercock et al., 2007). Moreover, older patients showed reduced HRV in total power and both LF and HF power compared to younger patients (Zhang, 2007).

Additionally, there was a significant recovery of autonomic balance reflected by a significant decrease in HR between admission and 3 months of follow-up. Other HRV indices showed no significant changes over 3 months following acute MI. These results are relatively consistent with the findings of Vaage-Nilsen et al. (2001) who showed that HRV measured during the day did not change over one-and-a-half years following acute MI, but was significantly reduced compared with healthy men. An explanation for the significant decrease of resting HR within 3 months could be that cardiac rehabilitation was an independent predictor of resting HR in our study sample. These findings highlight the potential of rehabilitation programs to improve recovery after a cardiac event.

TABLE 2 | Illness coherence and illness control as predictors of HF Power at 3 months after acute MI.

Statistics of entire model	Entered variables	*B*	S.E.	β	*p*	r^2
Model 1a	Age	−0.002	0.007	−0.050	0.74	0.230
[$F_{(2, 111)} = 3.678$, $p = 0.021$, adjusted $R^2 = 0.167$]	Gender	0.482	0.161	−0.443	0.005	0.186
	HF baseline	0.090	0.123	0.112	0.47	0.011
Model 1b	Age	−0.001	0.007	−0.023	0.88	0.001
[$F_{(5, 111)} = 1.983$, $p = 0.096$, adjusted $R^2 = 0.128$]	Gender	0.418	0.179	0.384	0.026	0.118
	HF baseline	0.101	0.127	0.124	0.44	0.013
	Diabetes	−0.141	0.249	−0.090	0.57	0.007
	Beta blockers	0.113	0.196	0.091	0.57	0.007
	LVEF	0.004	0.007	0.091	0.61	0.005
Model 1c	Age	−0.003	0.007	−0.059	0.70	0.003
[$F_{(7, 111)} = 2.324$, $p = 0.043$, adjusted $R^2 = 0.209$]	Gender	0.486	0.173	0.446	0.009	0.155
	HF baseline	0.154	0.126	0.191	0.23	0.029
	Diabetes	−0.160	0.238	−0.102	0.51	0.009
	Beta blockers	−0.063	0.215	0.029	0.77	0.001
	LVEF	0.002	0.007	0.132	0.79	0.001
	BDI	0.023	0.025	0.152	0.37	0.016
	Rehabilitation	−0.465	0.199	−0.394	0.026	0.108
Model 1d	Age	−0.006	0.007	−0.133	0.41	0.011
[$F_{(10, 111)} = 2.989$, $p = 0.009$, adjusted $R^2 = 0.354$]	Gender	0.406	0.162	0.373	0.018	0.101
	HF baseline	0.201	0.115	0.249	0.091	0.049
	Diabetes	−0.435	0.235	−0.277	0.074	0.055
	Beta blockers	0.116	0.204	0.093	0.58	0.005
	LVEF	−0.006	0.007	−0.165	0.35	0.014
	BDI	0.020	0.024	0.133	0.40	0.011
	Rehabilitation	−0.301	0.213	−0.286	0.049	0.083
	Timeline	−0.029	0.025	−0.197	0.25	0.022
	Personal control	0.103	0.038	0.443	0.011	0.118
	Coherence	0.079	0.031	0.426	0.014	0.109

HF, high frequency; MI, myocardial infarction; S.E., standard error; LVEF, left ventricular ejection fraction; BDI, Beck Depression Inventory.

LIMITATIONS

Several methodological limitations of our study need to be mentioned. The Brief IPQ was assessed at admission only. Therefore, an evaluation of possible changes over time in illness perceptions on HRV was not possible. However, this study was one of the first to assess illness perceptions very shortly after MI. Severe depression was an exclusion criterion for participation in the study. Consequently, the variance in the severity of depressive symptoms at admission was rather small and thus might help explain why depressive symptoms did not predict HRV measures. Since the MI-SPRINT parent study is an intervention study, it is also possible that HRV indices were moderated by the two different interventions performed at admission. As the trial is still running, we could not break the blinding. The external validity of our findings is limited because only patients referred to a tertiary center were included. The limited sample size must also be considered when interpreting the HRV findings. Even if the study design controlled for different covariates, HRV might be influenced by other processes after the traumatic event, such as coping strategies, cardiovascular fitness or personality traits. Thus, although the study applied a prospective design, causal inferences cannot be drawn from our results.

CONCLUSIONS

This study highlights the importance of illness understanding and control over the illness in MI patients for vagal modulation of the heart. Therefore, identifying patients with lower internal locus of control and lack of illness understanding might help to select patients at high risk for negative health outcome and offer them support in coping with the cardiac disease. Implementing psychoeducation and psychotherapeutic interventions in MI patients, targeting illness perceptions, has been shown to be predictive for lower anxiety and greater increases in exercise (Broadbent et al., 2009) and might therefore increase HRV and thus possibly reduce the risk of recurrent cardiac events. Such interventions and their potential beneficial

TABLE 3 | Timeline as predictor of HR at 3 months after acute MI.

Statistics of entire model	Entered variables	*B*	S.E.	β	*p*	r^2
Model 2a	Age	−0.155	0.124	−0.149	0.22	0.022
[$F_{(2, 111)} = 11.196$, $p < 0.001$, adjusted $R^2 = 0.433$]	Gender	−4.510	2.907	−0.187	0.13	0.034
	HR baseline	−0.500	0.099	−0.697	0.001	0.360
Model 2b	Age	−0.142	0.120	−0.137	0.24	0.018
[$F_{(5, 111)} = 7.331$, $p < 0.001$, adjusted $R^2 = 0.487$]	Gender	−5.310	3.101	−0.220	0.096	0.037
	HR baseline	−0.513	0.101	−0.624	< 0.001	0.328
	Diabetes	9.458	4.300	0.271	0.035	0.062
	Beta blockers	−4.333	3.326	−0.157	0.20	0.021
	LVEF	0.214	0.121	0.246	0.085	0.040
Model 2c	Age	−0.135	0.119	−0.130	0.26	0.015
[$F_{(7, 111)} = 6.301$, $p < 0.001$, adjusted $R^2 = 0.515$]	Gender	−6.197	3.136	−0.257	0.057	0.047
	HR baseline	−0.483	0.102	−0.587	< 0.001	0.271
	Diabetes	9.692	4.186	0.277	0.028	0.064
	Beta blockers	−0.504	3.777	−0.018	0.90	0.001
	LVEF	0.227	0.120	0.260	0.068	0.043
	BDI	−0.824	0.440	−0.244	0.071	0.042
	Rehabilitation	4.784	3.504	0.183	0.18	0.022
Model 2d	Age	−0.234	0.135	−0.226	0.039	0.033
[$F_{(10, 111)} = 5.574$, $p < 0.001$, adjusted $R^2 = 0.557$]	Gender	−5.389	3.170	−0.224	0.10	0.032
	HR baseline	−0.508	0.102	−0.617	< 0.001	0.275
	Diabetes	6.647	4.383	0.190	0.14	0.025
	Beta blockers	−0.626	3.705	−0.023	0.87	0.001
	LVEF	0.039	0.129	0.107	0.48	0.005
	BDI	−0.679	0.431	−0.201	0.13	0.027
	Rehabilitation	7.142	3.995	0.273	0.084	0.035
	Timeline	0.964	0.458	0.292	0.044	0.049
	Personal control	0.014	0.704	0.003	0.98	0.001
	Coherence	0.705	0.562	0.170	0.22	0.017

HR, heart rate; MI, myocardial infarction; S.E., standard error; LVEF, left ventricular ejection fraction; BDI, Beck Depression Inventory.

effect on outcomes ought to be tested in future trials. A more detailed examination of the coping mechanism such as resilience or self-efficacy underlying the promoting effect of illness perception on HRV needs to be addressed in future studies.

Taken together, the results of this study show that illness perceptions independently predict vagally-mediated HRV indices assessed at 3 months after acute MI. Thus, the findings might help explain the poor cardiovascular prognosis in post-MI patients as related to decreased HRV.

A brief illness perception questionnaire used in clinical routine might help assess the need for correcting maladaptive beliefs, and implementation of psychotherapeutic interventions may possibly improve HRV further downstream.

This study is a first step toward a better understanding of the changes in HRV in a longitudinal setting and the role of illness perception in the context of acute MI.

AUTHOR CONTRIBUTIONS

RvK, JS, US, JB, and HZ contributed to the development of the study design. US, HZ, JB, RvK, RM, and MP contributed to the development of the verum and control intervention. MS, RM, and MP contributed to the recruitement of the patients in hospital. MP and MS wrote the first draft of the manuscript. All authors critically revised and approved the final manuscript.

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Protective Effect of Self-Compassion to Emotional Response among Students with Chronic Academic Stress

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The literature has shown that self-compassion is a protective factor of an individual's emotional response to chronic stress. However, this stress-buffering effect has not been completely analyzed in individuals who report significantly high academic stress. The present study explored the role of self-compassion in a group of undergraduate students who experience chronic academic stress. A total of 208 undergraduate students who were preparing for the Postgraduate Entrance Examination (PEE) were recruited and completed the Self-Compassion Scale, Adolescent Self-Rating Life Event Check List, and Positive and Negative Affect Schedule. Differences analysis confirmed that the participants reported significantly higher academic stress than their peers who were not preparing for PEE. Self-compassion positively related to positive affect but negatively related to negative affect and learning stress. Further analysis showed that self-compassion negatively mediated the relationship between chronic academic stress and negative affect. Findings imply that self-compassion-centered interventions can be developed in the educational context to assist students cope with chronic academic stress.

Keywords: self-compassion, chronic academic stress, stress-buffering effect, emotional response, mediation

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INTRODUCTION

Human beings suffer from an extensive variety of daily stressful events, such as academic failure, social embarrassment, and traumatic events. Stress is defined as a state of threatened homeostasis that is induced by the internal or external environment, thereby threatening an individual's physical and mental health and further calling for restoration (Lazarus and Cohen, 1977). In general, stress is associated with decreased well-being, increased negative affect, and various affective disorders, such as depression and post-traumatic stress disorder (Habra et al., 2003; Hoffman and Al'Absi, 2004; Marin et al., 2011; Cheng et al., 2014). However, this case is not constant. Studies have also indicated that people with a few positive qualities can live through traumatic events, manage them well, and stay healthy (Carver and Antoni, 2004; Duan and Guo, 2015; Duan et al., 2015a). These findings are consistent with the Cognitive Transaction Model of Stress (Lazarus and Folkman, 1984). This model underscores that stress is recognized as a transactional and dynamic state that depends on the individual appraisal of the stimulus and behavioral responses to it. This model emphasizes the interactions between personal characteristics and situational factors rather than objective stressors alone (Lazarus and Folkman, 1984). Cross-sectional and longitudinal studies

demonstrated that individuals with positive qualities, such as caring, inquisitiveness, and self-control, often perceived limited stress and showed an improved mental well-being (Duan et al., 2015b; Duan, 2016b). Therefore, the role of positive qualities in stressful situation should be investigated.

Recently, self-compassion has been increasingly recognized as a positive quality to facilitate mental well-being. Self-compassion is described as the disposition of accepting and caring for oneself, particularly as treating oneself with kindness and concern in adversity (Neff, 2003a,b). During the process of self-compassion, individuals are encouraged to recognize related experiences to oneself and others with metacognitive activities. Theoretically, self-compassion is a multi-dimensional construct with six basic components: self-kindness versus self-judgment, where self-kindness is being kind and careful towards oneself in dealing with stress; humanity versus isolation, where humanity means considering one's experiences as an unavoidable component of the human experience; and mindfulness versus over-identification, in which mindfulness is holding painful thoughts and feelings in mindful awareness without avoiding or exaggerating them. Although six separate but related factors were obtained through exploratory factor analysis, an overreaching factor of self-compassion was recommended in both research and practice by the author (Neff, 2003b).

Existing studies have shown that self-compassion buffer both acute stress induced in laboratory settings (Pace et al., 2009; Bluth et al., 2015) and chronic life stress, such as childhood maltreatment and academic stress (Ying and Han, 2009; Vettese et al., 2011). For example, individuals with considerably high self-compassion showed substantially low autonomic response and anxiety when they were exposed to acute psychosocial threat (Neff et al., 2007a; Breines et al., 2014). Vettese et al. (2011) determined that self-compassion was reported to mediate the relationship between the experience of maltreatment in childhood and later emotion dysregulation. In the educational context, chronic academic stress is the most common. The literature that focuses on this topic has suggested that self-compassion could reduce the negative influence of chronic academic stress on academic performance and emotional well-being. Neff et al. (2005) determined among undergraduates who perceived their recent midterm grade as a failure that self-compassion was positively associated with mastery and perceived competence but negatively associated with performance avoidance. Other studies reported that self-compassion buffered the influence of academic stress (e.g., limited goal progress, academic burnout) on negative affect and depression in undergraduates (Kyeong, 2013; Hope, 2014). One study also determined that self-compassion was negatively associated with homesickness and depression in students who transited to college (Terry et al., 2013), thereby further reporting that self-compassion could reduce the influence of low satisfaction with social life on homesickness.

Nevertheless, the existing studies conducted in the educational context did not identify their participants as stressful individuals. The participants recruited in these studies were often undergraduate freshmen or master's students (Ying and Han, 2009; Terry et al., 2013; Hope, 2014). Although the chronic academic stress is a typical life stressor to students, whether they were undergoing academic or other types of life stress is unclear. Accordingly, the current study aimed to analyze if self-compassion can mediate the relationship between chronic academic stress and emotional health among undergraduates who were preparing for the Postgraduate Entrance Examination (PEE). PEE is a typical and well-recognized chronic stressor for students in China. We hypothesize that undergraduates who were preparing for PEE would report higher perceived academic stress than those who were not preparing for this examination. We further assumed that self-compassion would reduce the negative effect of the perceived academic stress on emotional health among students preparing for PEE.

MATERIALS AND METHODS

Participants and Procedures

All participants ($n = 208$; 66 males and 142 females; age $M = 21.67$, $SD = 0.93$) were recruited from libraries and study rooms in Southwest University in China. Before participating in this study, they were asked to indicate that they have already registered for the 2016 PEE and reported how long they have prepared for this examination (1 = approximately 3 months; 2 = 3–6 months; 3 = 6–12 months; 4 = over 12 months). All participants voluntarily participated in this study. Another compared sample was included to test if the participants preparing for PEE were under academic stress. This compared sample comprises 300 undergraduate students who are not preparing for PEE from the same university. None of them reported any history of neurological or psychiatric illness. The procedures of the present study were approved by Southwest University, and all the participants signed a written informed consent before the start of their participation.

Measurements

Self-Compassion Scale

The 26-item Self-Compassion Scale (SCS) was adopted to measure individual differences in self-compassion and comprises six subscales: self-kindness, self-judgment, common humanity, isolation, mindfulness, and over-identification. The participants were asked to indicate how they typically act toward themselves in difficult times using a five-point Likert scale (from 1 "never" to 5 "almost always") (Neff, 2003b). SCS showed well-established psychometric characteristics in previous studies ($\alpha = 0.93$). Chen et al. (2011) reported the Cronbach's alpha (0.83) and test–retest reliability (0.89) of the Chinese version. In the present study, the total scale reported a Cronbach's alpha coefficient of 0.80. For the subscales, the internal consistency coefficients were between 0.60 and 0.77.

Adolescent Self-Rating Life Event Check List

The Adolescent Self-Rating Life Event Check List (ASLEC) uses 26 negative life events collected from multiple daily stress domains to evaluate stressful experiences within the past 12 months. These life stressors can be conceptualized into six factors, namely, interpersonal, learning stress, punishment,

bereavement, health adaptation, and other factors (Liu et al., 1997). The participants report the effect of each life stressor on their lives using a 5-point Likert scale (1–5 means "not at all" to "extremely severe," respectively). The learning stress score was calculated to measure the academic stress in this study. The internal consistency of this scale is 0.85 and test–retest reliability is 0.69 (Liu et al., 1997). The total scale demonstrated good internal consistency ($\alpha = 0.93$) in the current study. For the scales of the six factors, the internal consistency coefficients ranged from 0.55 to 0.91, among which the learning stress factor scale reported a Cronbach's alpha coefficient of 0.61.

Positive and Negative Affect Schedule

The participants reported how much they experienced positive and negative affect over the past months using the Positive and Negative Affect Schedule (PANAS) (Watson et al., 1988). PANAS is a 20-item scale with 10 emotion words that assess the positive affect and another 10 words that assess the negative affect. The participants rated these words from 1 to 5 (very slightly or not at all to extremely). Watson et al. (1988) reported the good psychometric properties of this scale, with the Cronbach's alphas ranging from 0.84 to 0.87 for the negative affect and from 0.86 to 0.90 for the positive affect. The Chinese version of PANAS has a Cronbach's alpha of 0.83 for the negative affect and 0.85 for the positive affect (Huang, 2003). The internal consistency coefficient of this scale was 0.86 for the negative affect and 0.82 for positive affect in the current study.

Statistical Analysis

Descriptive statistics and correlation analysis were conducted using SPSS Statistics. We first compared the difference in the reported learning stress between the undergraduate students preparing and not preparing for PEE using independent-sample *t*-test. In the sample of undergraduate students preparing for PEE, correlations were calculated among the learning stress, total score of self-compassion, subscales of self-compassion, and positive and negative affects. Previous studies indicated significant gender differences of self-compassion between males and females (Neff, 2003b). Thus, partial correlation was conducted with gender as the control variable. Finally, mediation analysis was conducted with bootstrapping method using PROCESS (Hayes, 2013) among undergraduate students preparing for PEE. This method can provide confidence limits for the specific indirect effect, as well as include multiple mediators in the same model (Preacher and Hayes, 2008). The bias-corrected and accelerated (BCa) bootstrap estimates presented in the current study were based on 5,000 bootstrap samples.

RESULTS

Differences Analysis on the Perceived Stress

The levels of learning stress between the two samples were compared. We calculated the learning stress ($M = 8.52$, $SD = 3.78$) in the sample of undergraduate students not preparing for the entrance examination. Independent-sample *t*-test revealed significant difference in the learning stress between the two groups ($t_{(506)} = 2.69$, $p < 0.005$). The participants preparing for PEE showed higher learning stress than the general undergraduate students. These results confirm that the participants preparing for PEE feel stressed about their learning and the coming examination.

Descriptive and Correlations Analysis

A total of 13.46% of the students preparing for PEE have spent approximately 3 months to prepare for this examination, 35.10% indicated 3–6 months, 38.46% indicated 6–12 months, and 12.98% reported over 1 year. The Pearson correlation between the preparing time period and learning stress was negative ($r = -0.15$, $p < 0.05$). Consequently, gender and preparing time period were considered controlling variables. **Table 1** presents the descriptive statistics and correlations among all variables. After controlling for gender, age, and preparing time, learning stress was positively associated with negative affect but not associated with positive affect (see **Table 1**). Furthermore, learning stress was negatively correlated with the total score of self-compassion

TABLE 1 | Correlation coefficients between learning stress, affects, self-compassion.

Variables	1	2	3	4	5	6	7	8	9	10
(1) Learning stress	_									
(2) Negative affect	0.37**	_								
(3) Positive affect	0.04	−0.17*	_							
(4) Self-compassion	−0.28**	−0.47**	0.40**	_						
(5) Self-judgment	0.28**	0.37**	0.08	−0.58**	_					
(6) Common humanity	−0.03	−0.08	0.40**	0.53**	0.09	_				
(7) Isolation	0.35**	0.51**	−0.12	−0.69**	0.58**	−0.05	_			
(8) Self-kindness	−0.05	−0.14	0.39**	0.64**	−0.08	0.59**	−0.08	_		
(9) Over-identified	0.32**	0.43**	−0.09	−0.54**	0.53**	0.17*	0.59**	0.02	_	
(10) Mindfulness	0.03	−0.18**	0.54**	0.64**	0.03	0.58**	−0.15*	0.61**	−0.04	_
M	9.49	25.82	31.16	3.22	2.73	3.24	2.78	3.21	2.96	3.34
SD	4.28	6.58	5.25	0.39	0.59	0.69	0.75	0.57	0.67	0.69

**$p < 0.01$, *$p < 0.05$.

TABLE 2 | Mediation results presented based on 5,000 bootstrap resamples.

	Total effect	Direct effect	Path *a*	Path *b*	Indirect effect
Self-compassion	0.56**	0.40**	−0.03**	−6.51**	0.17 (0.08–0.28)†

Adjusted coefficients with 95% confidence intervals. †Indicates a 95% confidence interval that does not include 0. Learning stress served as independent variable.

and was positively associated with the subscales of self-judgment, isolation, and over-identification.

Mediation Analysis

Results showed that self-compassion mediated the effect of learning stress on the negative affect, with the estimate of 0.17 and a 95% BCa bootstrap confidence interval (CI) of 0.08–0.28 (see **Table 2** and **Figure 1**). We can claim based on this result that the difference between the total and direct effect of self-compassion on the negative affect is different from zero. A high learning stress was associated with a low level of self-compassion that linked to a high negative affect.

DISCUSSION

This study explored the protective role of self-compassion in a cohort of undergraduate students with chronic academic stress. The negative and positive relationships between the learning stress and subscales of self-compassion were identified in the present study. These results are expected because of the bipolar characteristics (i.e., positive and negative wording items) of the six components of self-compassion. The results also indicated that self-compassion negatively mediated the relationship between learning stress and negative affect. Taken together, these findings suggest the protective role of self-compassion to buffer chronic academic stress and its influence on emotional response (Leary et al., 2007; Neff et al., 2007a,b; Neff and Vonk, 2009), thereby further indicating that self-compassion-centered interventions can be developed to assist students in coping with academic stress.

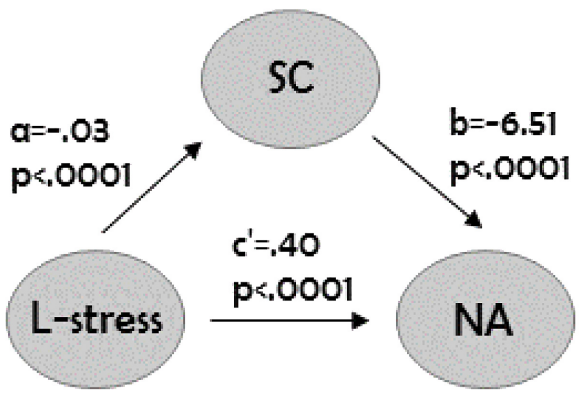

FIGURE 1 | Mediation analyses of self-compassion on the relationship between learning stress and negative affect. Learning stress served as independent variable. Path *a* is the effect of learning stress on the proposed mediator, while path *b* represents the effect of the mediator on negative affect. Path *c'* shows learning stress's direct effect on negative affect. L-stress, learning stress; SC, self-compassion; NA, negative affect. Result presented here is based on 5,000 bootstrap samples.

Expectedly, a limited learning stress is associated with improved self-compassion, thereby resulting in limited negative affect. This result is evident in previous studies, which also determined that self-compassion could buffer an individual's emotional response to chronic academic stress (Neff et al., 2005; Kyeong, 2013; Hope, 2014). Using a stressful sample, the present study extends the stress-buffering effect of self-compassion to a cohort of participants that report a significantly higher academic stress than their peers; this case has not been reported in existing studies. Allen and Leary (2010) proposed that the essential of self-compassion is to treat yourself kindly when facing adversities. Furthermore, self-compassion involves positive cognitive restructuring process, in which individuals could change their point of views of stressful events to determine the positive aspects behind these negative events. Therefore, the students with a high level of self-compassion would treat themselves kindly and with acceptable attitude under chronic academic stress. They would take PEE as a self-improvement and self-growth path. Even if they fail in this examination, they are still able to treat this matter in a positive manner. Studies have also shown that self-compassion could lead to increased mastery goals among undergraduate students through limited fear of failure and improved perceived competence (Neff et al., 2005). Accordingly, an individual who is high in self-compassion can cope well with stress; they may be able to stay calm in the face of academic stress. Thus, undergraduate students with high self-compassion may not be overwhelmed by learning stress and the coming examination. Therefore, they do not experience considerable negative affect as those with low self-compassion do.

Neff (2003b) considered self-compassion as a beneficial emotional regulations strategy. That is, negative emotions, psychological distress, and painful feelings are accepted in awareness with kindness, understanding, and non-judgmental attitude. Lazarus and Folkman (1984) distinguished between the problem- and emotion-focused coping strategies in the literature. Problem-focused coping manages or alters the problem that causes the distress, whereas emotion-focused coping aims to directly regulate emotional responses to a problem (Lazarus and Folkman, 1984). From this point of view, individuals with high self-compassion tend to adopt substantial emotional and adaptive coping responses to academic stress. Neff et al. (2005) reported that self-compassion is positively associated with emotionally adaptive coping responses (e.g., reinterpretation and acceptance) but negatively associated with maladaptive coping responses (e.g., denial and mental disengagement) among students who were recently confronted with an academic failure. The similar result was replicated in another study among first year master's students (Ying and Han, 2009). Consequently, students with high self-compassion would like to transform negative cognition and

emotions into substantially positive state, as well as further adopt actions to change themselves or the external environment in the appropriate and effective manner (Carver and Connor-Smith, 2010).

Brief self-compassion induction programs have been developed based on the preceding findings to modify the participants' self-relevant thoughts, emotions, and behaviors (Adams and Leary, 2007; Leary et al., 2007). Adams and Leary (2007) asked female participants to think about overeating in a self-compassionate manner to analyze the relationship between eating guilt and self-compassion. The results indicated that the eaters who were given the self-compassion induction showed limited distress and ate less (Adams and Leary, 2007). Nevertheless, comprehensive interventions that rely on self-compassion are limited in the education context. Educators or educational psychologists can develop interventions that focus on positive cognitive restructuring to assist students positively view themselves and their situations with considerable self-directed compassion. Iskender (2011) demonstrated that self-compassion was significantly related to academic procrastination and dysfunctional attitudes. Accordingly, educational self-compassion induction programs may be a promising method to change these attitudes and correct behaviors. In addition, other interventions can be used to enhance the participants' self-compassion. For example, mindfulness-based stress reduction programs have been determined to enhance self-compassion (Birnie et al., 2010). Thus, future studies should also explore approaches that enhance self-compassion through traditional and mature interventions. Recent studies also indicated that mindfulness may help individuals to clearly identify their character strengths, which further result in enhanced wellbeing (Duan, 2016a). Accordingly, the mechanisms underlying mindfulness and self-compassion have to be examined.

Despite these results, the present study presents a few limitations. Self-compassion exerted direct and indirect effects on stress in two female chronic illness groups, namely, inflammatory bowel disease and arthritis (Sirois et al., 2015). On the one hand, self-compassion reduced stress through the substantial use of adaptive coping (e.g., positive reframing, acceptance) and limited use of maladaptive coping (e.g., behavioral disengagement, self-blame). On the other hand, self-compassion was associated with low stress through routes beyond coping responses. Similarly, the current study experiences difficulty in concluding whether self-compassion reduces negative affect via modulating stress response directly or indirectly by coping with academic stress. This issue can be addressed in future studies with specific designs. Other limitations should also be mentioned. First, the gender factor is considered a control variable in the current study. Existing studies suggested that females tend to be considerably critical of themselves, which is associated with limited self-compassion (Neff, 2003b). Therefore, whether gender is a moderator in the self-compassion buffer models is unclear. Second, other studies implied the moderating role of self-compassion in the relationship between academic burnout and psychological health (Kyeong, 2013). Further studies are necessary to analyze or distinguish the mediation and moderation roles of self-compassion in the stress study areas. Third, other emotional outcomes such as well-established flourishing (Duan and Xie, 2016; Tang et al., 2016) and thriving (Duan et al., 2016) need to be adopted in future studies to explore the emotion-buffer effects of self-compassion. These comprehensive wellbeing indicators will deep our understanding of the role of self-compassion in stressful situations.

AUTHOR CONTRIBUTIONS

The study was designed and the data was collected by XL and XC. The manuscript was prepared by YZ, XL, XC, and WD. WD finalized the final submission.

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Coping Strategies in Liver Transplant Recipients and Caregivers According to Patient Posttraumatic Growth

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The purpose of this study was to analyze the differences in coping strategies employed by liver transplant recipients and their family members according to patient posttraumatic growth. Two matched groups of 214 liver transplant recipients and 214 family members were selected. The Posttraumatic Growth Inventory and Brief COPE were used. The most relevant results were: (1) Interactive effects in active coping, support (instrumental and emotional) and acceptance strategies, which were all used more by patients with higher growth levels, while their family members showed no differences in use of these strategies by patient growth level. Furthermore, while a low level of patient growth did not mark differences between them and their caregivers, a high level did, patients employing more active coping and support (instrumental and emotional), (2) In both groups a high level of patient growth was associated with more use of positive reframing and denial than a low one, and (3) Self-blame was employed by patients more than by their caregivers. It was concluded that a high level of posttraumatic growth in liver transplant recipients is associated with more use of healthy coping strategies, basically active coping, instrumental support, and emotional support.

Keywords: liver transplantation, posttraumatic growth, coping strategies, patients, caregivers

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INTRODUCTION

Liver transplantation is a therapeutic option which increases the patient's quality of life, although not up to normative data (Fernández-Jiménez et al., 2012; Pérez-San-Gregorio et al., 2013). Such surgery forms part of a very stressful process which must be faced by the patients and their families. The period before the transplant is marked by uncertainty, specifically, the unknown about whether the patient will meet the requirements for getting on the waiting list or how long he will have to be on it until a compatible donor becomes available (Meltzer and Rodrigue, 2001; Martín-Rodríguez et al., 2014). The post-transplant stage is characterized by patient survival depending on a lifelong immunosuppressant treatment, with constant medical checkups and tests, in addition to a strong fear of losing the implant and other medical complications such as recurrence (Pérez-San-Gregorio et al., 2012; Reed-Knight et al., 2013). Thus immunosuppressant treatment has secondary effects with negative repercussions on the patient's quality of life (Grinyó et al., 2012). This can be coped with in different ways, from strategies facilitating adaptation to a new medical condition (for example, acceptance or positive reframing) to other strategies which would impede

it. All this time, family members take on the role of caregivers, so they provide the patient with emotional support, take them to doctors' appointments, look out for their dietary requirements, and do housework (Cohen et al., 2007). These caregivers may suffer from the frustration of their professional plans, employment complications, economic difficulties and even conflictive relations between the patients and their caregivers (Miyazaki et al., 2010).

Living under these conditions is associated with a diversity of psychological complications for both patients and their caregivers which usually appear in the post-transplant stage: anxiety, depression, feelings of blame, fantasies about the donor, excessive gratitude toward the donor's family, etc. (Pérez-San-Gregorio et al., 2005; Grover and Sarkar, 2012; Látos et al., 2012; Errichiello et al., 2014). Nevertheless, these complications may coexist with posttraumatic growth, which refers to a series of positive changes experienced by the person as a result of the struggle ensuing experience of a traumatic event (Tedeschi and Calhoun, 1996). In the scope of transplantation, some studies on cancer patients who have received a hematopoietic stem cell transplant have found high levels of posttraumatic growth, where these patients appreciated more value in their own lives, changed the priorities of what is important in their lives, appreciated each day more, learned how wonderful other people are and realized that they could count on them in times of trouble (Widows et al., 2005; Tallman et al., 2010).

Therefore, because of its repercussions on clinical practice, it is of great interest to find out whether the coping strategies of liver transplant recipients are different from those of their caregivers, and the influence patient posttraumatic growth could have on these differences. In spite of its relevance, there are no such studies in the field of liver transplantation, although in other clinical samples an association has been found between posttraumatic growth and certain coping strategies. For example, in patients with spinal cord injuries, it has been associated with mental disengagement and active coping (Pollard and Kennedy, 2007), in patients with rheumatoid arthritis or those who have had a myocardial infarction, it is associated with problem-focused coping (Dirik and Karanci, 2008; Senol-Durak and Ayvasik, 2010), in bone marrow transplant recipients, it is associated with avoidance, positive reinterpretation and problem-solving (Widows et al., 2005), and in cancer patients it is associated with active coping, positive reevaluation and religion (Schmidt et al., 2012; Shand et al., 2015). Some of these studies demonstrate that both avoidance and problem-focused strategies are important to posttraumatic growth (Ogińska-Bulik and Kobylarczyk, 2015). However, other studies in cancer patients have concluded that avoidance strategies (denial, behavioral disengagement, and self-blame) are unrelated to positive changes (Park et al., 2008) and even that strategies such as self-distraction are related to negative changes (Schroevers et al., 2011).

The transplant definitely involves confronting exceptional life events. This could lead to various levels of posttraumatic growth in patients associated with the use of different coping strategies. As there is no clear causal relationship between coping strategies and posttraumatic growth, and in other clinical samples the results are contradictory, in this study, we analyzed the difference in coping strategies used by liver transplant recipients and their caregivers as a function of patient posttraumatic growth (low, medium, and high).

MATERIALS AND METHODS

Participants

Two matched groups were selected for a 2 × 3 mixed factorial design: 214 liver transplant recipients with different levels of posttraumatic growth (low, medium, and high) and 214 family members (each patient's main caregiver). The design had two independent variables, one intra referring to group with two values (patient and caregiver), and another inter referring to posttraumatic growth of the patients with three values (low, medium, and high), depending on the patient's total score on the Posttraumatic Growth Inventory.

The transplant patient group (G1) was made up of 165 men and 49 women with a mean age of 60.41 years ($SD = 9.36$ years). The liver in all cases came from a donor who had died from one of the following causes: stroke (60.7%), traumatic brain injury (27%) and others (12.3%). **Table 1** shows the sociodemographic and clinical characteristics of the three of liver transplant subgroups.

The caregiver group (G2) was made up of 47 men and 167 women with a mean age of 53.19 years ($SD = 12.62$ years). The relationship to the patients was: partner (71%), child (19.6%), sibling (4.2%), mother/father (3.7%), or other (1.5%).

Instruments

The Posttraumatic Growth Inventory (Tedeschi and Calhoun, 1996) consists of 21 items answered on a Likert-type scale from 0 ("no change") to 5 ("very great degree of change") evaluating perception of personal benefits in survivors of traumatic events. It provides information referring to the total score on the scale and five dimensions: relating to others, new possibilities, personal strength, spiritual change and appreciation of life. We used the Spanish version provided by Weiss and Berger (2006). This inventory was administered to patients, with a Cronbach's alpha in this study of 0.94 for the complete scale and 0.73–0.88 on the various subscales.

The Brief COPE (Carver, 1997) is made up of 28 items answered on a Likert-type scale from 0 ("no, not at all"/"I haven't been doing this at all") to 3 ("a lot"/"I've been doing this a lot"). It evaluates 14 coping strategies: active coping, planning, instrumental support, emotional support, self-distraction, venting, disengagement, positive reframing, denial, acceptance, religion, substance use, humor, and self-blame. We used the Spanish version provided by Morán et al. (2010). This scale was administered to the patients and their caregivers, with a Cronbach's alpha in this study of 0.50 to 0.85 on the various subscales, except for the disengagement subscale which not surpass 0.50.

Procedure

After this study was approved by the Ethics Committee of the Virgen del Rocío University Hospital of Seville, we selected two

matched groups of liver transplant recipients and their family members.

To select the transplant group, we started out from a clinical population of all those patients who had received a liver transplant from a deceased donor in Seville from 1990 to 2014. During this period, 1053 liver transplantations were performed in adults, of which only 569 patients remained alive at the start of this study. All of them and their caregivers were informed through the Association of Liver Transplant Recipients and the Hepatic-Biliary-Pancreatic Surgery and Liver Transplant Unit of the possibility of participating in this psychological study.

The criteria for inclusion in both groups were that they must be of adult age, sign the informed consent, have no problem understanding the evaluation instruments employed, and not have any severe pathology or disability at the time of evaluation which would impede comprehension of the items. Other considerations specific to patients were whether a family member was caring for the patient (accompanied them to checkups and medical tests, supervised their immunosuppressant medication, etc.) and whether they had only had one transplant.

Based on these criteria, 331 patients were excluded: 282 because they did not wish to participate, two could not be located, 15 did not understand the instruments, eight

TABLE 1 | Comparison of the sociodemographic and clinical variables of the three subgroups of liver transplant recipients (G1) with different levels of posttraumatic growth (low, medium, and high).

	Posttraumatic growth levels			Intergroup comparisons		Effect sizes
	Low ***n*** **= 70** **a**	**Medium** ***n*** **= 71** **b**	**High** ***n*** **= 73** **c**			
	***M* (*SD*)**	***M* (*SD*)**	***M* (*SD*)**	***F*(2.211)**	***p***	**Cohen's *d***
Age	61.54 (8.85)	59.89 (9.59)	59.82 (9.62)	0.77	0.466	
					a–b = 0.547	0.18 N
					a–c = 0.516	0.19 N
					b–c = 0.999	0.01 N
Time since transplant (in months)	79.76 (63.44)	95.63 (67.96)	88.41 (71.57)	0.97	0.381	
					a–b = 0.348	−0.24 S
					a–c = 0.726	−0.13 N
					b–c = 0.799	0.10 N
	%	**%**	**%**	**χ^2**	***p***	**Cohen's *w***
Gender				1.07	0.586	0.07 N
- Male	30.9	33.9	35.2			
- Female	38.8	30.6	30.6			
Marital status				0.63	0.731	0.05 N
- Partner	32.6	34.3	33.1			
- No partner	33.3	28.2	38.5			
Education				7.32	0.120	0.18 S
- Low	28.7	32.4	39.0			
- Medium	35.6	31.1	33.3			
- High	45.5	39.4	15.2			
Employment				1.94	0.379	0.09 N
- Working	43.8	37.5	18.8			
- Not working	31.8	32.8	35.4			
Etiology of the liver disease				13.28	0.103	0.25 S
- Alcoholic	29.4	30.9	39.7			
- Hepatocellular carcinoma	33.3	25.0	41.7			
- Hepatitis C virus	32.4	43.2	24.3			
- Hepatitis B virus	8.3	50.0	41.7			
- Others	45.9	35.1	18.9			

N, null effect size; S, small effect size.

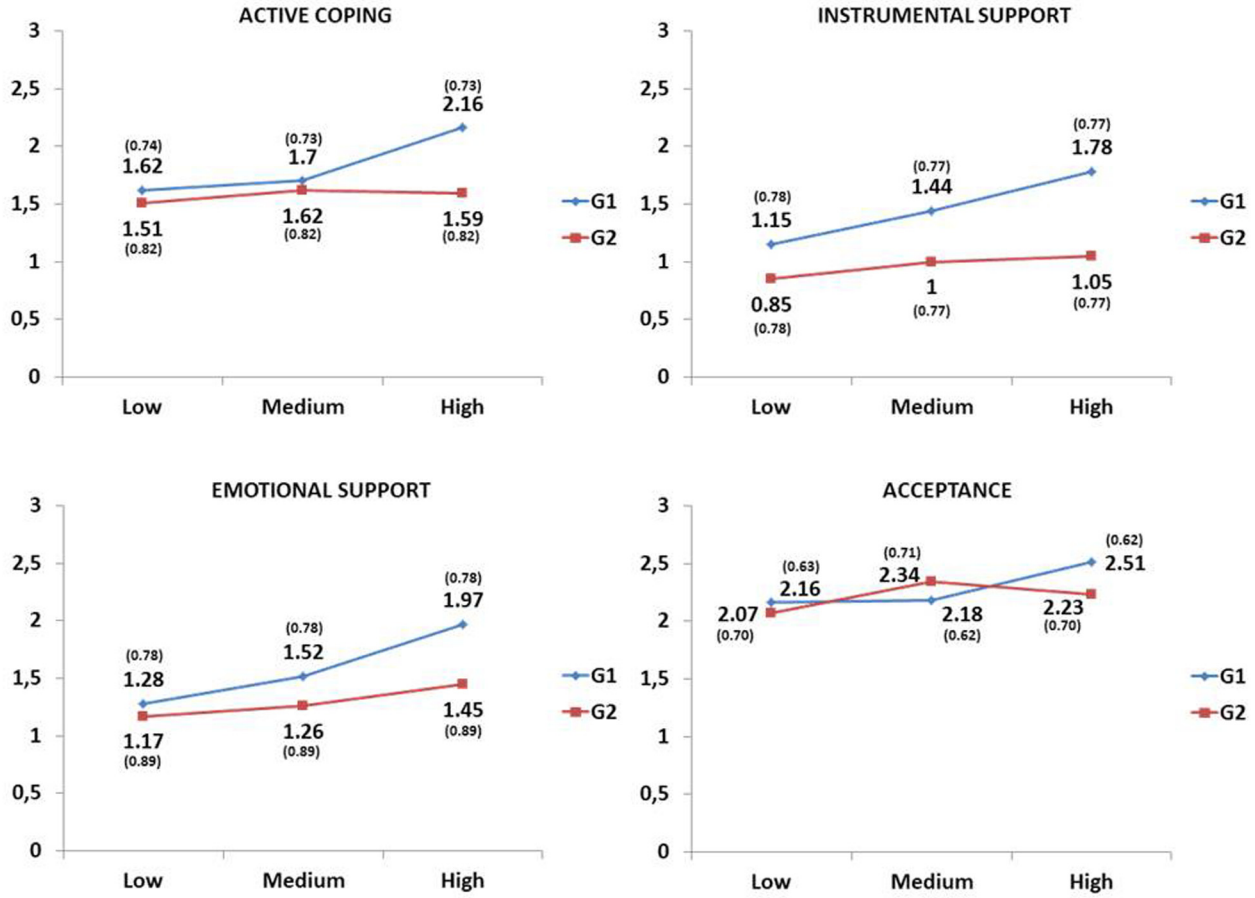

FIGURE 1 | Interactive effects of the group and patient posttraumatic growth level (low, medium, and high) factors. Means (standard deviations) adjusted for time since transplant covariate, G1 = Liver transplant recipients, G2 = Caregivers.

had other disorders (stroke, hepatic encephalopathy, etc.) and 24 were retransplant patients, leaving 238 patients finally evaluated. Of the main caregivers of each of these patients, 12 did not wish to participate, two did not understand the instruments, and 10 patients did not have a main caregiver. Therefore, 214 patient-caregiver pairs were finally evaluated.

Statistical Analysis

Data were analyzed using the SPSS 22 statistics program. Pearson's Chi-Square was used to compare the qualitative variables in the three patient subgroups, and to compare the quantitative variables, a one-way ANOVA was applied with the Tukey HDS test for *post hoc* comparison. A 2 × 3 mixed factorial ANCOVA was also done to evaluate the influence on coping strategies exerted by group (liver transplant recipients and caregivers) and patient posttraumatic growth level (low, medium, or high). Time since transplantation (in months) was included as a covariate in this analysis. The Cohen's *w* (for qualitative variables) and Cohen's *d* (for quantitative variables) were calculated as an index of effect size.

RESULTS

Three groups were formed based on the total score by liver transplant recipients on the Posttraumatic Growth Inventory: (a) 70 patients with low posttraumatic growth (32.7% of the sample, 0–57 points), (b) 71 patients with medium posttraumatic growth (33.2% of the sample, 58–77 points), and (c) 73 patients with high posttraumatic growth (34.1% of the sample, 78–105 points). Two criteria were used for the selection of these three groups: (1) the total scores found for each of the patients on the Posttraumatic Growth Inventory, which varied from 0 to 105, and (2) after putting patient scores in order from lowest to highest, three subgroups were formed corresponding to about one third of the sample based on the percentiles found. As shown in **Table 1**, among the three subgroups there were no differences in sociodemographic or clinical variables (*d*s from 0.01 to 0.25, null or small effect sizes).

Interactive effects between the two factors in the study were found in the following coping strategies: active coping [$F(2,210) = 5.30$, $p = 0.006$], instrumental support [$F(2,210) = 4.21$, $p = 0.016$], emotional support [$F(2,210) = 3.29$,

$p = 0.039$], and acceptance [$F(2,210) = 4.29$, $p = 0.015$]. Specifically, as shown in **Figure 1** and **Tables 2** and **3,** the simple effects demonstrated that these four coping strategies were more used by the patients with the highest levels of posttraumatic growth (*d*s from −0.55 to −0.89, medium or large effect sizes), while there was no variation in the use of these strategies for caregivers as a function of posttraumatic growth of patients (*d*s from 0.04 to −0.38, null or small effect sizes) (**Table 2**). Furthermore, while low posttraumatic growth in patients did not mark important differences between them and their caregivers (*d*s from 0.13 to 0.38, null or small effect sizes), a high level did show very relevant differences in which patients employed active coping ($p < 0.001$, $d = 0.74$, medium effect size), instrumental support ($p < 0.001$, $d = 0.95$, large effect size) and emotional support ($p < 0.001$, $d = 0.62$, medium effect size) strategies more than their caregivers. Medium posttraumatic growth also showed a difference in instrumental support ($p < 0.001$, $d = 0.56$, medium effect size), as this strategy was more used by patients than by their caregivers (**Table 3**).

TABLE 2 | Simples effects: comparisons of patient posttraumatic growth levels in liver transplant recipient (G1) and caregiver (G2) groups.

	G1 $n = 214$		G2 $n = 214$	
Posttraumatic growth levels (G1)	***p***	**Cohen's *d***	***p***	**Cohen's *d***
Active coping				
Low-medium	1.000	−0.10 N	1.000	−0.14 N
Low-high	<0.001	−0.73 M	1.000	−0.09 N
Medium-high	0.001	−0.63 M	1.000	0.04 N
Instrumental support				
Low-medium	0.075	−0.38 S	0.727	−0.20 S
Low-high	<0.001	−0.81 L	0.414	−0.25 S
Medium-high	0.030	−0.43 S	1.000	−0.05 N
Emotional support				
Low-medium	0.198	−0.31 S	1.000	−0.10 N
Low-high	<0.001	−0.89 L	0.195	−0.31 S
Medium-high	0.002	−0.57 M	0.625	−0.21 S
Acceptance				
Low-medium	1.000	−0.04 N	0.071	−0.38 S
Low-high	0.003	−0.55 M	0.532	−0.23 S
Medium-high	0.007	−0.52 M	1.000	0.16 N

N, null effect size; S, small effect size; M, medium effect size; L, large effect size; G1, liver transplant recipients; G2, caregivers.

Concerning the main effects, the posttraumatic growth factor was significant in positive reframing ($p = 0.006$) and denial ($p = 0.008$) coping strategies, where a high level of posttraumatic growth showed an important association with greater use of positive reframing ($p = 0.004$, $d = -0.54$, medium effect size) and denial ($p = 0.006$, $d = -0.53$, medium effect size) than a low one. The group factor also marked an import difference in the self-blame strategy ($p < 0.001$, $d = 0.55$, medium effect size), which was used much more by patients than by their caregivers (**Table 4**).

DISCUSSION

The most relevant finding of this study was the interactive effects of the active coping, instrumental support, emotional support and acceptance variables. All of them were used to a greater extent by liver transplant recipients who had more posttraumatic growth (medium or large effect sizes). However, the use of those strategies by family members did not vary with patient posttraumatic growth level (null or small effect sizes). This means that patients with more posttraumatic growth face their problems by employing adaptive strategies, that is, they take action or carry out specific activities to solve their problems (active coping), seek advice and information about what they should do (instrumental support), consolation and understanding from others (emotional support), and also recognize the problems they are going through (acceptance). This result on acceptance supports Zoellner and Maercker's (2006) theory on the importance of accepting traumatic situations, usually life events which are uncontrollable or unchangeable, in the process of posttraumatic growth. The other three strategies (active coping, instrumental support, and emotional support), while low-level posttraumatic growth did not mark differences between patients and their caregivers (null or small effect sizes), the opposite was true of high-level posttraumatic growth, which did mark relevant differences (medium or large effect sizes) and were more used by the patients than by caregivers. This difference with the same trend was also observed in the instrumental support strategy when patients had a medium posttraumatic growth level. A possible explanation for these results, as demonstrated in breast cancer patients, would be that these strategies foster positive changes in liver transplant recipients. This means that the active effort to try and change difficult circumstances for the better, facing the problem, and seeking support, would increase the possibility that the patients have fewer negative feelings when they can express them. This

TABLE 3 | Simples effects: comparisons of liver transplant recipients (G1) and their caregivers (G2) at each of the patient posttraumatic growth levels.

Posttraumatic growth levels	**Active coping**		**Instrumental support**		**Emotional support**		**Acceptance**	
	p	**Cohen's *d***	***p***	**Cohen's *d***	***p***	**Cohen's *d***	***p***	**Cohen's *d***
Low	0.335	0.15 N	0.009	0.38 S	0.363	0.13 N	0.401	0.13 N
Medium	0.523	0.10 N	<0.001	0.56 M	0.026	0.31 S	0.134	−0.24 S
High	<0.001	0.74 M	<0.001	0.95 L	<0.001	0.62 M	0.009	0.41 S

N, null effect size; S, small effect size; M, medium effect size; L, large effect size

TABLE 4 | Coping strategies: differences between liver transplant recipients (G1) and their caregivers (G2) by patient posttraumatic growth levels.

	Posttraumatic growth levels M^1 (*SD*)			Comparisons *p* (Cohen's *d*)			Groups M^1 (*SD*)		Main effects		Interactive effects
	Low *n* = 70 a	Medium *n* = 71 b	High *n* = 73 c	a–b	a–c	b–c	G1 *n* = 214	G2 *n* = 214	Posttraumatic growth levels *F*(2,210) *(p)*	Groups *F*(1,210) (*p*) [Cohen's *d*]	*F*(2,210) (*p*)
Planning	1.12	1.38	1.26	1.000	0.536	0.716	1.23	1.11	1.09	4.17	1.42
	(0.63)	(0.63)	(0.62)	(−0.03 N)	(−0.22 S)	(-0.20 S)	(0.85)	(0.73)	(0.338)	(0.036) [0.16 N]	(0.245)
Self-distraction	0.85	1.06	1.13	0.234	0.062	1.000	1.07	0.95	2.95	0.28	1.27
	(0.72)	(0.72)	(0.72)	(−0.30 S)	(−0.39 S)	(−0.09 N)	(0.89)	(0.86)	(0.054)	(0.598) [0.14 N]	(0.282)
Venting	0.73	0.76	0.76	1.000	1.000	1.000	0.76	0.74	0.05	0.01	1.93
	(0.61)	(0.61)	(0.61)	(−0.05 N)	(−0.05 N)	(0.00 N)	(0.75)	(0.75)	(0.952)	(0.915) [0.02 N]	(0.147)
Disengagement	0.22	0.26	0.23	1.000	1.000	1.000	0.34	0.13	0.24	5.69	0.09
	(0.35)	(0.34)	(0.35)	(−0.11 N)	(−0.04 N)	(0.07 N)	(0.55)	(0.35)	(0.784)	(0.018) [0.45 S]	(0.913)
Positive reframing	1.28	1.48	1.62	0.174	0.004	0.560	1.46	1.46	5.31	0.80	2.71
	(0.63)	(0.63)	(0.62)	(−0.32 S)	(−0.54 M)	(−0.22 S)	(0.79)	(0.77)	(0.006)	(0.373) [0.00 N]	(0.069)
Denial	0.28	0.40	0.53	0.369	0.006	0.348	0.46	0.35	4.92	0.16	2.05
	(0.48)	(0.48)	(0.48)	(−0.26 S)	(−0.53 M)	(−0.26 S)	(0.63)	(0.60)	(0.008)	(0.686) [0.17 N]	(0.131)
Religion	1.00	1.01	1.34	1.000	0.023	0.029	1.07	1.16	4.73	3.60	1.00
	(0.76)	(0.76)	(0.76)	(−0.01 N)	(−0.45 S)	(−0.44 S)	(0.98)	(0.95)	(0.010)	(0.059) [−0.09 N]	(0.371)
Substance use	0.05	0.05	0.05	1.000	1.000	1.000	0.05	0.05	0.00	0.76	0.39
	(0.21)	(0.21)	(0.21)	(0.01 N)	(0.00 N)	(−0.01 N)	(0.29)	(0.23)	(0.996)	(0.384) [0.03 N]	(0.679)
Humor	0.49	0.48	0.49	1.000	1.000	1.000	0.57	0.41	0.02	1.19	1.03
	(0.58)	(0.59)	(0.59)	(0.02 N)	(−0.01 N)	(−0.03 N)	(0.77)	(0.69)	(0.983)	(0.277) [0.22 S]	(0.360)
Self-blame	0.51	0.64	0.56	0.490	1.000	1.000	0.76	0.38	0.99	14.21	0.68
	(0.54)	(0.54)	(0.54)	(−0.24 S)	(−0.10 N)	(0.14 N)	(0.80)	(0.57)	(0.374)	(<0.001) [0.55 M]	(0.507)

[1]*Means adjusted for the time since transplant covariate; N, null effect size; S, small effect size; M, medium effect size; G1, liver transplant recipients; G2, caregivers.*

would therefore allow them to concentrate on the benefits, which along with the increase in close relationships, would contribute to recognition of one's own personal strength (Manne et al., 2004). In this same line, the fact that patients with more posttraumatic growth employ active coping to face their problems has also been confirmed in other studies done with patients suffering from rheumatoid arthritis (Dirik and Karanci, 2008), have had spinal cord injury (Pollard and Kennedy, 2007), heart attack (Senol-Durak and Ayvasik, 2010) or breast cancer (Schmidt et al., 2012). Seeking support (instrumental and emotional) as a coping strategy provides an opportunity for patients to tell their problems to someone and express their emotions and negative thoughts. This facilitates event processing, trying to understand it, and finding a positive meaning in it (Cordova et al., 2001; Manne et al., 2004). Thus, different types of support (emotional, cognitive, and instrumental) are associated with posttraumatic growth (Hasson-Ohayon et al., 2016).

Another very interesting result was that regardless of the role (patient or caregiver), a high level of patient posttraumatic growth was associated with more use of positive reframing and denial than a low level. Along this same line, in bone marrow transplant (Widows et al., 2005) and cancer patients (Schmidt et al., 2012; Shand et al., 2015), posttraumatic growth was also associated with positive reframing. It could be said that the effort patients and caregivers make to interpret the threat positively would facilitate the search for real positive changes, or at least promote the perception that such changes have occurred (Thornton and Perez, 2006). With regard to denial, similar results were also found in bone marrow transplant recipients, which could be explained because under some circumstances, taking on an active attitude toward problems would facilitate posttraumatic growth, while in others, the use of denial would alleviate the anxiety temporarily, leading in turn to the perception of growth (Widows et al., 2005; Dirik and Karanci, 2008). In fact, as argued by Ogińska-Bulik and Kobylarczyk (2015), both avoidance and problem-focused strategies are relevant in posttraumatic growth. Similarly, although without controlling for the influence of posttraumatic growth, Stilley et al. (2010) found that 17% of liver transplant recipients used both approach and avoidance strategies to face the various problems related to transplantation.

On the other hand, being a patient or a caregiver made an important difference (medium effect size) in the use of the self-blame strategy regardless of posttraumatic growth of the patient. It is the patients, rather than their family members, who tend to criticize and blame themselves for what happened. This result could be explained by patients considering themselves responsible for the distress their family members feel due to their illness, and feeling like a burden on the whole family (Domínguez-Cabello et al., 2012a). It should be stressed that the main illnesses triggering liver transplant are alcohol addiction and illegal use of drugs, reason for which, for example, the caregiver of a patient who is a candidate for a liver transplant compared to those of a lung transplant, experience a heavier burden (Meltzer and Rodrigue, 2001), in addition to suffering in each of the stages associated with transplantation, especially in those before it (pre-transplant study and waiting list) (Domínguez-Cabello et al., 2012b). In other etiologies leading to liver transplant, such as hepatitis C virus, patients have been described as socially isolating themselves, whether they received a transplant or not, mainly for fear of transmitting the virus to family and friends, which generates feelings of guilt and shame (Dudley et al., 2007; Pérez-San-Gregorio et al., 2012). To all of the above it would have to be added that transplant patients sometimes feel guilty for the death of their donor to the point of having difficulties in organ acceptance (Zimbrean, 2015). Regardless of the patient's posttraumatic growth, the main difference from their caregivers is that the latter are less self-critical. This result is very significant, as it would reduce the caregiver's burden by presenting less guilt for all the circumstances associated with the transplant.

Summarizing, the main contribution of this study is that a higher level of posttraumatic growth in liver transplant recipients is associated with their using more adaptive coping strategies compared to their family members to face their problems. Therefore, and as suggested by Dirik and Karanci (2008), it would be very advisable to strengthen healthy coping strategies to be able to reinforce posttraumatic growth. It would also be beneficial to increase posttraumatic growth by means of intervention based, among others, on self-help groups or cognitive-behavioral therapy, as demonstrated in cancer patients who undergo hematopoietic stem cell transplantation (Jeon et al., 2015).

Finally, some limitations of this study which should be considered in future research would be the following: (1) The results of the comparison of coping strategies between patients and their caregivers could vary depending on the levels of posttraumatic growth of the family member, (2) Posttraumatic growth and some coping strategies (for example, positive reframing) might overlap, and (3) finally, to solve the specific causal relationship between posttraumatic growth and coping strategies, longitudinal studies would be advisable, as both aspects could vary over time.

AUTHOR CONTRIBUTIONS

MÁP-S-G, AM-R, MB-M, MLA-N, JP-B, and MÁG-B: Conception and design of the work; data analysis and interpretation; revising the article critically for important intellectual content; giving final approval of the version to be submitted. MÁP-S-G and AM-R: Bibliography research about the topic; data collection; drafting the article.

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Predictors of Stress in College Students

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University students often face different stressful situations and preoccupations: the first contact with the university, the freedom of schedule organization, the selection of their master's degree, very selective fields, etc. The purpose of this study is to evaluate a model of vulnerability to stress in French college students. Stress factors were evaluated by a battery of six scales that was accessible online during 3 months. A total of 483 students, aged between 18 and 24 years (Mean = 20.23, standard deviation = 1.99), was included in the study. The results showed that 72.9, 86.3, and 79.3% of them were suffering from psychological distress, anxiety and depressive symptoms, respectively. More than half the sample was also suffering from low self-esteem (57.6%), little optimism (56.7%), and a low sense of self-efficacy (62.7%). Regression analyses revealed that life satisfaction, self-esteem, optimism, self-efficacy and psychological distress were the most important predictors of stress. These findings allow us to better understand stress-vulnerability factors in students and drive us to substantially consider them in prevention programs.

Keywords: college students, perceived stress, optimism, self-efficacy, psychological distress, self-esteem

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INTRODUCTION

Many studies highlighted mental health issues in young adult, especially during their studying years at university (Blanco et al., 2008; Milojevich and Lukowski, 2016).

According to health surveys, young people from 12 to 25 years old suffer from an insufficient level of psychological health (Grebot and Barumandzadeh, 2005; Windfuhr et al., 2008; Thapar et al., 2012). Some studies also show that, compared to individuals of the same age (Roberts et al., 1999; Adlaf et al., 2005; Boujut et al., 2009) and, in general, to any other population (Nerdrum et al., 2006; Blanco et al., 2008; Walsh et al., 2010; Moreira and Telzer, 2015), students have more psychological problems.

Students' psychological discomfort is reflected in several ways including depression, anxiety, stress, and sleeping disorders (Lejoyeux et al., 2011; Schraml et al., 2011; Boulard et al., 2012; Nyer et al., 2013; Petrov et al., 2014; Feld and Shusterman, 2015; Milojevich and Lukowski, 2016). This discomfort has been the subject of many investigations. In fact, depression is common in students from 15 to 24 years olds (Lafay et al., 2003). According to a French study (Boujut et al., 2009), 27, 18, and 3% of college students suffer from mild, moderate and severe depression, respectively. Anxiety (Neveu et al., 2010) and feeling overwhelmed are actually quite typical of college students, including those who succeed (Lassarre et al., 2003). More than 83% of students from the University of Lodz suffer from fatigue (Maniecka-Bryła et al., 2005). In addition, according to two French studies, 15% of students had suicidal thoughts (Lafay et al., 2003) while 3% had a suicidal tendency (Boujut et al., 2009). It seems that suicidal thoughts are more prevalent, during the past 12 months, in students than other young people (Grémy et al., 2002). Furthermore, another study found that

60% of first-year students of a business school (Ecole Supérieure de Commerce) had significant levels of psychological distress and low self-esteem (Strenna et al., 2009). Their coping strategies were principally based on withdrawal (Strenna et al., 2009). Humphris et al. (2002) found that more than 30% of European dental students reported significant psychological distress and 22% reported a high level of emotional exhaustion.

These mental health issues among students are of growing concern (Castillo and Schwartz, 2013; Milojevich and Lukowski, 2016). It should be noted that in most cases, men report being less anxious and depressed (Castillo and Schwartz, 2013) and having less suicidal thoughts than women (Dusser et al., 2009).

This poor psychological well-being is sometimes associated with physical disorders (Graziani et al., 2001). It could also be associated with the broader concept of "stress," that involves all aspects of life's difficulties, including psychological discomfort. Each student deals with the same stress differently (Boujut, 2007). A French study showed that 79% of students reported being stressed (Vandentorren et al., 2005).

On the other hand, other studies focused on the factors that were linked to these issues in students and found that neuroticism, which is the general tendency to experience unpleasant or negative emotions, could be a stress predictor in students (Vollrath, 2000). Nonetheless, low self-esteem was found to be the strongest predictor of stress symptoms (Han, 2005). Strenna et al. (2009) found a link between low self-esteem and anxiety and depression in students.

Little research is currently being conducted on the psychological health of college French students (Boujut, 2007; Strenna et al., 2009). Ongoing research has mainly been carried out as part of students' health insurance surveys (Boujut et al., 2009). The main purpose of this study is to determine the role of some factors (gender, age, year of studies, formation and research units (UFR), self-esteem, optimism, self-efficacy and psychological distress, including somatic symptoms, anxiety, insomnia, social dysfunction and severe depression) linked to the presence of perceived stress in students, after evaluating different aspects of mental health in college students. This could help to better evaluate and understand the psychological malaise of French college students.

METHODS

Data Collection Procedure

Online data collection was conducted between February and May 2014, using a battery of questionnaires posted on Googles docs. Information regarding this survey was distributed to all registered students at the University Paris Ouest Nanterre La Defense and other universities in the Parisian area.

Ethics Statement

The study protocol was approved by the ethics committee of the Psychological Science and Learning Science department at the University of Paris Ouest Nanterre La Défense, UFR SPE (Department of Psychology and Education) and by the CNIL (Commission nationale de l'informatique et des libertés). In accordance with the Helsinki declaration, written informed consent was obtained from each student before inclusion.

Population

Out of 630 replies, 147 were incomplete and/or useless. Thus, the final sample consisted of 483 college students (355 women, 128 men), aged between 18 and 24 years (*M*: 20.23; *SD*: 1.99) from the Parisian area (11.6% were not registered at the University Paris Ouest Nanterre La Defense).

Measures

The questionnaire of the study was divided in two parts. In the first part, students were asked to give socio-demographic data concerning their gender, age, place of residence, current year of studies, study program and university of origin. They also had to report, using a visual analog scale, whether they were satisfied with the discipline they chose at university and whether they had ever repeated an academic year. The second part included six questionnaires:

Self-esteem was measured using the 10-item version of the Rosenberg Self-Esteem Scale (RSES), developed by Rosenberg (1965) and translated and validated in French by Vallieres and his team. All items were answered using a 4-point Likert scale format ranging from strongly agree to strongly disagree (Vallieres and Vallerand, 1990). A score lower than 30 indicates a low self-esteem (Chabrol et al., 2004). Cronbach's alpha coefficient in this study was: (0.86).

Perceived self-efficacy was evaluated using the General Self-Efficacy Scale (GSE), developed by Matthias Jerusalmen and Ralf Schwarse (Luszczynska et al., 2005). It was translated in French and validated by Dumont and his team and consisted of 10 items that are answered using a 4-point Likert scale ranging from "not at all true" to "exactly true" (Dumont et al., 2000). Cronbach's alpha coefficient in this study was: (0.84).

Optimism was assessed using the 10-item revised version of the Life Orientation Test (LOT-R) developed by Scheier and Carver (Trottier et al., 2008). It was translated in French and validated by Sultan and Bureau (Shankland and Martin-Krumm, 2012). A higher score indicates higher optimism. Cronbach's alpha coefficient in this study was: (0.83).

Student's well-being was measured using the Satisfaction With Life Scale (SWLS) developed by Diener et al. (1985); Diener (2006). It was translated in French and validated by Blais and his team and consisted of five items that are answered on a scale from 7 (strongly agree) to 1 (strongly disagree) (Blais et al., 1989). A higher indicates a higher satisfaction. Cronbach's alpha coefficient in this study was: (0.82).

Perceived stress was assessed using the 10-item Perceived Stress Scale (PSS-10). It was developed by Cohen et al. (1983) and translated and validated in French by Bellinghausen et al. (2009). Each item is rated on a 5 points scale from "1" (never) to "5" (very often). It includes two factors: perceived helplessness and perceived self-efficacy (Bellinghausen et al., 2009), and two scores thresholds: a score superior to 24 for anxiety and to 26 for depression (Collange et al., 2013). In this study Cronbach's alpha coefficient in this study was: (0.82).

Psychological distress was evaluated using the 28-item General Health Questionnaire (GHQ-28) scale. This measure was initially described by Goldberg in 1972 (Goldberg and Hillier, 1979) then translated and validated in French by Bolognini et al. (1989). It is divided into 4 subscales which measure somatic symptoms, anxiety/insomnia, social dysfunction and severe depression (Goldberg and Hillier, 1979), each consisting of 7 items that are answered using a 4-point Likert scale (Bolognini et al., 1989). A score greater than or equal to 5 indicates psychological distress (Guelfi, 1993). Cronbach's alpha coefficient in this study was: (0.84).

Statistical Analysis

Statistical analyses were performed using the software Statistica (version 12). First, descriptive analyses (such as percentages, means and standard deviations) were produced. Then, bivariate analyses (Mann–Whitney *U*-test, Spearman's correlation) were performed in order to investigate the possible links between all variables of interests (gender, age, year of studies, UFRclassification at the University of Paris Ouest Nanterre, self-esteem, optimism, generalized self-efficacy and psychological distress (somatic symptoms, anxiety/insomnia, social dysfunction, severe depression). Finally, multivariate analyses (multiple regressions) were run to test the link between perceived stress as the dependent variable and including, as predictors, the year of studies, the academic sector, self-esteem, optimism, the sense of self-efficacy and psychological distress. The significance limit was set at $p < 0.05$.

RESULTS

General Characteristics of the Sample (Table 1)

The final sample consisted of 483 students from the Parisian area (88.41% from the University of Nanterre), of whom the majority were women (73.5%). The average age was 20.23 years (±1.99). Most students lived with their parents (68.7%), did not have kids (88.4%) and reported being somewhat satisfied with their studies (38.5%). This sample included students from all years of studies (first year of license to PhD) and from different academic sectors. The majority of students did not repeat any academic year (77.6%).

Results of the Questionnaires Used (Table 2)

Low self-esteem was reported by 57.6% of students while 25% of them were slightly satisfied by their well-being and 56.7% had little optimism. The majority of them also reported having a low sense of self-efficacy (62.7%), anxiety (86.3%) and depression (79.3%). Finally, according to their GHQ-28 scores, 72.9% of students declared suffering from psychological distress.

Results of Gender Differences (Table 3)

Results showed that men had a higher sense of self-efficacy than women. The latter had significantly higher scores on perceived stress and both its factors (perceived helplessness and perceived self-efficacy) and presented more psychological distress, including more somatic symptoms and anxiety/insomnia.

Results of the Links between Stress and Studied Factors (Table 4)

When simultaneously taking into account all studied factors (gender, age, year of studies, UFR classification at the University of Paris Ouest Nanterre, self-esteem, optimism, generalized self-efficacy and psychological distress (somatic symptoms, anxiety/insomnia, social dysfunction, severe depression), we found a significant link between stress and most of these factors. In fact, on the one hand, there was a negative correlation between perceived stress and factors that could be considered as "positive" ones such as self-esteem, optimism and sense of self-efficacy. On the other hand, there was a positive correlation between perceived stress and factors that could be considered as "negative" ones such as psychological distress and its four factors on the GHQ-28 scale including somatic symptoms, anxiety and insomnia, social dysfunction and severe depression.

Results showed a significant link between gender and scores on the perceived stress scale, specifically in women who were more stressed on most of the evaluated factors. Analyses did not show any association between perceived stress score (and its factors) and age, year of studies or UFR classification.

Additional studies on perceived helplessness and perceived self-efficacy, two subscales of the PSS-10 scale, showed similar results concerning the negative and positive associations found with perceived stress.

Results of Linear Multiple Regression Analyses (Table 5)

A linear multiple regression analysis was performed using perceived stress as the dependent variable and including as predictors the year of studies, the academic sector, self-esteem, optimism, the sense of self-efficacy and psychological distress. The total variance accounted for by the model was 57% [$F_{(7, 475)} = 93.269$; $p < 0.0001$]. Life satisfaction (Beta $= -0.11$; $p = 0.002$), self-esteem (Beta $= -0.20$; $p = 0.000002$), optimism (beta $= -0.12$; $p = 0.002$), self-efficacy (beta $= -0.19$; $p = 0.00$) and psychological distress (beta $= 0.38$; $p = 0.00$) independently and significantly predicted perceived stress. Furthermore, among those variables, self-esteem, optimism and self-efficacy negatively predicted perceived stress and were considered to be "positive" variables while psychological distress positively predicted perceived stress and was considered to be a "negative" variable.

DISCUSSION

Prevalence of Stress and Psychological Difficulties Evaluated in Our French College Students Sample

In line with several previous research stating the importance of psychological problems among college students (Lafay et al., 2003; Lassarre et al., 2003; Boujut et al., 2009; Strenna et al.,

TABLE 1 | Participants' sociodemographic and educational characteristics.

Participants' characteristics		Number (total $N = 483$)	Percentage frequency (%)
Gender	Women	355	73.5
	Men	128	26.5
Residence	Living with parents	332	68.7
	University residence	32	6.6
	Roommate/couple	56	11.6
	Other	63	13
Have children	No	456	94.4
Home university	Paris Nanterre La Defense	427	88.4
Year of studies	L1: First academic year	213	44.1
	L2: Second academic year	109	22.6
	L3: Third academic year	109	22.6
	M1: First year of Master degree	24	4.97
	M2: Second year of Master degree	21	4.4
	PhD	7	1.5
Formation and research units (UFR)	Foreign cultures and languages (LCE)	44	9.1
	Philosophy, information-Communication, Language, Literature, Performing Arts (PHILLIA)	92	19
	Economics, Management, Mathematics, Computer Science (SEGMI)	57	11.8
	Law and Political Science (DSP)	109	22.6
	Psychological Sciences and Educational Sciences (SPSE)	72	14.9
	Social sciences and administration (SSA)	74	15.3
	Other	35	7.3
Repetition of academic year	No	375	77.6
Cursus satisfaction *	Not satisfied at all	14	2.9
	Unsatisfied	30	6.2
	Slightly dissatisfied	84	17.4
	Slightly satisfied	186	38.5
	Satisfied	148	30.6
	Extremely satisfied	21	4.4

**Level of satisfaction with the university cursus the student picked.*

2009), our results show that the students included in our sample ($N = 483$) have high levels of anxiety (86.3%), depression (79.3%), psychological distress (72.9%) and have a low self-esteem (57.6%). The level of stress in our sample is slightly higher than the ones found in the literature(Vandentorren et al., 2005; Strenna et al., 2009; Dachew et al., 2015; Deasy et al., 2015; Larcombe et al., 2016; Weier and Lee, 2016).

Gender Differences

Overall, the psychological difficulties were significantly higher in women than men when it came to perceived stress, perceived helplessness, perceived self-efficacy, global psychological distress, somatic symptoms, anxiety and insomnia. They also have a lower sense of self-efficacy than men. However, we did not find significant differences between women and men concerning self-esteem, life satisfaction, and optimism.

On the one hand, these results are in accordance with many previous research performed in different countries (Backović et al., 2012; Cruz et al., 2013; Shamsuddin et al., 2013) that show that levels of stress and psychological distress are higher in female than male college students (Spitz et al., 2007; Backović et al., 2012; Deasy et al., 2015). On the other hand, our results concerning associations between gender and the sense of self-efficacy are in opposition to other literature data (Follenfant and Meyer, 2003; Ayle and Nagels, 2014). This was also the case for our results concerning the links between gender and self-esteem (Dozot et al., 2009).

Link between Stress and Gender, and Stress and Age, in Students

When it comes to the link between stress and gender, our results confirm the significant link previously find in other studies.

TABLE 2 | Students' results to different questionnaires.

Scale	Level (threshold)	Number (*N* total = 483)	Percentage frequency (%)	Total	
				M	*SD*
SWLS:				22.63	6.28
Life satisfaction	Extremely satisfied (31–35)	35	7.25		
	Satisfied (26–30)	156	32.3		
	Slightly satisfied (21–25)	121	25		
	Neutral (20)	21	4.35		
	Slightly dissatisfied (15–19)	89	18.4		
	Dissatisfied (10–14)	47	9.7		
	Extremely dissatisfied (5–9)	14	2.9		
RSES:				28.41	5.43
Self-esteem	Low self-esteem (<30)	278	57.6		
	High self-esteem (≥30)	205	42.44		
LOT-R:				12.36	4.77
Optimism	High optimism (19–24)	46	9.5		
	Moderate optimism (14–18)	163	33.75		
	Low optimism (0–13)	274	56.7		
GSE:				28.13	4.51
Self-efficacy	Low sense of self-efficacy (<29)	303	62.7		
	High sense of self-efficacy (≥29)	180	37.27		
PSS-10:				30.48	6.17
Perceived stress	Anxiety (≥24)	417	86.3		
	Depression (≥26)	383	79.3		
	Perceived helplessness	–	–	19.78	4.42
	Perceived self-efficacy	–	–	10.72	2.53
GHQ-28:				8.45	5.32
Psychological distress	Psychological distress (≥5)	352	72.9		
	No psychological distress (<5)	131	27.12		

M, Mean; SD, standard deviation; SWLS, Satisfaction With Life Scale; RSES, Rosenberg Self-Esteem Scale; LOT-R, Revised version of the Life Orientation Test; GSE, General Self-Efficacy Scale; PSS-10, 10-item Perceived Stress- Scale; GHQ-28, 28-item General Health Questionnaire.

Female students are usually found to be more stressed than male students (Fornés–Vives et al., 2012; Cruz et al., 2013; Shamsuddin et al., 2013). However, Koochaki et al. (2011) did not find any significant differences according to gender and oppositely, two studies found that male students reported higher stress levels than females (Acharya, 2003; Ahern and Norris, 2011).

When it comes to the link between stress and age, we did not find any associations between these two variables, independently of the studied stress factor. This result is in line with some studies (Koochaki et al., 2011) while others show a negative association between perceived stress and age (Fornés–Vives et al., 2012; Voltmer et al., 2012).

Stress Predictors

Both the year of studies and the academic sector did not have a significant impact on perceived stress in the regression analyses. Nonetheless, and unlike other protective factors (i.e., life satisfaction, self-esteem, optimism and generalized self-efficacy) that negatively predicted perceived stress, we found that psychological distress significantly contributed the most to the variance of perceived stress. The total variance of perceived stress accounted for by the model including all studied factors was 57%. These factors could be considered stress vulnerability factors among students.

Interestingly, previous research found significant associations between perceived stress and: (1) psychological distress (La Rosa et al., 2000; Strenna et al., 2009); (2) self-esteem (Boujut, 2007) optimism (Mazé and Verlhiac, 2013) self-efficacy (Han, 2005). In fact, according to the literature, the most important predictor of stress symptoms in university students was the sense of self-efficacy (Han, 2005). Nevertheless, we found that self-esteem (beta $= -0.20$; $p = 0.000002$) and self-efficacy (beta $= -0.19$; $p = 0.00$) negatively predicted it. Regression analysis also showed that psychological distress (beta $= 0.38$; $p = 0.00$) was the most powerful positive predictor of stress symptoms.

TABLE 3 | Results of questionnaires according to gender.

Factors	Women Mean(*SD*)	Men Mean (*SD*)	*p*
Life satisfaction	22.9(6.27)	21.76 (6.24)	0.05
Self-esteem	28.17(5.44)	28.96 (5.41)	0.23
Optimism	12.21(4.8)	12.76 (4.69)	0.31
General self-efficacy	27.7(4.6)	29.4(4.005)	0.0002***
THE PERCEIVED STRESS			
Global	31(6.15)	29 (6)	0.002**
Perceived helplessness	20(4.42)	18.3 (4.33)	0.02*
Perceived self-efficacy	10.95(2.55)	10 (2.38)	0.0001***
PSYCHOLOGICAL DISTRESS			
Global	8.96 (5.34)	7.03 (5.05)	0.0002***
Somatic symptoms	2.8 (1.95)	1.82 (1.68)	0.00000***
Anxiety and insomnia	3.3 (2.18)	2.65 (2.16)	0.002**
Social dysfunction	1.48 (1.43)	1.29 (1.25)	0.3
Severe depression	1.28 (1.78)	1.25 (1.83)	0.61

*SD, standard deviation; p: *: 0.05. **:0.01. ***:0.001.*

TABLE 4 | Results of the links between stress and studied factors.

Factors	Perceived stress	Perceived helplessness	Perceived self-efficacy
	r	*r*	*r*
Gender	−0.13**	−0.1*	−0.17***
Age	0.07	0.09*	−0.02
Year of studies	0.05	0.1*	0.06
Formation and research units	0.05	0.003	0.01
Life satisfaction	−0.49***	−0.42***	−0.45***
Self-esteem	−0.58***	−0.48***	−0.57***
Optimism	−0.52***	−0.44***	−0.48***
Self-efficacy	−0.51***	−0.38***	−0.58***
Psychological distress	0.57***	0.54***	0.45***
Somatic symptoms	0.43***	0.41***	0.34***
Anxiety and insomnia	0.50***	0.49***	0.38***
Social dysfunction	0.19***	0.18***	0.16**
Severe depression	0.53***	0.49***	0.43***

*r, Spearman's rank correlation coefficients; p: *: 0.05. **:0.01. ***:0.0001.*

POTENTIAL SHORTCOMINGS AND LIMITATIONS

This research has a number of limitations. It is limited by a small sample size, which reduced statistical power. Participants mainly consisted of women and were principally recruited from the university of Paris Nanterre La Defense (that only has human sciences' department), which is not representative of all students in the Ile de France region. In addition, our sample was recruited via the internet and this could have limited the participation of more students. Our study also lacked an adequate control group. We used non-randomized sampling. The assessment was solely based on self-reported questionnaires and their results were not validated by a semi-structured interview.

Additionally, the cross-sectional design of our study investigates associations rather than causality. Thus, future research needs to replicate these findings using a longitudinal design to compare students' states at the start vs. the end of their university year.

TABLE 5 | Results of linear multiple regression analyses using the PSS-10 score as the dependent variable.

***N*: 483**	$R = 76{,}082{,}630$, $R^2 = 57{,}885{,}665$, R^2 Ajusté = 57,265,033 $F_{(7, 475)} = 93.269$, $p < 0.0000$, Err-Type de l'Estim.: 4.0347		
Factors	**Beta**	**Standard error of Beta**	***p***
Year of studies	0.03	0.03	0.24
Academic sector	−0.01	0.03	0.57
Life satisfaction	−0.11	0.03	0.002**
Self-esteem	−0.20	0.04	0.000002***
Optimism	−0.12	0.04	0.002**
Self-efficacy	−0.19	0.03	0.00***
Psychological distress	0.38	0.03	0.00***

*p: *: 0.05. **:0.01. ***:0.0001.*

CONCLUSION

Most university students included in this study displayed high levels of perceived stress and psychological distress and low levels of self-esteem, optimism and self-efficacy. The multivariate model included in our research helped us identify the most important stress-vulnerability factors that should be taken into consideration when identifying stress among students and when establishing prevention and intervention programs.

In fact, these findings suggest that focusing on the sense of self-efficacy and self-esteem could be essential in intervention programs for students.

Future research could benefit from including more homogeneous samples regarding gender and from recruiting students from a larger variety of academic sectors (medicine, physics, etc.).

AUTHOR CONTRIBUTIONS

DS: Conception or design of the work, data collection, data analysis and interpretation, drafting the article, final approval of the version to be published. NC: Conception or design of the work, data collection, critical revision of the article, final approval of the version to be published. LR: Conception or design of the work data analysis and interpretation critical revision of the article, final approval of the version to be published.

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Coping Intelligence: Efficient Life Stress Management

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Coping Intelligence is defined as efficient individual ways of managing life stress. This paper presents a new assessment instrument named *Coping IQ (CIQ; Coping Intelligence Questionnaire)*. A measure is based on the Multidimensional Positive Coping Model, which includes three cross-cutting parameters that characterize coping strategy as efficient or inefficient, emotional, cognitive or behavioral, and active or passive. Results of the factor analysis verified a basic two-factor structure of the Coping Intelligence with the alternative solutions for efficient and inefficient coping strategies characterized via three basic modalities. The validity of the Coping IQ instrument showed an internal consistency ranging from 0.72 to 0.81.The unified methodology that underlies the new concept of Coping Intelligence, as well as *Coping IQ* assessment, is applicable for studying both clinical and general populations. *CIQ* parameters might serve as useful feedback while assessing changes in individual coping repertoire, for *CIQ* measures strategies that can be modified as a result of life experiences or educational training. Based on the study findings, Coping Intelligence is further defined by a broad repertoire of life skills required to solve successfully everyday stress and life adversities in order to achieve desired goals and maintain physical, mental, and social well-being.

Keywords: life difficulties, coping Intelligence, coping IQ, efficient and inefficient coping, multidimensional positive coping model, temperament, life satisfaction

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INTRODUCTION

'Creating a science of human strength' is a promising mission of psychology that focuses on 'systematically building competence, not on correcting weakness' (Seligman, 2000). This direction of research is based on a healthy, positive model of human behavior. The basic principals of positive psychology correspond strongly to the guidelines of differential psychology, whose primary goal is to explore the uniqueness of human individuality (Lamiell, 2003; Libin A., 2004). The concept of human competence is an ideal starting point for studying the complexity of human individuality and the fundamental issues of quality of life, including efficient and inefficient ways of coping with everyday difficulties that each of us faces on the way to happiness and personal achievements.

Traditional Approach to Efficient and Inefficient Coping

There is a huge need among researchers, educators, academic professionals and practitioners, as well as among people of all ages, for knowledge on how to empower individual competence by mastering of efficient coping skills. However, existing studies on coping with life difficulties are very contradictory. Literature analysis of relevant concepts and related measures revealed two major trends in this research area: coping with stress (Lazarus and Folkman, 1984; Carver and Scheier, 1994) and applied problem solving (Heppner and Petersen, 1982; D'Zurilla and Nezu, 1990; Heppner et al., 2002, 2004). The most known in the first designated area of research is a cognitive theory of stress, developed by

Lazarus and Folkman (1984), that interprets coping as either problem- or emotion-oriented. Problem-focused coping is directed toward managing and/or regulating a stressful situation. It occurs 'if cognitive appraisal tells that something can be undertaken.' Emotion-focused coping is directed toward regulation of emotional responses to a given stressor and occurs 'when cognitive appraisal tells that nothing can be done' in order to resolve a stressful situation (Folkman and Lazarus, 1985). This approach frames the development of The Ways of Coping (Lazarus and Folkman, 1984), which is a widely used instrument in health and clinical studies. Although this concept and the instrument proved to be very reliable in studying stress-evoked coping responses, a major limitation of this approach in the context of coping with everyday life difficulties is that emotional strategies are viewed as inefficient, whereas cognitive and behavioral strategies are always considered efficient.

A second trend in coping research emphasizes the importance of studying social aspects of problem solving competence through attitudes and underlying belief systems. An example is the social problem solving theory by D'Zurilla and Nezu (1990) who developed a Social Problem Solving Inventory (SPSI). This inventory consists of the problem solving skill scale (PSSS) and the problem orientation scale (POS) that includes cognitive, emotional, and behavioral subscales. Although the POS differs from the coping with stress theory (Lazarus and Folkman, 1984) in that it views cognitive and behavioral dimensions as separate categories, an emotional problem solving strategy still has the same negative connotation and is measured as an inefficient strategy.

A combined approach that merges the traditional applied problem solving concept and the stress-related coping theory resulted in Problem-Focused Style of Coping Scale (PF-SOC) developed by Heppner et al. (2004). The perceived effectiveness of a problem solving activity is viewed as the degree to which one's actions facilitate or inhibit progress toward a resolution of the problem. The PF-SOC measures 18 strategies organized into three factors – reflective, reactive, and suppressive styles. *Reflective style* measures cognitive activities that promote problem solving, whereas *reactive style* emphasizes distorted cognitive and emotional activities. Denial and avoidance form *suppressive style*. Again, a cognitive strategy is analyzed as efficient or inefficient depending on the organization of the cognitive efforts, whereas emotional strategies along with behavioral ones, are defined as strictly inefficient.

New Positive Coping Model: Efficient and Inefficient Management of Everyday Life Difficulties

The above described traditional approaches, while identifying cognitive, emotional, and behavioral aspects of coping, often confuse the modality of the strategy with its functionality and outcome. This conceptual drawback presents quite a few challenges to the measurement of efficient and inefficient strategies in coping research and psychological practice.

First of all, our review illustrates that the study of efficient and inefficient strategies has been limited in scope and in the choice of basic parameters. For instance, the inadequate conclusion that cognitive efforts are always efficient while emotional activities are always inefficient is based on a false assumption that basic parameters differentiating between efficient and inefficient strategies are associated with only one predominant modality. *Secondly*, existing models offer a very unclear depiction of the role of behavioral efforts. Behavioral strategies either form a separate category of inefficient coping (D'Zurilla and Nezu, 1990), or are combined with cognitive efficient strategies in one single class (Lazarus and Folkman, 1984; Folkman and Lazarus, 1988; Carver and Scheier, 1994). *Most importantly,* according to the existing approaches for problem solving and coping with stress, emotional strategies are viewed as contradictory to cognitive and behavioral ones. In the last two decades, numerous studies were conducted that proved the beneficial role emotions play in resolving life difficulties when they are used in manner appropriate to the task. Data suggest that particular characteristics of emotional experience as optimism, hope, and emotional intelligence positively influence the coping process (Seligman, 1991; Salovey and Sluyter, 1997; Snyder, 1998; Averill, 2000; Bar-On, 2000; Fredrickson, 2002). Salovey and Mayer (1990), defining the concept of Emotional Intelligence, stated that 'emotion and intelligence are not mutually contradictory.' As research shows, used accurately and adaptively, emotions help in reasoning, information processing, and problem solving by prioritizing thinking, shaping memory and facilitating creativity. Emotional strategies may be efficient if they are used adequately and inefficient if they employed inadequately for the process of resolving life difficulties. This findings support a new paradigm of understanding human intelligence that overcomes the limitations of 'pure intelligence' (Gardner, 1999) and its role in individual well-being. The contemporary view on individual competence considers emotional, cognitive, behavioral, and social abilities as integral parts of generalized intelligence (Goody, 1995; Salovey et al., 1999; Hedlund and Sternberg, 2000; Sternberg et al., 2003; Libin E., 2004). *In sum,* traditional perception of the incongruency between modalities (cognitive, emotional, or behavioral) of a particular strategy and its functionality or organizational efforts (efficient vs. inefficient) hinders the development of an integrated methodology for a generalized coping process and the design of an adequate assessment instrument.

A proposed concept of Coping Intelligence based on Multidimensional Positive Coping Model (Libin, 2003a) lays at the foundation of a new assessment instrument known as *Coping IQ (CIQ)*. This model strives to overcome traditional limitations in studying coping and problem solving by suggesting cross-cutting parameters for the unified classification of efficient and inefficient strategies. Coping Intelligence is defined by the quality, functionality, repertoire, and efficiency of cognitive, emotional, and behavioral strategies of varying intensity that people employ while dealing with difficult situations. Taking into account the new findings on generalized properties of human intelligence described in the previous section, the proposed model categorizes efficient and inefficient strategies based on *their functionality or the organization of coping efforts* (not on their modality).

According to the Multidimensional Positive Coping Model each strategy is characterized by:

- ***The primary cross-cutting parameter****: organization of the efforts* (efficient or inefficient)
- ***The secondary cross-cutting parameter****: modality of manifestation* (emotional, cognitive or behavioral), and
- ***The cross-cutting parameter of the third level****: intensity of efforts* (active or passive)

Thus, *the organizational efforts* define a coping activity as efficient or inefficient, whereas *the modality* characterizes any given efficient or inefficient strategy as emotional, cognitive, or behavioral. In addition, each emotional, cognitive, or behavioral strategy can be evaluated as active or passive depending on the intensity of provided efforts. Hereby, a strategy is defined as a vector of emotional, cognitive, or behavioral efforts of varying intensity resulting either in an effective or ineffective outcome for dealing with life difficulties. Cognitive, emotional, and behavioral efforts that underlie efficient coping strategies *focus on* the resolution of the difficult situation. Accordingly, cognitive, emotional, or behavioral efforts underlying inefficient coping strategies *diverge from* the resolution of life difficulties.

Based on this model, a newly developed CIQ (Libin, 2002) differentiates between efficient or inefficient strategies as they relates to three basic modalities – cognitive, emotional, and behavioral, while including a measure of the intensity of human involvement with the situation, such as passive or active. The present article focuses on the first experimental phase of the new assessment tool development, whereas a theoretical foundation for the positive coping approach is described in details elsewhere (Libin, 2003a,b).

MATERIALS AND METHODS

Four consequential steps were performed in developing the *CIQ* assessment including (1) literature analysis and the development of a pool of items, (2) studying content validity of the new measure through the expert review panel, (3) exploring psychometric properties of the *CIQ* via Cronbach alphas, (4) and validation of the proposed measure via the analysis of individual differences in efficient and inefficient coping strategies with relation to age, gender, temperament, and subjective evaluation of meaningful life outcomes.

Participants

The sample consisted of 114 participants with the mean age of 25.7 years including 28 (25%) males and 86 (75%) females. Participants were adolescents and young adults, recruited from public high school and colleges, and adults attending secondary education classes. The presented data is part of a larger cross-cultural study on coping with life difficulties currently being conducted in the U.S. Russia, and Ukraine.

Recruitment

Only participants who were enrolled in academic programs as part-time or full-time students were approached for informed consent. The recruiting process was conducted through a pre-screened list obtained from the Office of Academic Programs. All participants were assigned a number for the study, thereby maintaining their anonymity. Researchers involved with the project were trained and sensitized to the importance of confidentiality of the data.

Measurement Instruments

The *CIQ* instrument was designed to measure cognitive, emotional, and behavioral responses to a difficult situation viewed as a meta-concept of problematic events that trigger coping efforts. *CIQ* is a self-report measure consisting of 72 items, which assesses three efficient and three inefficient scales differentiated by the cognitive, emotional, and behavioral modality of coping responses. The instructions ask a participant to indicate whether he or she employs a particular strategy while facing a difficult situation, using a 5-point Likert-type scale of frequency with '1 = never' and '5 = always.' Outcome variables included three measures of efficient and three measures of inefficient coping scales, two general indexes for efficient and inefficient strategies and four indexes for active and passive efficient and inefficient measures, as well as a combined quantitative measure named *coping intelligence quotation* calculated as a ratio of efficient strategies index divided by the inefficient strategies index. All indexes and scales were calculated as a mean of appropriate strategies. Each of six *CIQ* basic scales can be briefly described as follows:

- Efficient cognitive coping is characterized by cognitive activity *focused on* the resolution of the difficult situation, whereas inefficient cognitive coping characterizes cognitive activity *deviating from* the task at hand.
- Efficient emotional coping is comprised of emotional efforts *concentrated on* the problem's solution, while inefficient emotional coping is associated with the emotional efforts *divergent from* resolving difficulties.
- Efficient behavioral coping consists of behavioral efforts *applied toward* resolving the difficulties. At the same time, inefficient behavioral coping characterizes behavioral activity *deviating from* problem-solving.

Subjective Life Satisfaction Scale (SLS) was developed and validated by the author in previous studies (Libin, 2003b). *SLS* measures subjective satisfaction with life goals, self and relationships with others on the 12 item Likert-type self-evaluation scale from '1 = completely dissatisfied' to '5 = completely satisfied.' Items refer to five separate, but interrelated aspects of one's life – indexes of satisfaction with meaningful life outcomes ('things that happened in my life,' 'projected goals,' and 'the way the life goes'), and indexes of satisfaction with socially oriented life areas including distant relationships (with superiors, colleagues, and peers) and close relationships (with friends, parents, and other family members) subscales. *SLS* also includes three single-items evaluating satisfaction with self, professional relationships, and relations with the opposite sex in general. *SLS* was tested on 60 people of both genders with the age mean of 27.4 years. Psychometric

analysis showed a sufficient level of internal validity with the range of Cronbach alphas from 0.84 to 0.93 for scales and subscales combined as indexes.

The Object-related and Communicative Temperament Inventory (*STQ*; Rusalov, 1989) is based on the four-phase algorithm underlying Anokhin's (1975) functional systems model. The *STQ* comprises 105 "agree-disagree" items organized in eight scales, measuring four basic temperamental parameters including ergonicity, plasticity, tempo and emotionality as they relate to social-oriented (communicative) and object-oriented areas of human activities. Four object-oriented scales measure ergonicity (Er), plasticity (P), tempo (T) and emotionality (Em) reflecting different aspects of mastering the object world. Social-oriented scales such as ergonicity (SEr), plasticity (SP), tempo (ST), and emotionality (SEm) measure, respectively, the level of social activity, the ease of switching from one social contact to another, the speed of social performance, and sensitivity in the communicative sphere. The *STQ* is shown to be a valid and reliable measure of temperament with Cronbach alphas ranging from 0.72 to 0.84 (Rusalov, 1989; Bishop and Hertenstein, 2004).

Procedure

One hundred and twenty-eight participants were administered a set of three questionnaires over a 1-month period. A qualified researcher supervised the assessment performance. Each participant conducted self-evaluation individually. 14 participants were unable to compete the whole set due to the different reasons and were excluded from the data analysis. A total of 114 participants were included in the final analysis. Data were analyzed using SPSS 12.0.

Analysis

The goal of the study was to address psychometric properties, as well as to analyze the structure of correlations between efficient and inefficient coping and other assessments, such as subjective life satisfaction and temperament. The content validity of the *CIQ* was studied through the experts' panel. The reliability of the *CIQ* was assessed using an internal consistency measure based on Cronbach alphas. The construct validity of the developed coping measure was analyzed using a subjective life satisfaction scale and temperamental assessment. At the initial stage, descriptive univariate and bivariate statistics (e.g., frequency distributions, means, standard deviations, etc.) regarding participants' background (gender and age) were examined. To further investigate the nature of efficient and inefficient coping strategies, we used correlations and an independent sample *t*-test, which clarified the reciprocal relationships between coping and background variables, and individual characteristics such as temperamental qualities and various aspects of subjective life satisfaction.

Results

The study of content validity of the *CIQ* was conducted through the expert review panel, which included four experts familiar with the literature on coping. All experts were psychologists and academic professionals experienced at teaching high school, undergraduate and adult students. The panel reviewed all *CIQ* items prior to the testing. Necessary word changes were made so that the proposed items would be better understood by the participants. Then experts reviewed the list of items, rating relevance of the items to efficient or inefficient coping. The initial pool for the questionnaire included 180 items, which after initial reviewing with the group of four researchers was narrowed down to 108 items. During the next step an internal consistency of the *CIQ* was studied via data collected from 114 participants. As a result 36 more items were excluded, leaving 72 items with most significant loading organized in six scales with Cronbach alphas ranging from 0.72 to 0.81 (**Table 1**).

The next step was to study a structure of the *CIQ* via factor analysis. We assumed that two basic dimensions, inefficient and efficient coping, would be associated with two different factors. This structure of the *CIQ* was confirmed by the principal component factor analysis with Varimax rotation of 72 items. The result revealed a basic two-factor structure with the alternative factor solutions for efficient and inefficient coping strategies. Each basic factor (efficient or inefficient) included all three modalities; that is, cognitive, emotional, and behavioral scales.

The relationship between efficient and inefficient coping strategies, measured by *CIQ,* and gender, age, and individual characteristics (such as temperament and life satisfaction) were studied on groups of 61 and 70 people, respectively. Additionally, gender differences were studied on the group of 48 people (24 male and 24 female) aged 14–17.

Gender and Age Differences in Efficient and Inefficient Coping

Analysis via independent sample using Levene's test for equity of variances as a statistical measure (F) of the differences between the groups ($N = 48$) showed no statistically significant gender-related differences regarding the preference of efficient vs. inefficient strategies. Comparison by Levene's test between two age groups of adolescents (15–16 year old, $N = 31$) and young adults (17–21 year old, $N = 36$), both balanced by gender, revealed significant differences in inefficient emotional and efficient cognitive coping scales. Additionally, comparisons revealed differences in the integrative coping intelligence quotation, as well as in the intensity of coping efforts measured through indexes of active and passive strategies. Only outcomes with an alpha level of less than 0.05 were considered for interpretation. Distribution of the analyzed variables was fairly symmetric and had no outliers (**Table 2**).

Correlation analysis of the coping, subjective life satisfaction and temperamental parameters, measured, respectively, via *CIQ*, *STQ,* and *SLS,* confirmed our initial hypothesis about the links between inefficient strategies, life dissatisfaction, and temperamental impulsivity and anxiety (**Table 3**).

Results of the correlation analysis showed that a higher index of *inefficient coping* via *CIQ* was associated with the lower levels of meaningful life outcomes, including goals, major life events and future prospects, personal well-being, and social relationships. The largest number of significant correlations between *ineffective coping* and low scores on *STQ* was found for the parameters of temperamental emotionality (neuroticism) and tempo (impulsivity). Cognitive, emotional,

TABLE 1 | *Coping IQ (CIQ)* scales reliability via Cronbach alphas.

CIQ Scales	CIQ item sample	Mean	*SD*	α
Inefficient cognitive	Get caught up in thinking about insignificant details	2.62	0.55	0.75
Inefficient emotional	Feel that I will never get over it	2.36	0.57	0.76
Inefficient behavioral	Do anything but the task at hand	2.10	0.51	0.72
Efficient cognitive	Break up the complex problem into simple manageable components	3.67	0.55	0.78
Efficient emotional	Use my desires and interests as direction where I want to go in solving the difficulty	3.61	0.59	0.81
Efficient behavioral	Work through the difficulties until the situation is completely resolved	3.63	0.52	0.80

and behavioral ineffective coping strategies were also associated with subjective dissatisfaction in various domains of life. The general index of inefficient coping, measured as a mean of all three scales, correlated negatively with major subjective satisfaction parameters. Statistically significant links were found between coping strategies and all temperamental parameters assessed via *Temperament Inventory (STQ), with the exception of* object-oriented ergonicity and plasticity. In sum, *inefficient coping was found to* correlate positively with temperamental emotionality and negatively with social tempo and social activity. *Efficient coping* correlated positively with both socio-oriented plasticity and temperamental activity, while negatively with neuroticism (**Table 3**).

A *T*-test was performed to clarify the structure of the relationships between different levels of coping intelligence quotation, temperament, and life satisfaction. The comparative analysis of groups (mean age 23 years) with high and low levels of Coping IQ by temperament and subjective life satisfaction revealed that individuals with *efficient coping* are characterized by a higher level of *social-oriented plasticity* ($t_{(39)} = -3.05, p < 0.04$) and *index of social-oriented activity* ($t_{(39)} = -3.36, p < 0.02$). Individuals with *inefficient coping* are distinguished by the higher level of *object-oriented tempo* ($t_{(39)} = 2.14, p < 0.04$).

Also, participants with high levels of *inefficient coping* are characterized by an increased level of *dissatisfaction with meaningful life outcomes* ($t_{(34)} = -2.47$, $p < 0.02$), *social relationships* in general ($t_{(34)} = -2.56$, $p < 0.02$), and *distant social relationships* in particular ($t_{(34)} = -2.53$, $p < 0.02$). Individuals with low Coping IQ are more dissatisfied with major aspects of life, including 'things that happened in life' ($t_{(34)} = -1.08$, $p < 0.05$), 'projected goals' ($t_{(34)} = -2.22$, $p < 0.03$), and 'the way life goes' ($t_{(34)} = -1.99$, $p < 0.05$). In socially oriented areas they are especially unhappy with their distant relationships, including those with superiors ($t_{(34)} = -2.62$, $p < 0.01$), colleagues and peers ($t_{(34)} = -2.00$, $p < 0.02$), with their parents ($t_{(34)} = -2.48$, $p < 0.05$), and with their relationships with the opposite gender ($t_{(34)} = -2.06$, $p < 0.05$).

The general conclusion is that a *low Coping IQ*, is associated with a predominance of ineffective strategies in individual repertoire, and is linked with high scores on such individual variables as temperamental impulsivity (tempo) and subjective dissatisfaction with personal achievements and with relationships with others. On the contrary, a *high coping intelligence quotation*, associated with a predominance in individual repertoire of effective strategies, is linked to socio-oriented temperamental flexibility (plasticity) and subjective satisfaction with both personal achievements and with social aspects of life.

TABLE 2 | Age differences in efficient and inefficient coping.

Scale	Group	Mean	*SD*	*F*	*p*
Inefficient emotional	$N = 31$	2.54	0.73	7.02	0.009
	$N = 36$	2.39	0.47		
Efficient cognitive	$N = 31$	3.47	0.67	5.04	0.028
	$N = 36$	3.71	0.45		
Index					
Inefficient active scales	$N = 31$	2.53	0.55	6.56	0.013
	$N = 36$	2.46	0.38		
Inefficient passive scales	$N = 31$	2.49	0.58	8.90	0.004
	$N = 36$	2.41	0.43		
Efficient active scales	$N = 31$	3.47	0.66	4.41	0.040
	$N = 36$	3.69	0.41		
Coping intelligence quotation	$N = 31$	1.44	0.43	8.71	0.004
	$N = 36$	1.53	0.25		

DISCUSSION

Coping Intelligence Concept

Both academic researchers and practitioners have noted that the absence of general principles for classification of efficient and inefficient strategies poses methodological and practical difficulties in their diagnostics and differentiation, thereby causing additional obstacles in the systematic study of this important phenomenon (Chang et al., 2004). The newly developed concept of Coping Intelligence suggests the use of cross-cutting parameters to facilitate the unified classification of efficient and inefficient coping. Results of the factor analysis verified a basic two-factor structure of Coping Intelligence with alternative solutions for efficient and inefficient strategies characterized via three basic modalities.

Coping IQ Assessment

A theorized relationship between efficient and inefficient coping strategies, positioned in the continuum formed by three basic dimensions – cognitive, emotional, and behavioral– guided the development of the *CIQ* instrument that was designed to measure a variety of strategies in all three dimensions that individuals tend to use while facing life difficulties. While the primary cross-cutting parameter (*organization of the efforts)* differentiates

TABLE 3 | Correlations between coping strategies, subjective life satisfaction, and temperament.

Parameter	InCoSc	InEmSc	InBhSc	EfEmSc	EfBhSc	Inefficient coping	Efficient coping	Coping quotation
SLS								
S5		−0.37**	−0.28*			−0.33**		
S11		−0.36**				−0.30*		
IMLO		−0.39**	−0.26*			−0.30*		
ISR	−0.26*	−0.45**	−0.31**			−0.40**		
STQ								
SEr	−0.26*							
SP				0.32*	0.29*		0.31*	0.34*
T				−0.26*				−0.26*
ST	−0.27*		−0.29*			−0.30*		
Em	0.29*	0.27*	0.26*			0.31*		
SEm	0.38**	0.48**	0.36**			0.47**		−0.36**
ISAct	−0.43**	−0.30*	−0.32*			−0.40**		0.35**

*Coping Inventory (CIQ) scales and indexes (N = 70): InCoSc, Inefficient Cognitive Scale; InEmSc, Inefficient Emotional Scale; InBhSc, Inefficient Behavioral Scale; EfEmSc, Efficient Emotional Scale; EfBhSc, Efficient Behavioral Scale; InCoping, Inefficient Coping Index; EfCoping, Efficient Coping Index; Coping IQ, Coping Intelligence Quotation. Subjective Life Satisfaction Scale (SLS) (N = 70): S5, Satisfaction with Professional Relationships; S11, Satisfaction with the Opposite Gender Relationships; IMLO, Index of Satisfaction with Meaningful Life Outcomes; ISR, Index of Satisfaction with Social Relationships in General. Temperament Inventory (STQ) scales and indexes (N = 61): Er, Object-oriented Ergonicity Scale; P, Object-oriented Plasticity Scale; T, Object-oriented Tempo Scale; SEr, Social-oriented Ergonicity Scale; SP, Social-oriented Plasticity Scale; ST, Social-oriented Tempo Scale; ISAct, Index of Social-oriented Activity; IEm, Index of Object-oriented Emotionality. *$p < 0.05$, **$p < 0.01$.*

between effective and ineffective strategies, the secondary cross-cutting parameter describes each efficient and inefficient strategy as cognitive, emotional, or behavioral according to *the manifest modality* of the efforts.

The final version of the *CIQ* instrument consists of 72 selected items to ensure high reliability for each of three effective and three ineffective scales. Outcome variables included six *CIQ* basic scales, two general indexes for efficient and inefficient strategies, and coping intelligence quotation calculated as a ratio of *efficient coping index* divided by the *inefficient coping index*. As a quantity indicator, *Coping IQ* shows whether efficient coping strategies prevail in the individual's repertoire.

Relationships between Efficient and Inefficient Coping, Temperament, and Subjective Life Satisfaction

Results showed that the young adults employ efficient strategies more often than the teenagers. Changes in coping related to age dynamics suggest that individual efficient coping repertoire arises initially as a result of the development of emotional and cognitive mental processes. Our findings also confirmed that not only emotional, but also cognitive and behavioral inefficient strategies are associated with low life satisfaction.

The association between inefficient coping strategies and *object-oriented temperamental impulsivity (high tempo)* corresponds with the data on increased problematic behaviors in persons with high levels of impulsivity (Horton and Oakland, 1997; Mcevoy and Welker, 2000). This allows us to make an assumption that higher psychomotor activity negatively influences coping outcomes. It is not the speed of object-oriented mental operations and motor acts performance (indicators of *high tempo* or *impulsivity*), but rather the accuracy with which mental and motor activity are performed (*adequate and timely channeled tempo)* along with the plasticity of social-oriented activity that contributes to the successful resolution of life difficulties. In the realm of social relationships, a broader repertoire of communicative programs, and flexibility in social relationships and in establishing social contacts (indicators of high *social plasticity)* are most likely to result in more efficient ways of dealing with other people which. This, in turn, could ease the complex process of handling life challenges.

The greater number of statistically significant correlations between temperamental (formal-dynamic) characteristics and inefficient strategies vs. efficient coping demonstrates close ties between formal-dynamic, biologically determined variables and inadequate ways of dealing with difficult situations. At the same time, *efficient* and *inefficient coping strategies* demonstrate reverse relations with both temperamental (formal-dynamic) and subjective life satisfaction (socio-psychological) characteristics. In comparison to efficient coping, inefficient strategies also revealed a much greater extent of negative association with subjective satisfaction parameters, thus illustrating the greater impact of inefficient coping on personal dissatisfaction with various aspects of life.

ETHICS STATEMENT

This study was carried out in accordance with the recommendations of Institutional Review Board at the Institute of Psychology, Russian Academy of Education. All subjects gave written informed consent in accordance with the Declaration of Helsinki. The protocol was approved by the Institutional Review Board at the Institute of Psychology, Russian Academy of Education.

AUTHOR CONTRIBUTIONS

The author confirms being the sole contributor of this work and approved it for publication.

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Military Service Member and Veteran Reintegration: A Conceptual Analysis, Unified Definition, and Key Domains

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Returning military service members and veterans (MSMVs) may experience a variety of stress-related disorders and challenges when reintegrating from the military to the community. Facilitating the reintegration, transition, readjustment and coping, and community integration, of MSMVs is a societal priority. To date, research addressing MSMV reintegration has not identified a comprehensive definition of the term or defined the broader context within which the process of reintegration occurs although both are needed to promote valid and reliable measurement of reintegration and clarify related challenges, processes, and their impact on outcomes. Therefore, this principle-based concept analysis sought to review existing empirical reintegration measurement instruments and identify the problems and needs of MSMV reintegration to provide a unified definition of reintegration to guide future research, clinical practice, and related services. We identified 1,459 articles in the health and social sciences literature, published between 1990 and 2015, by searching multiple electronic databases. Screening of abstracts and full text review based on our inclusion/exclusion criteria, yielded 117 articles for review. Two investigators used constant conceptual comparison to evaluate relevant articles independently. We examined the term reintegration and related terms (i.e., transition, readjustment, community integration) identifying trends in their use over time, analyzed the eight reintegration survey instruments, and synthesized service member and veteran self-reported challenges and needs for reintegration. More reintegration research was published during the last 5 years ($n = 373$) than in the previous 10 years combined ($n = 130$). The research suggests coping with life stresses plays an integral role in military service member and veteran post-deployment reintegration. Key domains of reintegration include individual, interpersonal, community organizations, and societal factors that may facilitate or challenge successful reintegration, and results suggest that successful coping with life stressors plays an integral role in post-deployment reintegration. Overall, the literature does not provide a comprehensive representation of reintegration among MSMVs. Although, previous research describes military service member and veteran reintegration challenges, this concept analysis provides a unified definition of the phenomenon and identifies key domains of reintegration that may broaden our understanding and guide reintegration research and practice.

Keywords: veterans, military, reintegration, coping, adjustment, deployment

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INTRODUCTION

Since 2001, nearly 3 million U.S. military service members have deployed to Operation Enduring Freedom (October 2001–present), Operation Iraqi Freedom (March 2003–August 2010), or Operation New Dawn (September 2010–December 2011). Formerly deployed military service members and veterans (MSMVs) report a high prevalence of physical and mental health problems including post-traumatic stress disorder (PTSD), traumatic brain injury (TBI), anxiety, major depression, and difficulty transitioning from their military operations to civilian roles (summarized in Elnitsky et al, 2013; Sayer et al., 2014). Even among veterans without physical or psychological disorders, research has shown that 25% or more report difficulty in social functioning, self-care, or other major life domains following deployment (Sayer et al., 2011). Many veterans experience relationship and employment difficulties (Sayer et al., 2011), homelessness, post-deployment injury, or suicide (IOM, 2010; Bachynski et al., 2012). Furthermore, the suicide rate among MSMVs exceeds the rate among civilians (Kuehn, 2009; Levin, 2009). Therefore, helping these veterans to resume participation in their life roles is a national priority (U. S. Department of Veterans Affairs [DVA], 2010). Based on our review of over 15 years of research literature on reintegration, we define *MSMV reintegration* as both a process and outcome of resuming roles in family, community, and workplace which may be influenced at different levels of an ecological system. The current article describes the systematic approach through which this definition emerged, while a previous article describes the critical analysis of the literature on reintegration (Elnitsky et al., 2017).

The empirical literature on health and social services is filled with references to reintegration. Some authors have discussed MSMV reintegration after deployment to Iraq and Afghanistan. Others have asked whether veterans who return with TBI or mental health issues have hope of reintegrating to productive civilian roles in the community. The goal of health and social services is to improve reintegration. However, the meaning of reintegration may differ when applied by scholars and practitioners to different problems. Does reintegration refer to health status, employment, family relationships, or some combination of these and other factors? Often, authors do not define the concept, leaving readers unclear about the term and their conceptualization of the problems and related factors. Further complicating the understanding of reintegration is the frequent use of potentially overlapping terms such as transition, readjustment, and community integration.

Conceptualizing Reintegration

Reintegration has previously been defined as "the resumption of age, gender, and culturally appropriate roles in the family, community, and workplace" (U. S. Department of Veterans Affairs [DVA], 2010, p. 1) and the process of transitioning back into personal and organizational roles following deployment (Currie et al., 2011). Furthermore, reintegration has been described as a dynamic process of adapting that is culturally bound, personal, and multidimensional (Reistetter and Abreu, 2005). Community reintegration has been described as the return of individuals to their role functions or participation in life roles (Resnik et al., 2012). Although, reintegration is often conceptualized as a positive series of events, it also maybe a time of personal stress and difficulty for MSMVs. A review of the literature suggests that the period following a return from deployment may be associated with increased tension at the personal, family, and work levels, and exacerbation of deployment-related stress conditions (Bolton et al., 2008).

A number of theoretical frameworks have been presented in the literature that focus on transition in an attempt to explore processes of MSMV reintegration. Schlossberg's (1995) theory of transition posits that the individual MSMV's situation, self, support, and strategies facilitate or impede successful transition (Robertson, 2013; Schiavone and Gentry, 2014). An alternate model of MSMV transition (Adler et al., 2011b) suggests that the effect of deployment-related factors on physical, emotional, and social domains of transition are moderated by the psychological processes involved in decompression (i.e., returning from the battlefield to a normal atmosphere), unit variables (i.e., leadership quality, cohesion), and the anticipation of redeployment. Other studies have employed multidimensional theories of grief (Kaplow et al., 2013), relational turbulence (Theiss and Knobloch, 2013), and engagement in diverse aspects of participation (Resnik et al., 2012) in their attempts to explain MSMV reintegration. However, across these studies the lack of a common definition for reintegration has led to inconsistencies in the understanding of what constitutes reintegration and makes it difficult to measure reintegration reliably and conduct research on the topic. This fragmentation limits the potential impact of the MSMV research and its ability to guide practice.

The purpose of this concept analysis is to clarify the meaning of MSMV reintegration. In the process, we determine a unified definition of reintegration, analyze current reintegration measurement instruments, and identify MSMV-reported needs and challenges to reintegration. Ultimately, we aim to further understand the concept and the systems that contribute to reintegration. Using a principle-based concept analysis approach (Penrod and Hupcey, 2005) we explicate the meaning of the concept *reintegration*, focusing exclusively on use of the concept in scientific literature, compare the terms used for the concept over time, and examine reintegration surveys and MSMV reintegration needs. The results of this analysis will enhance understanding of reintegration for MSMVs and inform the development of health and social services.

First, we analyze use of the concept *reintegration* in the literature, differentiating it from the related concepts of transition, readjustment, and community integration as it relates to MSMVs' lives. We then analyze instruments that measure reintegration and synthesize MSMV's self-reports of reintegration challenges and needs, in order to identify what the concept is and is not. Grounded in the empirical evidence, this concept analysis provides a unified definition of the phenomenon and identifies key domains of reintegration that may guide reintegration research and practice.

METHODS

Search Strategy and Data Collection

Empirical articles were identified in leading databases: Academic Search Complete; Anthropology Plus; ArticleFirst; ERIC; GPO Monthly Catalog; MEDLINE; WorldCat; and WorldCat.org. The search included the following constraints: (a) terms and phrases that included reintegrat*, re-integrat*, transition*, community integration, integrat* in* the community, readjust*; (b) sources using the above terms in combination with either the term veteran* or military; and (c) articles published in English between 1990 and June 2015. The scope of the search was deliberately broad to include definitions from various perspectives and to identify trends in terminology arising in the current era. These searches yielded 1,459 articles. We eliminated duplicates and read abstracts and articles to determine if they met the following inclusion criteria: (a) published in a peer-reviewed journal; (b) focused on U.S. MSMV population issues; (c) focused on health or social issues related to returning from war. Applying these criteria and removing duplicates yielded 466 articles for review. Of these, 213 studies used *reintegration* or a related term in the body of the text; 96 studies that used the term only in a reference list, appendix, or title were excluded from the study. Screening of abstracts and full text review based on our inclusion/exclusion criteria, yielded 117 articles for review.

Analysis Process

Characteristics of each article were abstracted and coded into a database by two authors using a data coding dictionary and evidence table developed and revised to include details of the studies (Galvan, 2014). Three interrelated coding processes were applied to each article to address the multiple aims of our analysis. First, a qualitative approach using a comparative analysis grounded in the evidence was adopted (Corbin and Strauss, 2008) to conduct the concept analysis of *reintegration* and related terms (i.e., transition, readjustment, and community integration). To define the boundaries of *reintegration*, each article was reviewed and phrases containing the related terms were extracted and analyzed to determine what the terms did and did not describe. Reviewing all the paragraphs containing the term *reintegration*, we constructed categories depicting the various ways reintegration was used (Corbin and Strauss, 2008), whether involving explicit description (e.g., reintegration is associated with family function) or implied meaning. We also examined articles addressing challenges and needs self-reported by MSMVs in this sample of articles. Each article's *reintegration* definition (if provided) and operationalization of the reintegration concept was coded. In addition, each article was coded to identify factors associated with reintegration which were then grouped into major themes or domains. Codes and themes "emerged" from the literature as we set out to discover the definition implicit in the data. We also counted the annual use of reintegration and related terms across articles to provide a historical picture of the terminology used. Data were abstracted by one investigator and reviewed for accuracy by one additional investigator.

Second, we described measurement instruments using coded data, specifically study design, setting, number and type of subjects, sample selection, and domains of measurement. Finally, we examined articles that addressed challenges and needs self-reported by post-9/11 MSMVs in our sample of articles. We classified these articles by number and type of subjects, key findings, and categories of reintegration needs addressed.

Our research team synthesized results from our analyses to identify a unified definition and key domains of reintegration. Specifically, we considered our analysis of the reintegration concept, existing measurement tools, and MSMV self-reported challenges and needs to determine the breadth of factors, or key domains, typically associated with reintegration. Regular discussions among the investigators facilitated this process. This systematic approach allowed us to reach conclusions about the concept of reintegration and related domains that were grounded in the evidence. Our inclusion of veterans' self-reported challenges and needs helped us to avoid the potential bias of using exclusively researcher-based perspectives.

RESULTS

Mapping the Use of the Reintegration Concept and Related Terms

To analyze and synthesize the term *reintegration* as used in the health and social sciences literature, we reviewed related terms that often overlap with or are used interchangeably with reintegration. These related terms, as well as reintegration itself, are described below. As **Figure 1** indicates, there has been greater than a four-fold increase in peer reviewed literature on reintegration and its related terms over the past 5 years.

The term *reintegration* is relatively new in the scientific literature on MSMV's. The term was seldom used before 2004 when its use began to increase dramatically (see **Figure 1**). The term was used more in 2011 than in any other year, perhaps reflecting the rapid withdrawal of U.S. troops from Iraq and the scientific community's recognition of their needs.

Use of the term *transition* has followed a similar pattern, becoming increasingly common around 2004. However, unlike *reintegration* and *transition*, the term *readjustment* has been used in the scientific literature for more than two decades. Its use has decreased since 2009 though it is unclear why; it may have fallen out of favor as the term *reintegration* gained traction. Alternatively, the scientific community may be placing more emphasis on the various domains of life in which psychological, physical, or social functioning may be improved, and is adopting the term *reintegration* because of its emphasis on multiple domains. *Community integration*, unlike the other terms included in this analysis, has been used rather infrequently over the past decade.

Reintegration and related terms describe a time period, process, or outcome that MSMVs may experience following military service. **Figure 2** shows that both *reintegration* and *community integration* place primary emphasis on participation in life's many roles—as an employee at work (Drebing et al., 2007; Brown, 2008), a student at school (Ackerman and DiRamio, 2009; Bauman, 2009; DiRamio and Spires, 2009; Baechtold and Danielle, 2011), or a spouse (Cohan et al., 2005) or parent within

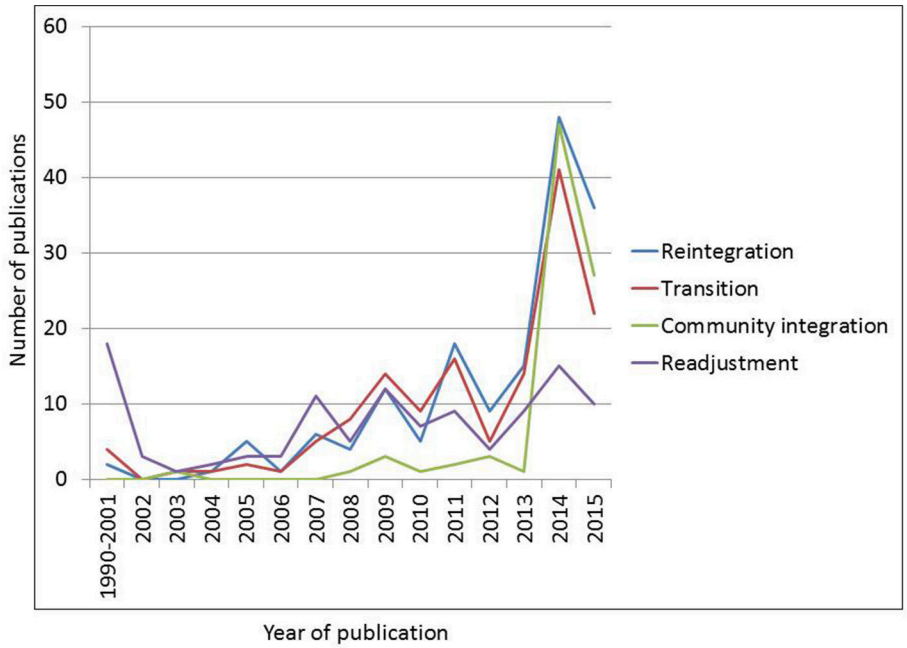

FIGURE 1 | Trends in reintegration and related term use 1990–2015.

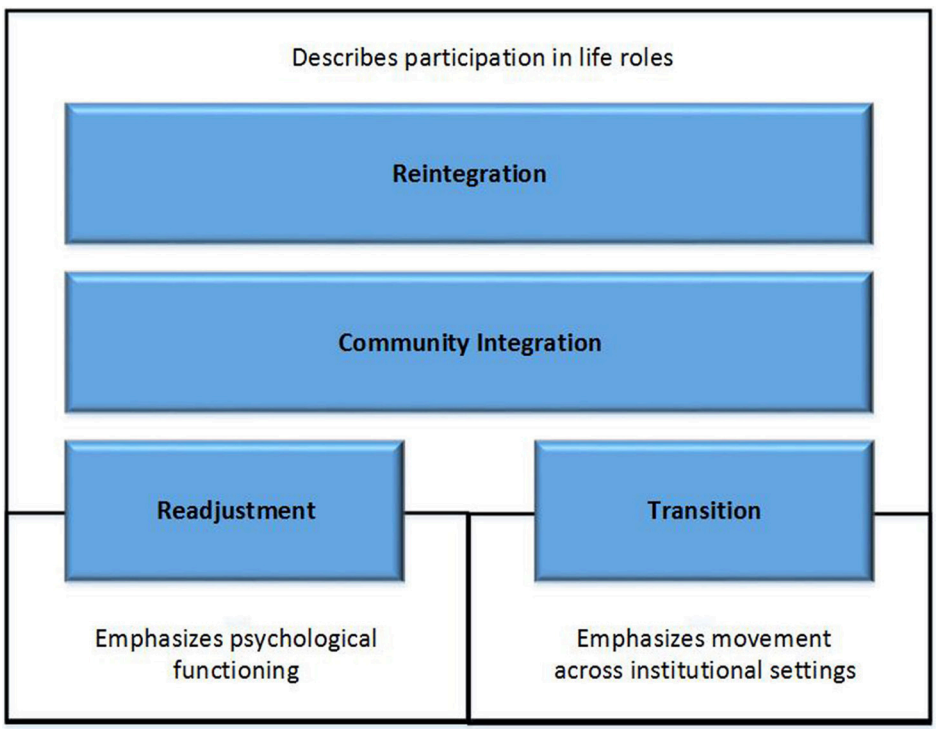

FIGURE 2 | Primary distinctions between reintegration and related terms.

one's family (Grantz, 2007; Chandra et al., 2010). *Readjustment* and *transition* also describe participation in life roles; however, they tend to highlight specific phenomena. *Readjustment* tends to emphasize psychological functioning, that is readapting to civilian life after deployment (Gironda et al., 2009; Sayers et al., 2009), while *transition* tends to emphasize movement across

institutional settings—for example, return from deployment (e.g., transition from warrior to civilian; Greene et al., 2010), separation from a military setting and movement to a civilian setting (Glover-Graf et al., 2010; Penk et al., 2010) or from one health care setting to another (Scherrer et al., 2014).

Transition

The term *transition* generally refers to either the time period or process during which a MSMV moves from a military to a civilian setting (Rosenheck et al., 2003; Bolton et al., 2008; Casarett et al., 2008), or the movement through various systems of health care (Malphurs and Striano, 2001; Kasprow and Rosenheck, 2007). Phrases such as "transition to veteran status" are common and tend to emphasize movement into or across institutional systems such as the Department of Veterans Affairs. *Transition* is also used to describe services or sets of services provided to MSMV's. However, given the range of possible needs and services, the specific meaning of "transitional services" is unclear.

Readjustment

Readjustment refers to the process of readapting to civilian life after deployment (e.g., Wolfe et al., 1993; Katz et al., 2007). Like the term *transition*, *readjustment* pertains to shifting from a military to a civilian role; however, *readjustment* typically evokes images of the MSMV grappling with psychological or emotional issues, including PTSD. The term has been used to refer to psychological health and social issues in a wide range of life roles including work, education, interpersonal relationships, and health (e.g., marital, family, or financial difficulties, homelessness, work issues, medical problems, and motor vehicle accidents). *Readjustment* has also been used in service program titles such as Readjustment Counseling Service—U.S. Veteran Compensation Programs, 2015 and to refer to education and economic benefits such as the Servicemen's Readjustment Act of 1944—also known as the G.I. Bill. Another common use of the term is in the National Vietnam Veterans' Readjustment Study (NVVRS) of the prevalence of PTSD among Vietnam veterans (see Kulka et al., 1990 for review). It is also used frequently without specific reference to what the term covers (e.g., "readjustment to civilian life").

Community Integration

Like the terms *transition* and *readjustment*, *community integration* pertains to separation from the military or return from deployment (Nidiffer and Leach, 2010). It is sometimes used in the context of physical rehabilitation (e.g., "the community integration of severely wounded veterans"; Taylor et al., 2003; Sporner et al., 2009; Wehman et al., 2009). The term *community integration* is used occasionally without description of its meaning.

Reintegration

Reintegration, the most frequently used term describing separation from the military or return from deployment, often refers to MSMVs' return to the social (e.g., Johnson et al., 1994) or occupational roles (Ortega and Rosenheck, 2000) they filled prior to deployment, however a specific definition is often not provided. *Reintegration* refers to co-occurring psychological, social, health-related, and community-related modes of functioning with one's immediate veteran friends, family, and larger social groups. For example, family -, social-, or community-reintegration, reintegration into society, and reintegration into community life refer to healthy functioning of MSMVs. *Reintegration* also refers to physical rehabilitation needs and systems of care (e.g., *reintegration and rehabilitation* treatment plans, case management, and community-based or in-home rehabilitation services for TBI or polytrauma) as well as employment programs. For example, the Yellow Ribbon Reintegration Program (YRRP), a Department of Defense program was established by U.S. Congress (2008) (Public Law 110–181 Section 582) to help MSMVs reintegrate with communities and employers. Finally, reintegration may also refer to part of military readiness such that active duty personnel are well prepared to deploy repeatedly (e.g., Enhanced Reintegration Action Plan program at Ft. Lewis).

Domains of Reintegration

Overall, 79 articles included explicit definitions of the reintegration concept including the following different dimensions and respective number of articles: (a) psychological health ($N = 43$); (b) family ($N = 36$); (c) physical health ($N = 29$); (d) employment ($N = 26$); (e) housing ($N = 10$); (f) financial ($N = 9$); (g) education, legal, spiritual, and non-specific ($N = 8$). These 10 categories are not mutually exclusive, and most articles referenced *reintegration* in more than one category. After analyzing the literature, we determined, importantly, that no single article in the literature included a comprehensive conceptualization of reintegration across various levels of an ecological model (i.e., individual, interpersonal, community systems, and societal), which is a core theme that emerged from this work (see Elnitsky et al., 2017).

The term *reintegration* referred to any number of issues related to successful functioning in various facets of life: (a) *Psychological health*—behavioral, mental, or emotional symptoms or disorders, or psychosocial functioning; (b) *Social*—interaction with family members, friends, parental or marital relationships, marital issues; (c) *Physical health*—disease, illness, or injury, or wellness; (d) *Employment*—post-military unemployment or jobs; (e) *Housing*—homelessness, shelter/accommodations; (f) *Financial*—personal economic issues; (g) *Education*—college, continuing education at school; and (h) *Legal*—unlawful behavior or criminal justice matters; (i) *Spiritual*—religious or spiritual activities or a sense of meaning or purpose in life; and (j) *Non-specific*—functioning (psychosocial, health, or community-related) without explicit reference to other categories.

In summary, *reintegration* is a broad, holistic concept of overall psychosocial functioning that includes psychological and physical health. It spans more health and social services than the other terms included in this analysis, and it frequently emphasizes physical health and rehabilitation issues. Unlike the other terms included in this analysis, *reintegration* sometimes refers to a key component of military readiness and evokes "positive reintegration experiences," or the ways in which deployment may enhance one's life or perceived meaning in life.

Reintegration Measurement Instruments

Eight Reintegration Measurement Instruments and their characteristics are summarized in **Table 1**. Overall, the instruments measure all the aforementioned conceptual sub-domains of reintegration, except transition (i.e., as movement across different types of healthcare). Despite this limitation, the results show promise for use of surveys to measure reintegration as either a process or outcome in future studies.

Transition was measured by only one tool, the Combat-to-Home Transition Scale, which defines and measures the experiences of transitioning home among U.S. military service members (Adler et al., 2009, 2011a). Adler et al. (2011b) defined transition as the adjustment following combat deployment, including the experience of psychological benefits and the emotional toll of deployment.

Readjustment has been measured by a number of scales which provide insight into how the concept is used with the current MSVM population; they include the Iraq Readjustment Inventory (IRI, Katz et al., 2007) and the Post-Deployment Readjustment Inventory (PDRI, Katz et al., 2010). The IRI assesses social readjustment and deployment concerns of women returning from Iraq; the PDRI extends the IRI to assess MSMVs serving in additional countries and added domains of functioning: career and intimate relationship challenges, health problems, and PTSD symptoms (Katz et al., 2010).

Community integration has been measured by a number of instruments. The Community Integration Questionnaire (CIQ) is a survey of home and social activities, and work or school activities of individuals recovering from a TBI (Willer et al., 1994). The Community Integration Measure (McColl et al., 2001) is a survey of participation and connections of individuals with TBI in the environment, including assimilation, support, occupation, and independent living (McColl et al., 2001).

Researchers have developed three assessment tools to measure *reintegration* explicitly. The Post Deployment Reintegration Scale measures positive and negative experiences of military personnel in work, family, and personal domains (Blais et al., 2009). The Community Reintegration of Service Members (CRIS) measures nine domains of participation (knowledge, general tasks, communication, mobility, self-care, domestic life, relationships, major life areas, and community, social, and civic life) among injured MSMVs. Three CRIS subscales assess participation frequency, perceived limitations, and satisfaction with a list of individual items (Resnik et al., 2009). The CRIS items relate to skills and problem solving; handling stress and multiple daily tasks; movement, driving and using transportation; self-care and caring for others; interpersonal, family and intimate relationships; acquiring, keeping, and terminating a job; making complex economic transactions; maintaining economic self-sufficiency; recreation and leisure; socializing; and maintaining citizenship and a political life (Resnik et al., 2009, p. 92). The Military to Civilian Questionnaire (M2C-Q), measures general difficulty in readjusting to civilian life following deployment (Sayer et al., 2011) by assessing social and health behaviors, specifically interpersonal relationships; productivity at work, school, or home; community participation; self-care; leisure; and perceived meaning in life. It excludes domains related to physical disability (Sayer et al., 2011, p. 664).

MSMV Reintegration Challenges and Needs

To analyze and synthesize the *challenges and needs* of post-9/11 MSMVs, we reviewed studies of MSMVs' self-reported needs in reintegrating to civilian life (see **Table 2**).

Overall, MSMVs report challenges and needs that may be categorized into a typology of individual, interpersonal, community, and societal issues. Individual challenges and needs reported by MSMVs include physical and psychological health and behaviors (Sayer et al., 2010, 2015; Plach and Sells, 2013; Bloeser et al., 2014; Larson and Norman, 2014; Wilcox et al., 2015), personal identity challenges (Beder et al., 2011), personal spirituality challenges (Sayer et al., 2010), self -care challenges (Plach and Sells, 2013), feelings of isolation (Bloeser et al., 2014), and financial difficulties (Bloeser et al., 2014). Interpersonal challenges reported by MSMVs include difficulties in social engagement (Sayer et al., 2015), social functioning and relationships (Sayer et al., 2010; Beder et al., 2011), lack of social support (Bloeser et al., 2014), and challenges with relationships and family reintegration (Wilcox et al., 2015). Community challenges reported by MSMVs include difficulties with community involvement and belonging (Sayer et al., 2010), and difficulties with productivity in work or school (Beder et al., 2011; Plach and Sells, 2013; Bloeser et al., 2014; Larson and Norman, 2014; Sayer et al., 2015). Societal challenges reported by MSMVs include unlawful behaviors (Sayer et al., 2010; Larson and Norman, 2014) including risky driving (Sayer et al., 2010), and physical fights (Bloeser et al., 2014). Approximately 25–56% of post-9/11 MSMVs experience health, economic, and social challenges (Sayer et al., 2010). Overall, challenges are more common among MSMVs with PTSD, though high proportions of MSMVs experience challenges in multiple dimensions of reintegration, regardless of their mental status.

The typology of key domains of reintegration that include individual characteristics, interpersonal relationships, community systems, and societal needs. These domains represent factors that may hinder successful reintegration of MSMVs or facilitators that may increase the likelihood of reintegration. Community systems and social policy emerged in this analysis as important components impacting reintegration of the MSMV population; the challenges point to the need for health, rehabilitation, education, employment, and legal services.

DISCUSSION

The purpose of this concept analysis was to provide a unified definition of reintegration, review existing empirical reintegration measurement instruments and identify the problems, challenges and needs of MSMV reintegration to guide future research, clinical practice, and related services. Our review of 15 years of research literature revealed that the term reintegration has been conceptualized differently across empirical studies, measurement instruments, and MSMV

TABLE 1 | Selected characteristics of reintegration measurement instruments (*N* = 8).

Concept domain	Instrument	Description	Concept definition	Standardization	Reliability	Dimensions	Validity	Summary and evaluation
Transition	Combat-to-Home Transition Scale (C2HTS)—(Adler et al., 2011a)	A 16-item, self-report measure designed to assess experiences of transitioning home among MSMVs. Responses are noted on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree)	Adjustment following combat deployment, including the experience of psychological benefits and the emotional toll of deployment	Active-duty US Army soldiers (96% male) at 4- and 8-months post-combat deployment	The C2HTS has been found to have adequate to high internal consistency with in dimensions with total score α = 0.90 and individual factors ranging from α = 0.71 to 0.83. Test-retest reliability data were not available	The C2HTS represents four distinct factors underlying transition experiences in MSMVs: Benefit, Appreciation, Anger/Alienation, and Guilt/Remorse	Negative and positive aspects were related to and distinct from PTSD symptoms. In addition, negative scale dimensions were correlated with combat experiences	The C2HTS is a valid and reliable measure of transition experiences post-deployment. The measure has been infrequently used and there is little research on the predictive validity
Readjustment	Iraq Readjustment Inventory (IRI)—(Katz et al., 2007)	A 16-item, self-report measure designed to assess experiences assess social readjustment and deployment concerns of women returning from Iraq. Responses are noted on a five-point Likert scale (1 = not at all to 5 = extremely)	Adjusting to life post-deployment, including education, employment, relationships, and familial roles	Women MSMVs who fought in OEF/OIF and were seeking treatment at a VA medical center	The IRI has been found to have high internal consistency in all dimensions except one (Career readjustment) total score: α = 0.89; Social α = 0.87; and Concerns about Iraq α = 0.81. Test-retest reliability data were not available	The IRI represents both three distinct factors: global measure of readjustment, social readjustment, and concerns about Iraq	Military sexual trauma was significantly related to mental health symptoms and readjustment ratings across all domains. Scales were highly correlated (r = 0.53–0.79) with objective clinician ratings of participant symptoms	The IRI is a reliable and valid measure of female MSMVs readjustment difficulty. The scale has been used less frequently and there is little research on the predictive validity of the measure
	Post-Deployment Readjustment Inventory (PDRI)—(Katz et al., 2010)	A 36-item, self-report measure designed to extend the IRI and assess MSMVs serving in additional countries and added domains of functioning. Responses are noted on a five-point Likert scale (1 = not at all to 5 = extremely)	Adjusting to life post-deployment, including emotional, mental health, occupational, relationships and interpersonal challenges	MSMVs (85% male) of OEF/OIF	Analyses revealed high internal consistency for the total scale (α = 0.97) and six subscales: α = 0.82–0.92. Test-retest reliability data were not available	The PDRI represents seven domains: global readjustment, career challenges, health concerns, intimate relationship problems, social difficulties, deployment concerns, and PTSD symptoms	The PDRI demonstrated strong convergent validity with the BSI (r = 0.82) and PCL-M (r = 0.90). Predictive validity revealed readjustment difficulty to be highly associated with MST (r = 0.26), being injured (r = 0.40), and witnessing death/injury (r = 0.23)	The PDRI is an extension of the IRI which includes the addition of several items to assess male MSMVs, MSMVs serving in other countries, and additional domains of functioning related to readjustment. Reliability and validity has been established

(Continued)

TABLE 1 | Continued

Concept domain	Instrument	Description	Concept definition	Standardization	Reliability	Dimensions	Validity	Summary and evaluation
Community Integration	Community Integration Questionnaire (CIQ)—(Willer et al., 1994)	A 15-item, self-report measure designed to assess different aspects of community activity of individuals recovering from a traumatic brain injury (TBI)	The opposite of handicap (i.e., to social disadvantage resulting from disability or impairment) with an emphasis on participation of the individual within their environment	Individuals with TBI living in the community	Several studies have examined the psychometric properties of the CIQ, and it has shown high internal consistency and good test-retest reliability, with scores of $r = 0.91$, 0.93, and 0.86, and 0.83 observed for the total CIQ, HI, SI, and PA scores, respectively	The CIQ can be assessed globally, or within three domains: home integration, social integration, and productive activity (i.e., work/school/volunteer)	Evidence for discriminant validity indicates that the CIQ is able to differentiate between patients with TBI and controls, as well as differentiate between TBI survivors with varying degrees of independence	The CIQ was originally developed due to recognition that community integration is a priority during rehabilitation. The CIQ has been validated and used in a wide range of samples and populations with various degree and type of injury. It is valued for its quantitative properties and ease of use. Short forms of the scale are also available
	Community Integration Measure (CIM)—(McColl et al., 2001)	A 10-item, client-centered, self-report measure designed to assess participation and connections of individuals with TBI in the environment. Responses are noted on a five-point Likert scale (1 = always disagree to 5 = always agree)	A function of four factors pertaining to participation and connection with the environment: assimilation (conformity, orientation, acceptance); social support (close and diffuse relationships); occupation (leisure, productivity); and independent living (personal independence, satisfaction with living arrangement)	Three subsamples: individuals with moderate-to-severe TBI, TBI patient family members, and college students	The CIM demonstrated high internal consistency, with total score $\alpha = 0.87$. Subgroup alpha values were: TBI patients $\alpha = 0.83$, college students $\alpha = 0.78$, and family members $\alpha = 0.92$. Test-retest reliability data were not available	Principal component analysis confirmed a 1-factor structure comprised of the following domains: assimilation, support, occupation and independent living	The CIM was found to have adequate content, criterion, and construct validity, and was able to differentiate between TBI patients and controls. Comparison of the CIM and CIQ revealed associations of $r = 0.34$, indicating that the measures, while related, are distinct	This CIM is a valid and reliable measure of perceived community integration among persons with a mild-to-severe history of TBI. The CIM has been validated and used in a wide range of studies
Reintegration	The Post-Deployment Reintegration Scale (PDRS)—(Blais et al., 2009)	A 36-item, self-report measure designed to assess positive and negative experiences of military personnel following deployment	Process of transition home and decompressing following overseas military service often accompanied by psychosocial stress	Canadian Forces personnel recently returned from an overseas peace support operation	The PDRS demonstrated moderate to high internal consistency, with reliability estimates ranging from $\alpha = 0.78$ to 0.89. Test-retest reliability data were not available	The PDRS offers the ability to assess positive and negative reintegration experiences across work, family, and personal domains	Discriminant validity was shown between positive and negative aspects of each domain. Predictive validity revealed that high military commitment and job-related affect predicted positive reintegration experiences	The PDRS is a psychometrically reliable and valid measure of post-deployment reintegration. The scale has been used less frequently and there exists little research on the predictive validity of the measure

(Continued)

TABLE 1 | Continued

Concept domain	Instrument	Description	Concept definition	Standardization	Reliability	Dimensions	Validity	Summary and evaluation
	Community Reintegration of Service Members (CRIS)—(Resnik et al., 2009)	A multi-dimensional scale designed to assess community reintegration and participation in life roles as defined by International Classification of Health and Functioning (ICF)	Adjustment to life at home and in the community	MSMVs recruited from a VA medical center primary care clinics	The CRIS demonstrated excellent internal consistency, with reliability estimates ranging from $\alpha =$ 0.91 to 0.97. Subsequent*t*-test–retest reliability analyses revealed ICCs >0.6	Three fixed subscales assess extent of participation, perceived limitations, and participation satisfaction	The CRIS demonstrated excellent construct, convergent, and discriminant validity	The CRIS is a comprehensive measure of community reintegration with conceptual integrity, excellent reliability, and construct, convergent, and discriminant validity. The scale has been adapted for computer and telephone use
	The Military to Civilian Questionnaire (M2C-Q)—(Sayer et al., 2011)	A 16-item self-report measure of post-deployment community reintegration difficulty. Responses are noted on a 5-point Likert scale ranging from 0 = No Difficulty to 4 = Extreme Difficulty	Readjusting to mainstream family and community life, fulfilling normal roles and responsibilities, and being and active and contributing member to one group and society as a whole	Stratified, random sample of OEF/OIF combat veterans using VA healthcare	The M2C-Q demonstrated excellent internal consistency ($\alpha = 0.95$). Test-retest reliability data were not available	Principal component analysis confirmed a 1-factor structure comprised of the following domains: social and health behaviors; interpersonal relationships; productivity; community participation; (self-care; leisure; and perceived meaning in life. Domains related to physical disability were excluded	The M2C-Q demonstrated excellent construct, convergent, and discriminant validity	The M2C-Q is a comprehensive and psychometrically sound measure of reintegration. The scale is novel and has been used less frequently and there is little research on the predictive validity of the measure

self-reported needs. Furthermore, while existing work has largely considered MSMV reintegration from unidimensional, individual perspective, our findings show that reintegration is a multi-dimensional phenomenon influenced by multiple domains as individual factors (e.g., a health condition), interpersonal relationships, community systems (e.g., utilization of a specific service), and societal structures. Thus, *we define MSMV reintegration as both a process and outcome of resuming roles in family, community, and workplace which may be influenced at different levels of an ecological system*.

This definition and the four domains provide clinicians, health and social service organizations, and policymakers a clear concept to inform research and practice, and it lays the foundation to enhance reintegration processes and outcomes. Currently, there is little agreement on how one domain level influences other levels or how the MSMVs' context is best understood. To address this gap in the MSMV reintegration literature, we link findings from a critical review of the literature to a social ecological systems model (see Elnitsky et al., 2017). For example, MSMVs face health, family, employment, and financial issues. These reintegration needs correspond to health and social services provided to assist MSMVs in reintegrating to the community.

Implications for Research

Investigators should seek to understand the various conceptualizations of reintegration, from the basic view of community integration to the most comprehensive conceptualization which considers the impacts of nine dimensions of reintegration (Resnik et al., 2009) on MSMVs' participation in civilian life. Although, different terminologies or uses of terms can highlight varied aspects of reintegration, this variation can lead to misunderstandings based on different conceptualizations and measurements.

Additionally, it is important for researchers to identify the dimensions of reintegration they are using and how this might affect the indicators and measurement methods they use. Likewise, in disseminating research, investigators should seek to define reintegration explicitly and place their research in context of the environment and specific domains of interest.

The multiple domains of reintegration pose opportunities for conceptualizing reintegration across domains (e.g., individual, interpersonal, community, and societal) and selecting indicators and measures specific to those domains. Several indicators have been described in literature, but taken together, none seem to capture the full reintegration concept. Future research must incorporate methods that capture the multiple dimensions of reintegration in order to develop a comprehensive theoretical explanation for the challenges and facilitators related to MSMV reintegration,

Future efforts in reintegration research might also seek to identify the unique contributions of individual, interpersonal, community systems, and societal policy factors that together impact reintegration processes and outcomes. For example, MSMVs frequently experience complex combinations of morbidities (Tanielian et al., 2014) and other challenges to reintegration which require integrated service supports. However there are gaps in service systems which result in a lack of integration of services (U.S. Government Accountability Office [GAO], 2014).

Furthermore, identifying the various domains of reintegration suggests areas for research which would engage multiple disciplines (e.g., rehabilitation, social sciences, epidemiology, psychology, education administration, etc.). First, researchers should consider whether the dimensions described here are addressed in current explanatory and predictive research. Conceptualizing reintegration as complex and multifaceted presents challenges as it will now be viewed as having multiple facets, not just the individual characteristics that have been most studied in the past 15 years. Emerging research highlights interpersonal and societal level factors that warrant further investigation. Second, considering reintegration as a process rather than a steady state will impact factors included in studies. For example, time since deployment is currently considered in studies, but reintegration as a process of change over time brings into question other contextual factors at play during reintegration. Third, reintegration as an outcome has typically been seen as the functional capacity of MSMVs in specific relationships and roles. However, clarification of factors that are part of successful reintegration is needed. Moreover, a broader conceptualization of reintegration as the ability to function across interpersonal, work, school, and other community roles is necessary if we intend to capture reintegration in various contexts.

Implications for Practitioners

Our comprehensive definition of reintegration promotes a broader focus of practice disciplines, underscoring the need to consider the individual MSMV within the broader context of their family, friends, community, and society and recognize that interventions need to attend to influences across key domains of reintegration (i.e., individual, interpersonal, community organizations, and societal factors). For example, MSMVs working to cope with reintegrating to the community may benefit from efforts to build on interpersonal and community strengths and resources to promote health and to create opportunities for peer support and mentoring. Such interventions will facilitate MSMV healthy adaptation and support successful reintegration.

Potential comprehensive strategies could include work to increase education and support services that are responsive to the needs and challenges experienced by MSMVs, including within post-secondary education, work places, and communities, to enhance interpersonal connections and ultimately reintegration. Because the settings and organizations where MSMVs are educated, work and live can support healthy adjustment, transition, and coping, enhancing the strengths, and supports in these environments is critical. These organizations can provide continuing education and professional development events to educate clinical staff and personnel about military culture and reintegration needs. In addition to increasing awareness of the MSMV needs, organizations may plan community events, and social activities necessary for MSMVs to connect with other colleagues and peers. Such activities, including empirically grounded programs, are needed to support a comprehensive

TABLE 2 | Reintegration needs reported by post-9/11 military service members and veterans.

Author	Sample (*n*- type)	Description of sample	Main findings	Categories of reintegration needs
Sayer et al., 2010	1,226 veterans	National stratified sample of Iraq and Afghanistan combat veterans who use VA	25–56% of veterans report difficulty in social functioning, productivity, community involvement, and self-care domains. Almost all were interested in services to help readjust to civilian life	Social functioning and relationships, productivity, community involvement and belonging, health care (physical and behavioral), risky behaviors (i.e., driving, substance use), substance use, anger management, suicidal/homicidal ideation, legal problems and spirituality
Beder et al., 2011	871 veterans, service members	Male and female veterans responding to survey online or in person	Reintegration difficulties varied by exposure to direct combat, being wounded, having PTSD, having multiple deployments, and lengths of deployment 6 months or more, and gender of veteran	Personal (sense of identity), relationships, and productivity (work/school)
Plach and Sells, 2013	30 veterans	Veterans 20–29 interviewed and surveyed in health screenings at university campus for occupation reintegration issues	Top five occupational performance challenges reintegrating to community and daily life were relationships, school productivity, and self-care. Respondents screened positive for most common mental health and brain injuries	Self-care (driving, sleep disruption, finances, physical health, interactions, mental health); productivity, leisure (relationships, drinking, balancing time), and mental health (PTSD, TBI, major depression, alcohol abuse)
Bloeser et al., 2014	152 veterans	Veterans recently separated and coming to a large urban VA Medical Center	Post-deployment difficulties and functional impairments were related to participation in VA mental health care	Problems with school and work, physical fights, physical health problems, financial difficulties, irritability/anger, isolation, drug use, problems with social support
Larson and Norman, 2014	461 recently separated veterans	Recently separated Marine veterans	PTSD symptoms predicted reintegration difficulties across nearly all domains of functioning (other than unlawful behavior). Greater combat exposure increased risk and greater resilience and being married protected against unlawful behavior	Functional difficulties included work related problems, financial problems, unlawful behavior, mental health symptoms limiting activities, post-traumatic stress disorder symptoms
Sayer et al., 2015	1,292 veterans	War veterans responded to a survey and clinical trial of expressive writing	54% prevalence rate of reintegration difficulty; veterans discharged from military 6 years prior. VA users had higher combat exposure, probable PTSD, TBI, distress, physical symptoms, and reintegration difficulty than nonusers	Mental and physical problems, psychological stress, physical symptoms) and difficulties in social, productivity, community or civic engagement, self-care and leisure domains
Wilcox et al., 2015	126 National Guard members	Recently returned from a 1-year deployment in Iraq	Rates of problems were elevated upon return from deployment and remained fairly constant until 6 months post-deployment	Psychological and behavioral problems, relationships, family reintegration challenges

response from community systems to the challenges and needs of MSMVs.

In clinical settings, care providers may incorporate screening for occupational health risk exposures of military service within the routine assessment practices of organizations serving MSMVs. While not typically included on assessment intake forms, there is a national "have you ever served" initiative to include screening for such occupational health exposures through identifying if the patient or their family member has ever served in the military as well as incorporating such assessments into the curriculum of health care professional training programs (Collins et al., 2013). Adding this targeted assessment approach will bring community services together and ultimately ensure that our MSMVs have the opportunities, resources, and support they need to reintegrate successfully.

Furthermore, clinicians may apply the unified definition by being aware of the peer connections and social supports that are so important to MSMVs. Clinicians could intentionally identify MSMV relationships and friendships as important resources and help build support to facilitate reintegration. Clinicians may develop and implement Veteran peer-based outreach and treatment groups and assess the overall impacts on

MSMV health care engagement and reintegration. Additionally, clinicians may develop innovative programs to support physical and psychological health with a focus on the various interpersonal relationships of individual MSMVs. Providers may implement resilience-building interventions that will enhance relationships and coping strategies and ultimately, reintegration outcomes.

Considering reintegration as a process may help health systems and practitioners identify the most effective timing of interventions to meet MSMV needs and facilitate reintegration. This broader perspective can lead to innovative interventions for the full variety of complex conditions (e.g., psychological, physical, education skills, etc.). Interventions during pre-deployment and deployment phases may promote resilience and reintegration during post-deployment transition. Evaluations of transition across different health care types (e.g., acute care, rehabilitation) and organizations are needed to clarify how these processes influence the reintegration of MSMVs. This view also encourages assessment of barriers in the community, and establishment of multidisciplinary teams to address complex comorbidities and disability and decrease the stigma of psychological health issues in work or school environments. Understanding the challenges and needs of MSMVs and viewing reintegration as having a time element could help clinicians clarify the appropriate timing of interventions as well as the coordination necessary across health and social systems to meet MSMV needs and facilitate reintegration. By applying a multidisciplinary approach to the integrated model of MSMV reintegration (Elnitsky et al., 2017), clinicians could provide for richer perspectives, and diverse intervention approaches to promote MSMV reintegration.

CONCLUSIONS

This article explored the concept of reintegration as it is understood in the context of post 9/11 MSMVs. The authors were motivated by their observation that the meaning of reintegration is currently not comprehensive as indicated by various definitions and lack of consensus on a unified theory of reintegration. This manuscript contributes in-depth understanding of a complex concept, identifying reintegration domains, and relevant levels of consideration using a systematic review of 15 years of peer reviewed empirical evidence.

Current literature points to the need for a unified definition of MSMV reintegration. This definition and the key domains of reintegration combine the perspectives of various disciplines and reflect our current understanding of reintegration, which is expected to continue evolving over time. Applying the unified definition and key domains of reintegration, researchers and practitioners may advance the science on reintegration by including relevant factors at various levels of the model, based on their issue of interest and specific contextual factors.

AUTHOR CONTRIBUTIONS

Original conception and design of the work CE and MF, substantial contribution to the revised conception and design of the work CB, acquisition, analysis, or interpretation of data for the work CE, MF, and CB, drafting the work CE, MF, and CB, revising the work critically for important intellectual content CE, MF, and CB, final approval of the version to be published and agreement to be accountable for all aspects of the work CE, MF, and CB.

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Family and Individual Risk and Protective Factors of Depression among Chinese Migrant Children with Oppositional Defiant Disorder Symptoms

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Migrant children reached 35.81 million in China and were vulnerable to serious emotional problems including depression. The present study aimed to identify the family and individual risk and protective factors for depression in an at-risk sample of Chinese migrant children. Participants were 368 children (9.47 ± 1.46 years old, 73.4% boys) who had at least one symptom of Oppositional Defiant Disorder symptoms (ODD) and their parents in Mainland China. Risk and protective factors within both family (i.e., family maltreatment and family functioning) and individual (i.e., automatic thoughts and resilience) perspectives. Family maltreatment and negative automatic thoughts served as risk factors in relation to children's depression. Further, automatic thoughts mediated the relationship between family maltreatment and children's depression. Family functioning (cohesion, but bot adaptability) and individual resilience could buffer the effects of risk factors in the Structure Emotion Model such that both cohesion and resilience moderated the relationship between family maltreatment and children's automatic thoughts only. Our findings highlighted the urgent need to decrease risk factors and increase protective factors of both family and child individual characteristics in prevention and intervention depression among migrant children with ODD symptoms in China.

Keywords: migrant children, risk factors, protective factors, family factors, individual factors, oppositional defiant disorder symptoms

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INTRODUCTION

Migration and immigration is certainly becoming one of the great issues all around the world (Dogra et al., 2011; Crosnoe and Fuligni, 2012). With the rapid development of economy and urbanization in China, as of 2014, there were over 35.81 million children (or 12.84% of all children) aged from 0 to 17 who migrated from rural to urban areas in China. In urbanized areas such as Beijing, it was estimated that as high as 36.28% of children were migrants (NWCCW et al., 2014). A growing body of research suggested that migration was a complex and stressful process particular for children and adolescents, and had been associated with elevated risks for emotional (e.g., depression, anxious, loneliness), behavioral (e.g., aggression, withdrawal,

delinquency), and other adjustment problems (Jordan and Graham, 2012; Washbrook et al., 2012). Oppositional defiant disorder (ODD) was a collection of emotional and behavioral problems, as children with ODD were characterized by a pattern of moody/irritable, argumentative/defiant, and hostile/vindictive behavior toward authority figures (American Psychiatric Association, 2013). Moreover, ODD symptoms were identified to be associated with more life stress (Lavigne et al., 2012). Targeting on children with ODD symptoms could be meaningful to understand those migrant children with emotional and behavioral problems.

DEPRESSION IN CHINESE MIGRANT CHILDREN WITH ODD SYMPTOMS

Given the critical role of emotional wellbeing in children's academic development and social relationship, particularly in clinic or at risk populations (Carlson and Cantwell, 1980; Izard et al., 2001), study on depression among migrant children with ODD symptoms can help to a further understanding of depression and inform treatment to children with ODD (Latimer et al., 2012). Indeed, there were some preliminary empirical evidences that migrant children in China did have emotional problems, such as depression (Yuan et al., 2012; Hu et al., 2014). Migrant children in China had more severe depression than local urban children (Zeng and Li, 2007), and even scored significantly higher than general rural children on depression (Lin et al., 2009). Moreover, childhood ODD was associated with an increased risk of depression (Hazell, 2010). It is essential to a better understanding of depression among migrant children with ODD symptoms.

RISK AND PROTECTIVE FACTORS FOR DEPRESSION AMONG MIGRANT CHILDREN

For risk factors relation to migrant children and children with ODD symptoms, child maltreatment executed by parents and children individual negative automatic thought were not be ignored. Parents of migrant children were more inclined to use harsh and abusive upbringing, particularly with child with ODD (Li et al., 2016b), as migrant families tended to have lower socio-economic status (SES) and less educated parents compared to non-migrant families (Li et al., 2008; Hou et al., 2009). Due to defiant problems and ill temper of children with ODD symptoms, they had an increased risk of being maltreated by their parents and caregivers (Gershoff, 2002; Lin et al., 2014). Research that focused on Chinese children with ODD indicated that parents often emotionally punished (e.g., shaming, blaming, and isolating) and/or physically punished their children (e.g., kicking, beating, slapping, hitting the child's buttocks, and twisting an ear; Lin et al., 2014). And this, consequently, was bound to increase children's depression (Li et al., 2016a). Moreover, the process of migration might be a very potent trigger for children's automatic thoughts, for migration always accompanied by a series of negative life events such as separation from friends and other family members, economic stressors, and perceived discrimination (Fang et al., 2008; Lin et al., 2009). Subsequently, those children with more negative automatic thoughts were vulnerable to have higher levels of depression (Clarke and Goosen, 2009; Hjemdal et al., 2013; Du et al., 2015). Additionally, cognitive theory (Beck, 1979) asserted that negative cognition interpretations of experience lead to negative views of self, world, and future, developed automatic and affected feelings and behavior, and further leaded to the emotional problems.

Despite exposure to risk factors or under adversities, more than half of children who experienced early adversity grew into competent, confident and caring individuals (Kashani et al., 1995; Wingo et al., 2010). And these differences may depend on both their families' circumstances (Kashani et al., 1995) and characteristics of children themselves (Hjemdal et al., 2006; Alim et al., 2008; Wingo et al., 2010). Optimal family functioning and higher level of personal resilience were always identified as family and individual protective factors for children developing into psychopathology.

Children who with a better family functioning usually had less emotional problems, and so they behaved well accordingly (Tamplin and Gooyer, 2001; Fang et al., 2004). Olson et al. (1979) developed the Circumplex Model and placed family functioning into adaptability and cohesion dimensions. Specifically, adaptability assessed the family ability to change in response to situational stress and cohesion meant the degree of emotional bonding between family members. Olson et al. (1979) studies showed the optimal family functioning was associated with moderate levels of cohesion and adaptability. Some studies showed that both adaptability and cohesion were negatively associated with children's depression (Cumsille and Epstein, 1994; Xu et al., 2008), however, some demonstrated that cohesion, but not adaptability, was negatively associated with children's depression (Kashani et al., 1995; Li et al., 2008). Moreover, studies has proved family functioning could be a moderator to the mental healthy, especially for those in adversity (Robbins et al., 2003). However, considering almost every migrant child has once stayed at home as left-behind child, they may have a less intimate or less close relationship with their parents (Duan, 2015). Consequently, family functioning in migrant family may be less cohesive and less adaptable. Whether the less cohesive and the less adaptable family functioning could be a buffer for depression with migrant children particular those with ODD symptoms? To a comprehensive consideration, we still propose both family adaptability and family cohesion could mitigate the threat of family maltreatment in current study.

As for individual protective factor, resilience has been identified as an important factor in the generation and the prevention of depression according to a series studies (Hjemdal et al., 2006; Alim et al., 2008). Rutter (2006) have proposed that resilience starts with a recognition of the huge individual variation responses to risk experiences, and further have applied for intervention strategies with respect to prevention. Later, three approaches on resilience's application, including the harm-reduction, the protection, and the promotion approach, were developed (Davydov et al., 2010). According to the protection approach, resilience has been viewed as a defense mechanism

(analogous to "immune barriers") to preserve health and protect against the negative outcomes occurring when confronted adversities (Patel and Goodman, 2007). Converse to children with less resilience, children with high level of resilience were capable to positively comprehend the negative life events rather than been frustrated. Moreover, these children utilized their positive attitude and ways to solve problems (Shannon et al., 2007; Davydov et al., 2010; Wang et al., 2014). Therefore, children with higher resilience were able to reduce the negative impact of the adversities and develop into health outcomes, which assist them well-adapted. Specifically, Wingo et al. (2010) have demonstrated that resilience as a main moderator mitigated the severity of depressive symptom in individuals exposed to childhood abuse or other traumas. Wang and Lin (2012) and Wang et al. (2014) also have found among Chinese migrant children that these children's high level of resilience reduced their emotional problems and promoted their adaption to the new environment. Although, resilience was confirmed as a moderator during stress or trauma, less was known for its work-effectively process. Did resilience kick in when exposing to the life stress directly? Or it was solely worked effectively in the person-internal systems involving cognition? Moreover, did resilience play an equally important role in reducing adverse impact for high-risk migrant children, such as migrant children with ODD? In the present study, we assume children's resilience play as moderators in the beginning of facing family maltreatment as well as the processes of developing automatic thoughts and depression, even for migrant children with ODD symptoms.

THE COMPLEX RELATIONSHIP OF RISK AND PROTECTIVE FACTORS AND CHILDREN'S DEPRESSION

A review by Grant et al. (2006) indicated that familial and individual factors were associated with children's psychopathology symptoms in complex processes and there always existed moderators or mediators. However, less was known for the process that how risk (i.e., maltreatment, negative automatic thoughts) and protective factors (i.e., family functioning and resilience) of both familial and individual impact on children's depression, particularly among migrant children with ODD symptoms. According to the Family System Theory (Cox and Paley, 2003), family was a dynamic and interactive system with interdependent factors at multiple levels that factors at the whole family level and the individual level played important roles in shaping and influencing the development of a child. Identifying the familial and individual risk and protective factors for depression of Chinese migrant children with ODD symptoms is a critical step to inform the development of intervention programs that addressing the needs of this growing population.

Among these risk and protective factors we aforementioned, automatic thoughts always played as a mediator in the link between stressors (e.g., maltreatment) and depressive symptoms, as cognitive behavioral theory postulated that automatic thoughts are concomitant with a stressful situation leading to depression (Beck, 1979; Kanter et al., 2004). And empirical studies suggested that negative automatic thought was not merely an concommitent of depression but also was a predictor of the course of depression following the family maltreatment (Hjemdal et al., 2013; Du et al., 2015). Regarding the moderators, protective factors in both family and individual (such as family functioning and individual resilience) had been examined to decrease the negative impact of risk factors. Family functioning has been tested for buffering effects and was found a strong evidence to a buffer (Robbins et al., 2003; Grant et al., 2006). Likewise, resilience moderated depressive symptom in individuals exposed to adversities in both cross-sectional and longitudinal researches (Alim et al., 2008; Wingo et al., 2010; Zhu et al., 2015).

THE PRESENT STUDY

This study aimed to examine how risk (i.e., family maltreatment, automatic thoughts) and protective (i.e., family functioning, resilience) factors in both the family and the child are jointly and interactively associated with depressive symptoms in migrant children with ODD symptoms in China. We hypothesized: (1) risk factors of both family and individual would be associated with depression of migration child with ODD symptoms; (2) children's automatic thoughts would mediate the relation between family maltreatment and children's depression; (3) protective factors of both familial and individual (family functioning and child resilience) would buffer the associations between risk factors to depressive symptoms. Specifically, we hypothesized that family functioning would only moderate path a and b [i.e., the relation between family maltreatment and children's automatic thoughts (a), and the relation between family maltreatment and children's depression (b)]. By contrast, we hypothesized that child resilience would moderate three paths, including the relation between family maltreatment and children's automatic thoughts (c), the relation between family maltreatment and children's depression (d), and the relation between children's automatic thoughts and depression (e) (See **Figure 1**).

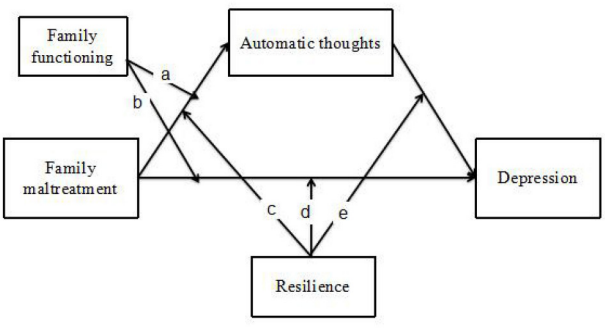

FIGURE 1 | Proposed model of risk and protective factors of both family and individual associated with depression among migration child with ODD symptoms.

METHODS

Participants and Procedure

Data in the present study were drawn from a larger study conducted on migrant children in Beijing recruited from 10 elementary schools (in which 7 public elementary schools and 3 schools especially for migrant children) during 2013 and 2014. Having or not having Beijing hukou (citizenship) divided them into migrant children or Beijing urban children. We reached 10 elementary schools' school psychologists inviting them to attend the study. After getting their approval, these school psychologists assisted to deliver our research invitation letter (including a study introduction and an informed consent) to all the class master teachers to acquire their agreement to participate the research. After class master teachers agreed and signed informed consent, they were asked to nominate the children who might have ODD symptoms using ODD symptoms assessment sheet (from Diagnostic and Statistical Manual of Mental Disorders, DSM-IV). Following, a school psychological teachers, a clinical psychologist researcher together with the class master teacher further confirmed whether the selected children have ODD symptoms or not. At last, there were 375 migrant children confirmed with ODD symptoms (excluding those with intellectual disability and other disorders). Noted that we matched the contrast group (both to the non-symptoms children and to the non-migrant children), but omitted here. Next, class master teachers connected with the selected 375 children's parents and delivered an invitation of the study and two informed consent of child and parent to sign. With the exception of a refuse-participate family, we measured other 374 families that agreed to participate, including the children, their parents and their class master teachers. The teachers completed teachers' questionnaire in their office. All the selected children used the recess time in a given room in school completed the questionnaire and took their parents' questionnaire back home. After their parents completed (told to be finished by one parent in a week) the questionnaire, children brought it back to their class master teachers. All the participants were given a thank-you gift.

In conclusion, 369 questionnaires were returned to our lab. Deleting one with too many missing value, there were 368 children and parents in our study, including 270 (73.4%) boys and 98 (26.6%) girls, 154 (41.8%) father- child dyads and 188 mother- child dyads (51.1%) and 26 (7.1%) parental participants missing their gender. There were 103, 87, 102, 75 children from grade two, three, four, five, respectively, aging from 7 to 14 with the average age 9.47 $\pm$ 1.46 years old. The average migrant time of migrant children was 75.16 $\pm$ 37.85 months, in which the maximum time was 156 months and the minimum migrant time was 6 months.

Measures

ODD Symptoms Assessment

Based on the 8 symptoms indicated in DSM-IV (American Psychiatric Association, 2013) for the diagnosis of ODD measured on a dichotomous scale ("0 = no," "1 = yes") (e.g., "often loses temper"; "often argues with adults"), the class master teacher, a school psychological teachers and a clinical psychologist evaluated whether a child had the ODD symptoms. As long as one had one or more than one item of the 8-item scale, child was identified with ODD symptoms. Scores from these eight items were summed with higher total scores indicating more symptoms on ODD. In current study, the Cronbach α of the scale was 0.85.

Family Maltreatment (Child Reported)

We used Childhood Trauma Questionnaire (CTQ-SF, Bernstein et al., 1997), the Chinese version (Zhao et al., 2005) to measure the family maltreatment. It is a 28-items scale (including 3 items used to evaluate the validity) manifested in five dimensions: Emotional abuse (e.g., "People in my family said hurtful or insulting things to me"), Physical abuse (e.g., "People in my family hit me so hard that it left me with bruises or marks"), Sexual abuse (e.g., "Someone molested me"), Emotional neglect (e.g., "My family was a source of strength and support"), Physical neglect (e.g., "I knew that there was someone to take care of me and protect me") and each sub-scale has 5 items. We used four CTQ sub-scales except sexual abuse one in the present study. Items with response options rated on a 5-point Likert scale ranging from "1 = Never" to "5 = Very often." The Cronbach α were high for of the total scale (0.84) and for each subscales (0.69∼0.82) in current study.

Family Functioning (Parent Reported)

Family functioning were measured using the Chinese version Family Adaptability and Cohesion Evaluation Scale (FACES-III; Olson, 2000; Xu et al., 2008). With 30 items, it evaluated the family functioning on adaptability (14 items; e.g., "Family members discuss problems and feel good about the solutions.") and cohesion dimensions(16 items; e.g., "Our family does things together"). Each participating parent assessed their perception of the actual condition in the family, using a 5-point scale ("1 = almost never" to "5 = almost always"). The Cronbach α for FACES-II were 0.84 (adaptability = 0.79 and cohesion = 0.81) in current study.

Resilience (Children Reported)

The Resilience Scale for Chinese Adolescences (Hu and Gan, 2008) was used to measure children's resilience. In which resilience was defined as individual's healthy and constructive adjustment after they had experienced serious, traumatic, or catastrophic events. It contained 27 items with dividing into 5 dimensions on a 5-point scale ("1 = never" to "5 = always"). The 5 dimensions were target focus (5 items; e.g., " I do set goals to push myself move forward."), emotional control (6 items; e.g., "I am capable of adjusting my mood well in a short time."), positive perception (4 items; e.g., "Adversity is an opportunity to the growth sometimes."), family support (6 items; e.g., "My parents always encourage me to go all out.") and interpersonal support (6 items; e.g., "I have a friend of my age, and I share my difficulties with he/she."). Of these 5 dimensions, the first three dimensions could be seen as personal strength, and the last two dimensions as supportive strength. We used both personal strength and supportive strength in present study. The Cronbach

α were high for the overall scale (0.82) and for the two subscales (personal strength = 0.77, supportive strength = 0.66) in current study.

Automatic Thoughts (Children Reported)

The Children's Automatic Thoughts Scale (CATS; Schniering and Rapee, 2002) was used to measure children's automatic thoughts. All 40 items loaded onto four separate sub-scales corresponding to physical threat (10 items; e.g., "I'm going to have an accident."), social threat (10 items; e.g., "I'm afraid of what other kids will think of me"), personal failure (10 items; e.g., "I've made such a mess of my life."), and hostility (10 items; e.g., "If someone hurts me, I have the right to hurt them back."). Children were asked to rate the frequency they have experienced over the past week on a 5-point scale ranging from "not at all (0)" to "all the time (4)." Total scores higher reflected a greater frequency of negative automatic thoughts. The Cronbach α were very high for of the total scale (0.96) and for each subscales (0.82∼0.88) in current study.

Depressive Symptoms (Children Reported)

Children's depressive symptoms were measured using the Chinese version of the Center for Epidemiological Studies Depression scale (CES-D; Radloff, 1977). It contained 20 items (e.g., "I was bothered by things that usually don't bother me.") rated on a 4-point scale from "1 = never" to "4 = always." Higher summed scores of 20 items indicated stronger feeling of depression. The Cronbach's α of this scale was 0.86.

Statistical Analyses

First, we used SPSS 16.0 to conduct preliminary statistical analysis. Descriptive statistics (mean and standard deviations) were calculated for all indicator variables (i.e., family maltreatment, family functioning, children's automatic thoughts, resilience, and depression) of demographic difference. Then, Pearson correlation analysis was conducted to examine the strength of associations among family maltreatment, family functioning, children's resilience, children's automatic thoughts and children's depression. Second, the proposed model of risk and protective factors of both family and individual associated with depression was conducted in Mplus 7.0 (Muthén and Muthén, 2012) to test the mediating effect of automatic thoughts and the moderating effect of family functioning and children's resilience on the relationship between family maltreatment and children's depression. Bias-corrected 95% confidence intervals for path estimates were generated via bootstrapping with 5,000 iterations (MacKinnon et al., 2002).

RESULTS

Descriptive statistics and correlation coefficients for study variables were given in **Table 1**. There were no significant gender differences between all variables. All of the bivariate correlations were statistically significant except family functioning with children's automatic thoughts and depression ($ps > 0.05$). Risk factors (family maltreatment and automatic) were positively correlated with depression and negatively correlated with protective factors (family functioning and resilience).

To test the mediation hypothesis, a path analysis was used to examine whether children's automatic thoughts mediated the relationship between family maltreatment and their depression (See **Figure 2**). The mediation model fit presented a good fit (CFI = 1.00, TLI = 1.00, RMSEA = 0.00, 95% CI = [0.26, 0.38]).

We then tested the moderated mediation model by adding the two hypothesized moderators, family functioning (adaptability and cohesion) and resilience with 5 moderated paths according proposed model in **Figure 1**. Considering adaptability and cohesion could be different moderators as aforementioned, 2 moderated mediation models were tested separately following. The moderated mediation model with adaptability and resilience (See **Figure 3**) terminated normally and the model fit the data well ($\chi^2 = 60.85$, $df = 1$, CFI = 0.90, RMSEA = 0.05). It showed that only resilience, but not adaptability, could be a moderator. And resilience could only moderate the relationship between family maltreatment and automatic thoughts (path c). The moderated mediation model with cohesion and resilience (See **Figure 4**) terminated normally and the model fit the data well ($\chi^2 = 55.50$, $df = 1$, CFI = 0.90, RMSEA = 0.05). It showed that both cohesion and resilience could be moderators. Both of them moderated the relationship between family maltreatment and automatic thoughts (path a and path c).

Simple slope analyses (Aiken and West, 1991) revealed that automatic thoughts increased significantly for individuals who reported lower family cohesion having lower resilience following family maltreatment presented in **Figures 5**, **6**. The risk effects of family maltreatment to children automatic thoughts was negative associated with the increasing levels of resilience. For children with lower resilience, family maltreatment had a positive associated with children's automatic thoughts ($b = 0.50$, $p < 0.001$), and for children with higher resilience, family maltreatment had a positive associated with children's automatic thoughts ($b = 0.23$, $p < 0.05$). The risk effects of family maltreatment to children automatic thoughts was significant negative associated with the increasing level of family cohesion, that with lower family cohesion, family maltreatment had a positive effect on children's automatic thoughts ($b = 0.61$, $p < 0.001$), and with higher cohesion, family maltreatment had a positive effect on children's automatic thoughts ($b = 0.33$, $p < 0.05$).

DISCUSSION

The current study extended prior understanding of the etiology of child psychopathology by examining familial combined individual effects of both risk and protective factors to the depression among Chinese migrant children with ODD symptoms. Our findings clearly illustrated the pathways that risk factors of both family and individual were positively associated with depression, and individual risk factor mediated the relationship between family risk factor and the depression among migration child with ODD symptoms. Moreover, protective factors moderated the effects of risk

TABLE 1 | Descriptive statistics for study variables.

	1	1.1	1.2	1.3	1.4	2	2.1	2.2	3	3.1	3.2	4	4.1	4.2	4.3	4.4	5
1 Family maltreatment	1																
1.1 Emotional abuse	0.75***	1															
1.2 Physical abuse	0.66***	0.57***	1														
1.3 Emotional neglect	0.72***	0.28***	0.11*	1													
1.4 Physical neglect	0.73***	0.33***	0.30***	0.52***	1												
2 Family functioning	−0.13*	–	–	–	–	1											
2.1 Cohesion	−0.15**	−0.12*	−0.04	−0.13*	−0.12*	0.93***	1										
2.2 Adaptability	−0.09	−0.08	0.01	−0.09	−0.10	0.94***	0.75***	1									
3 Resilience	−0.46***	–	–	–	–	0.11*	–	–	1								
3.1 Personal strength	−0.38***	−0.22***	−0.18**	−0.36***	−0.33***	0.11*	0.14**	0.07	0.92***	1							
3.2 Supportive strength	−0.43***	−0.34***	−0.24***	−0.31***	−0.34***	0.06	0.12*	0.01	0.75***	0.45***	1						
4 Automatic thoughts	0.49***	–	–	–	–	−0.09	–	–	−0.36***	–	–	1					
4.1 Personal failure	0.49***	0.49***	0.39***	0.22***	0.35***	−0.16*	−0.17**	0.01	−0.38***	−0.29***	−0.43***	0.93***	1				
4.2 Social threat	0.45***	0.49***	0.43***	0.16**	0.25***	−0.11*	−0.25***	−0.04	−0.36***	−0.28***	−0.40***	0.93***	0.84***	1			
4.3 Physical threat	0.45***	0.46***	0.44***	0.14**	0.30***	−0.06	−0.10*	−0.01	−0.32***	−0.24***	−0.40***	0.94***	0.85***	0.82***	1		
4.4 Hostility	0.39***	0.42***	0.40***	0.10	0.25***	−0.06	−0.11	−0.01	−0.28**	−0.23***	−0.31***	0.89***	0.72***	0.75***	0.78***	1	
5 Depression	0.48***	–	–	–	–	−0.07	–	–	−0.51***	–	–	0.74***	–	–	–	–	1
Total mean (SD)	10.95	1.76	1.69	2.41	1.96	3.47	3.60	3.33	3.43	3.51	3.30	0.77	0.72	0.72	0.66	0.98	1.84
(*N* = 368)	(0.62)	‘(0.86)	(0.80)	(1.08)	(0.73)	(0.54)	(0.57)	(0.58)	(0.55)	(0.65)	(0.62)	(0.72)	(0.77)	(0.80)	(0.73)	(0.81)	(0.52)
Boys mean (SD)	1.95	1.72	1.70	2.40	1.98	3.48	3.60	3.35	3.43	3.51	3.30	0.75	0.70	0.69	0.64	0.96	1.84
(*N* = 270)	(0.61)	(0.82)	(0.80)	(1.10)	(0.74)	(0.55)	(0.58)	(0.58)	(0.54)	(0.64)	(0.60)	(0.71)	(0.76)	(0.79)	(0.73)	(0.81)	(0.50)
Girls mean (SD)	1.95	1.84	1.65	2.44	1.89	3.44	3.60	3.28	3.44	3.52	3.29	0.82	0.76	0.81	0.70	1.02	1.85
(*N* = 98)	(0.66)	(0.96)	(0.81)	(1.01)	(0.70)	(0.53)	(0.56)	(0.58)	(0.59)	(0.69)	(0.66)	(0.73)	(0.80)	(0.83)	(0.74)	(0.82)	(0.57)

****Correlation is significant at the 0.001 level (2-tailed).*

***Correlation is significant at the 0.01 level (2-tailed).*

**Correlation is significant at the 0.05 level (2-tailed).*

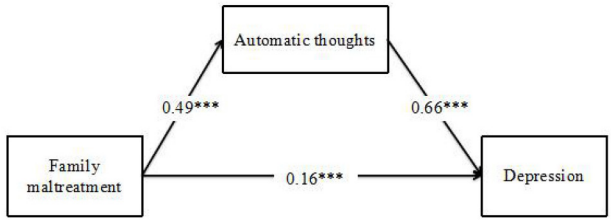

FIGURE 2 | The Mediation Model of Family maltreatment, Automatic thoughts, and Depression. ***$p < 0.001$.

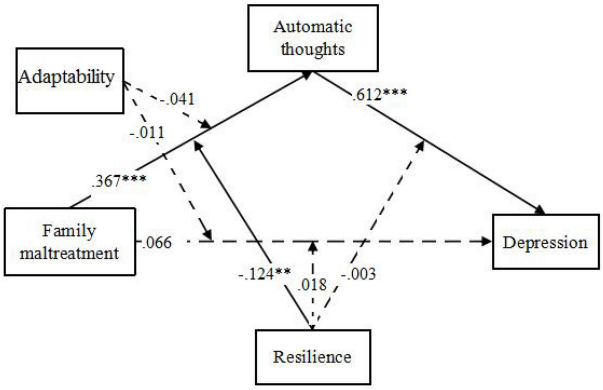

FIGURE 3 | The Moderated Mediation Model with Adaptability and Resilience. **$p < 0.01$, ***$p < 0.001$.

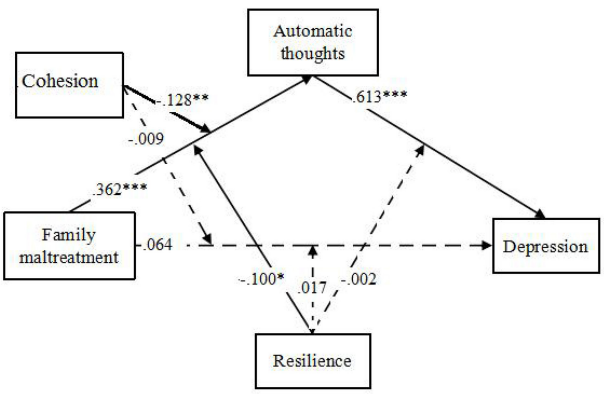

FIGURE 4 | The Moderated Mediation Model with Cohesion and Resilience. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

factors, that both family cohesion and children's own resilience moderated the relationship between family maltreatment and their automatic thoughts. These findings provided a better understanding for explaining child depression from a family system perspective. And it highlighted the urgent need to prevent family maltreatment and to promote more positive family functioning as well as to focus on children's own characteristics (both risk and protective factors) for migrant children with ODD in China. Additionally, family cohesion, but not adaptability, mitigated the threat of maltreatment to children' automatic thoughts. It seemed that promoting emotional bonding between families was more meaningful than heightening the family ability to the external distress, particularly for relationship-oriented Chinese children.

Risk factors of familial combined with individual were positively associated with children's depression. Consistent to previous findings (Glaser, 2002; Lin et al., 2016), we found that migrant children exposed to family maltreatment were more likely to have high levels of depression. Meanwhile, children with more automatic thoughts had significantly higher levels of depressive symptoms consistent with prior theory (Beck, 1979) and empirically works (Schniering and Rapee, 2002; Clarke and Goosen, 2009). The present study extended previous literature by utilizing a non-Western children sample especially a risk sample of migrant children with ODD symptoms, and confirmed the negative roles of parenting adversity and children's negative cognitive thoughts in their mental healthy across different cultures. While Chinese culture led Chinese parents to incorporate children accomplishments into their views of themselves and Chinese parents feelings of worth were contingent on children performance to a greater extent than both European and African American mothers (e.g., Ng et al., 2014), children with ODD symptoms in China might draw much more parents attention and caused much more family maltreatment.

Importantly, our findings additionally suggested that migrant children's automatic thoughts mediated the relationship between family maltreatment and their depression. As previous literature shown that automatic thoughts were concomitant with a stressful situation leading to depression (Hjemdal et al., 2013; Du et al., 2015), children's negative automatic thoughts were found in current study positively associated with family maltreatment, and further led to their mental health problems. While confirming automatic thoughts as a predictor of depression following the family maltreatment, it is fairly significant to alter migrant children's cognition of interpreting their experience as well as reducing their exposure to maltreatment, particular for the vulnerable migrant children with ODD symptoms.

We also found that protective factors mitigated the threat of risk factors in the moderated mediation model. More specifically, both family cohesion and resilience moderated the effect of family maltreatment on children's automatic. These provided an integrated evidence to the extant research on the respectively buffering effect of family cohesion (Robbins et al., 2003; Xu et al., 2008) and resilience (Wingo et al., 2010; Zhu et al., 2015). Accordingly, protective factors can be viewed as defense mechanisms, which enabled migrant children to thrive in face of adversity and reduced their vulnerability to mental health problems, even the strength of the protective factors were relatively weaker. Here, what was not consistent to our third hypothesis was that the moderated paths existed and only existed in two paths. We did not identify any significant interactions in the directly path between family maltreatment and children's depression, and children's resilience could not

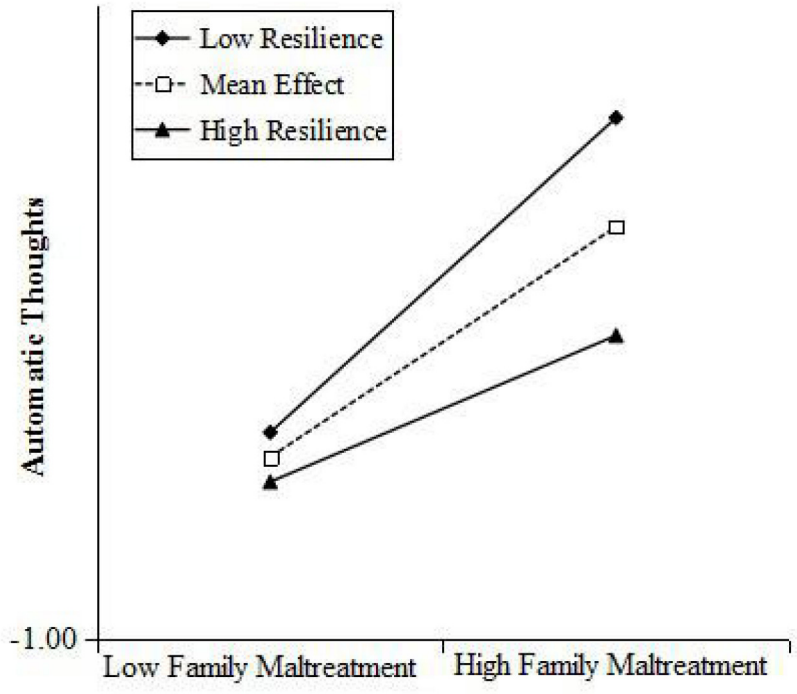

FIGURE 5 | Resilience moderated the relationship between family maltreatment and their automatic thoughts: the risk effects of family maltreatment to their automatic thoughts decreased significantly with the increasing levels of resilience.

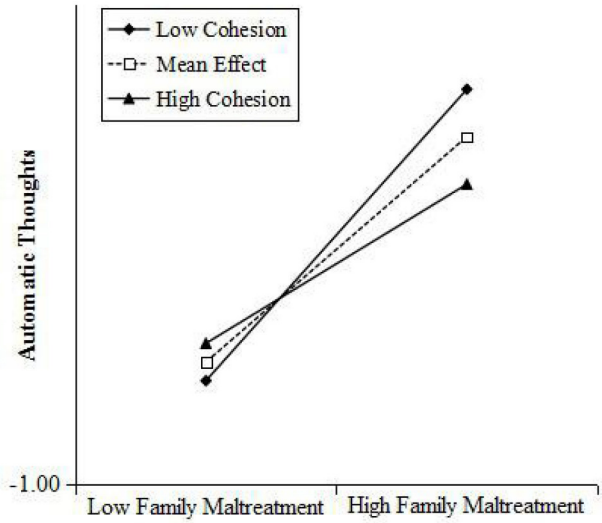

FIGURE 6 | Cohesion moderated the relationship between family maltreatment and children's automatic thoughts: the risk effects of family maltreatment to their automatic thoughts decreased significantly with the increasing level of family cohesion.

moderate the relationship between their automatic thoughts and depression.

For the moderated effects of family functioning, the results from the present study, together with those from other studies (Kashani et al., 1995; Li et al., 2008), demonstrated the outcomes that family cohesion, but not adaptability, mitigated the threat of risk factors to children's depression. While cohesion meant the emotional bonding between family members and adaptability meant the family ability to change in response to the stress, it seemed that the emotional bonding between families was more meaningful than the family ability to the emotional distress, especially for relationship-oriented Chinese (Li et al., 2008). But weather it was similar to the behavior problems still needed more research in the future.

Another important distinction needed to be interpret in the current results was why we did not identify any significant interactions in the directly path between family maltreatment and children's depression, and why children's resilience could not moderate the relationship between their automatic thoughts and depression. As we knew, a high proportion of migrant parents was struggling to cope with the life troubles under a considerable amount of stress and pressure, they may usually adopt simple and crude parenting behavior, neglecting their child's physical and emotional needs (Li et al., 2008, 2016b). Their family maltreatment to migrant children was so severe and the directly pathway to depression was so significant that both family functioning and child individual resilience were unable to buffer against its negative effects. Moreover, migrant children in China used to be left- behind children earlier, so their relationship with their parents was less close (Duan, 2015). Thus, it was unable

to resist the strong risk effects of family maltreatment and it can solely moderate partly in the model. With a new perspective on this issue, we apprehended that family maltreatment, to a certain extent, inhibited the ability of family functioning. Additionally, migrant children, particularly with ODD symptom, may have less resilience. Their resilience could only buffer the risk effects against to develop the negative automatic thoughts. And once the negative automatic thoughts formed, their resilience could no longer resist against it.

Findings from our research should be interpreted with caution, given some limitations in this study. First, special participants of migrant children with ODD symptoms recruited in our study, they might have uncommon characters both in the individual and family. Second, our data about all the variables were collected by questionnaire. Although, we considered different reports of parents, teachers and children themselves, there were still some problems interfering with the accuracy of our study. Future studies should include various methods to collect data, such as observational survey and behavioral experiments. Third, in terms of causality, a time line should be implemented while testing the mediation effect of automatic thoughts in relation to depression, longitudinal research is essential in future studies to establish such causal relations.

Despite these limitations, the current study adds to the literature of integrating the potential moderate and mediate factors in a moderated mediation model in a family system perspective. Our findings emphasized the importance to promote more positive family functioning as well as to focus on children's own positive characteristics, and to prevent children' automatic thoughts as well as the family maltreatment for migrant children with ODD in China. Clearly, targeting on reducing the external risk factors (e.g., family maltreatment) may be more effective to promote the mental healthy than appealing to focus on promote the positive ones only.

ETHICS STATEMENT

For interested parents of the identified children, psychiatrists from Anding Hospital, mental health counselors, and a family therapist from Center of Family Study and Therapy at Beijing Normal University offered opportunities for ODD treatment. Prior to conducting the study, the Institutional Review Board of Beijing Normal University in China approved the research protocol, including the consent procedure.

AUTHOR CONTRIBUTIONS

Each of the five authors contribute a lot to the current manuscript. Firstly, XiL and XuL worked out the paper's idea, and discussed the content of the whole manuscript. Secondly, XuL wrote the sections of Introduction, Results, and Discussion. Then, XuL and NZ together conducted the data analysis. Thirdly, XiL and QZ edited the whole paper and revised the language. Finally, YL wrote the part of method. Additionally, DL attended our discussion on manuscript content and gave very useful ideas. Each author read the final version of the current manuscript and support its submission.

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Patterns of Change in Collaboration Are Associated with Baseline Characteristics and Predict Outcome and Dropout Rates in Treatment of Multi-Problem Families. A Validation Study

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Objective: The present study validates the Multi-Problem Family (MPF)-Collaboration Scale), which measures the progress of goal directed collaboration of patients in the treatment of families with MPF and its relation to drop-out rates and treatment outcome.

Method: Naturalistic study of symptom and competence-related changes in children of ages 4–18 and their caregivers.

Setting: Integrative, structural outreach family therapy.

Measures: The data of five different groups of goal directed collaboration (deteriorating collaboration, stable low collaboration, stable medium collaboration, stable high collaboration, improving collaboration) were analyzed in their relation to treatment expectation, individual therapeutic goals (ITG), family adversity index, severity of problems and global assessment of a caregiver's functioning, child, and relational aspects.

Results: From $N = 810$ families, 20% displayed stable high collaboration ($n = 162$) and 21% had a pattern of improving collaboration. The families with stable high or improving collaboration rates achieved significantly more progress throughout therapy in terms of treatment outcome expectancy ($d = 0.96$; $r = 0.43$), reaching ITG ($d = 1.17$; $r = 0.50$), family adversities ($d = 0.55$; $r = 0.26$), and severity of psychiatric symptoms ($d = 0.31$; $r = 0.15$). Furthermore, families with stable high or improving collaboration maintained longer treatments and had a bigger chance of finishing the therapy as planned. The odds of having a stable low or deteriorating collaboration throughout treatment were significantly higher for subjects who started treatment with low treatment expectation or high family-related adversities.

Conclusion: The positive outcomes of homebased interventions for multi-problem families are closely related to "stable high" and an "improving" collaboration as measured

with the MPF-Collaboration Scale. Patients who fall into these groups have a high treatment outcome expectancy and reduce psychological stress. For therapeutic interventions with multi-problem families it seems beneficial to maintain a stable high collaboration or help the collaboration, e.g., by fostering treatment expectation.

Keywords: collaboration, SES, home-based treatment, therapy outcome, outcome measures

INTRODUCTION

The principles of therapeutic change can be divided into three groups: client factors, relational aspects and components concerning therapeutic techniques (Castonguay and Beutler, 2006, p.8). Client factors represent prognostic factors such as attachment style, gender or type and severity of pathology. Additional moderating variables of patients contain resistance, functional impairment, stages of change, expectations, etc. The second group – relational aspects – includes, e.g., therapeutic alliance, empathy, goal consensus and goal-directed collaboration, feedback, repair of alliance ruptures or management of countertransference. The third group of technical factors adds such factors as the level of therapist directedness, treatment intensity (length, frequency, multi-modal, etc.). The therapeutic change that is accomplished by the interaction of these three therapeutically relevant groups has been shown to often run discontinuously through different "stages of change" (preparation, action, maintenance, contemplation, action) (Emmerling and Whelton, 2009; Schiepek et al., 2015). The crucial step is from "contemplation to action," i.e., to "collaboration."

Recently, research has taken interest in the second group of relational aspects of therapy, especially therapeutic relationship. An exact definition of therapeutic relationship and its underlying components is, however, not easily given. Some research dissects therapeutic alliance, goal consensus, collaboration, etc., into different aspects (Castonguay and Beutler, 2006; Anderson and Johnson, 2010; Norcross and Wampold, 2011). Others combine such factors conceptually, beginning with early research which understood therapeutic alliance as the combination of three factors: affective bond between client and therapist and mutual agreement or collaboration on goals and methods (Bordin, 1994; Stackert and Bursik, 2006; Tryon and Winograd, 2011; Asnaani and Hofmann, 2012; Accurso et al., 2013). Recent research confirms these factors (Johansson and Jansson, 2010; Munder et al., 2010) and finds consistent associations between the therapeutic relationship, individual goals and treatment outcome for various types and contexts of child and adolescent therapy (Shirk and Karver, 2003; Jacob et al., 2017a).

Improvements with respect to patient expectancies on outcome foster collaborative aspects of the working alliance (Falkenstrom et al., 2013) and reciprocally influence each other (Xu and Tracey, 2015). Johansson et al. (2011) described "expectancy–alliance–outcome" as a general mediational chain. Together with other common factors, a non-linear and individual interdependent mediating line in effective therapeutic processes emerges. Swift and Derthick (2013) demonstrated the relationship between increasing hope and treatment outcome. They showed specific interventions to contribute to patient outcome expectation by presenting a convincing treatment rationale, increasing clients' faith in their therapists, expressing faith in clients, providing outcome education, and comparing progress with expectations.

The difficulty of discriminating the different concepts and establishing a hierarchy in the realm of therapeutic relationship becomes especially apparent when creating or using instruments for measurement. Many items meant to distinctively measure therapeutic relationship tend to load on many factors (Horvath et al., 2011) and separate measures of, e.g., therapeutic alliance (Horvath and Greenberg, 1989; WAI Working Alliance Inventory) and collaboration correlate highly (Hatcher and Barends, 1996; CASF, The confident Collaboration scale of the patient). In a meta-analytical study, it has been shown that keeping mutually developed individual goals in focus is a good predictor of outcome, with an effect size for "goal directed collaboration" of $d = 0.69$; $r = 0.33$ (Tryon and Winograd, 2011). Different patterns of collaboration (improving, stable high, and deteriorating collaboration) have been shown. These groups generally manifest differences with respect to outcome rates in different treatment settings (Polaschek and Ross, 2010).

While the empirical field is busy finding solutions to these problems, the practitioner is faced with questions of how to integrate these findings into everyday work. A decision on whether to monitor collaboration, with which instrument and how often, is not easily made. It seems advisable to get informed about the client to continuously keep track of ongoing processes (Lambert et al., 2005; Kraus et al., 2011). In fact, it appears to be beneficial to monitor as closely and often as possible, because many therapeutically relevant processes change in stages, unpredictable and non-linear (Emmerling and Whelton, 2009; Halfon et al., 2016; Schiepek et al., 2016a).

The problem of bridging empirical findings on therapeutic relationship and collaboration into therapeutic practice becomes further aggravated in the field of families with a multitude of problems. Not only is family therapy in general faced with complex relationships between therapist, caregivers, and children (Shirk and Karver, 2003; Tuerk et al., 2012), multi-problem families (MPF) also show high drop-out rates, less compliance to tasks and goals agreed on to be part of therapy, such as filling in questionnaires. In addition, they are often faced with dramatic present and past life events which complicate any kind of intervention or maintaining good collaboration (Critchfield and Benjamin, 2006; Friedlander et al., 2006). Usually the goal-directed collaboration in the treatment of MPF in home-based treatments begins at "precontemplation or contemplation stage" with less "goal-directed collaboration" (subsequently we use the term collaboration). Too often families

are not able or willing to collaborate in a goal-directed manner and therefore might be characterized as "unwilling, involuntarily or mandated" clients (Bachler et al., 2014). Friedlander et al. (2006) discriminate four types of clients in family psychotherapy ('customers,' 'plaintiffs,' 'visitors,' and 'hostages') with a great impact on goal directed collaboration. 'Customers' (motivated patients) are mainly to be found in outpatient psychotherapy. These patients show insight and a high willingness to work on their problems. 'Plaintiffs,' 'visitors,' and 'hostages' are the dominant types in home-based treatment for MPFs. These three groups of family dynamics share a lack of insight problem-perception and collaboration. 'Plaintiffs' have less insight to a problem but tend to complain without seeing that they are part of the problem. 'Visitors' believe that others are mistaken, and 'hostages' are resentful against the therapist for being confronted with problems by an allegedly hostile therapist. For MPF, goal directed collaboration and a good therapeutic relationship is therefore an important therapeutic factor, eventually forming the basis of therapeutic change. MPF are often characterized by, e.g., dysfunctional parental relationships, ego-structural and interactional family dynamic abnormalities with respect to the family's everyday problem-solving abilities, bad emotional climate, and/or poor parenting skills of the primary caregiver. Studies on the epidemiology of MPF also show that this group of patients is generally hard to reach and therapy involves high costs (burden of disease) (Wittchen and Jacobi, 2005). Consequently, treatment concepts for MPFs are of great socio-political importance.

The aim of the present research is to help bridge the gap between empirical and practical considerations on how to monitor the therapeutic relationship in terms of collaboration and individual goals, especially for multi-problem families, and use monitoring data in therapy (Jacob et al., 2017b). To do so, our therapeutic/diagnostic approach contained an easy to use assessment of collaboration through the MPF-Collaboration Scale and attainment of individual goals by the therapist. Validating this method in line with the literature (Horvath et al., 2011; Tryon and Winograd, 2011), we hypothesized that (i) a positive change of collaboration scores and attainment of goals is connected to a better outcome and managing to stay in treatment without dropping out. Extending the approach of Hersoug et al. (2013), we tested this hypothesis by grouping clients into five groups of collaboration (deteriorating, stable low, stable medium, stable high and improving goal directed collaboration) and relating the groups to symptomatic change, individual goals, and treatment duration; a procedure that allows for a high face value and easy applicability to everyday practice.

Secondly, therapists should get informed as early as possible which clients are in special need of focussing on a good therapeutic relationship. Knowing who is most vulnerable in terms of dropping out of therapy due to stable low or deteriorating collaboration is of paramount interest to institutions, therapists, and clients themselves. We therefore tested exploratively, whether (ii) clients that fell into the groups of deteriorating or stable low collaboration as measured with the MPF-Collaboration Scale, had more severe family problems and a weaker expectancy of treatment at the beginning of treatment. Confirmation of that hypothesis also validates the MPF-Collaboration Scale, as it resembles earlier findings of, e.g., Constantino et al. (2011), who showed in their meta-analysis that patients' expectations are of great importance for engaging in a goal-directed collaborative working relationship in different treatment settings with their therapists, which in turn improves treatment outcome. Furthermore, it has been demonstrated that patients who indicated more hopelessness show lower scores of outcome expectancy (Goldfarb, 2002). Vîslă et al. (2016) showed the bidirectional relation between outcome expectation and alliance. In addition, family adversities (FAI) are closely connected with functional impairment, severity of problems and interpersonal conflicts (measured by GAF, GARF) and suggest general pathways from family dysfunction to psychopathology (Raposo et al., 2013).

MATERIALS AND METHODS

Treatment Procedure

The treatment method applied in this study – Therapeutic Outpatient Family Treatment (OFT) – was developed as a disorder-oriented, therapeutic outreach intervention for families with multiple problems. It integrates structural, family therapy interventions (Minuchin and Fishman, 1983), psychoanalytic elements of mentalization-based psychotherapy (Fonagy et al., 2006), and structural psychotherapy (Rudolf, 2006). OFT seeks to improve general parental skills of primary caregivers of minors through intra-psychological and interpersonal improvement of ego-structural skills, such as perception of self and others, defense and affect regulation, attachment, and communication (cf. Opd-2 Arbeitskreis Opd, 2006, Axis IV). The program incorporates the principles for treatment of personality disorders and structural psychotherapy (for the improvement of ego-structural competencies) that were identified by the task force of the APA Division 12: a strong working alliance, therapist ability to repair alliance ruptures, collaboration on goals, and a high level of therapist activity (Critchfield and Benjamin, 2006). Therapists at the institution have different therapeutic backgrounds (psychodynamic therapy and family therapy are in the majority) and obtain specific training in the integrative, technical characteristics of the OFT-approach. The therapeutic work takes place at the home of the families and in the natural environment of the index child. The costs of the treatment are borne by the Austrian or German Child Welfare Office, respectively. The average number of therapy hours in the institution and the sample constitutes 2.5–3 per week, divided amongst two sessions. Therapy is conducted by a group of 170 psychotherapists servicing 650 families.

Measures

MPF (Multi-Problem Family)-Collaboration Scale

The MPF-collaboration scale is an integrated part of the routine assessment of OFT (Bachler et al., 2014). Therapists estimate and report on the collaboration, choosing one of five levels: (1) "The family has deep insight into its problems and shows

continuously good goal directed collaboration." (2) "The family recognizes itself as being part of the problems and is interested in understanding the problems, and shows mostly willingness to collaborate goal directed." (3) "The family shows a passive recognition of own problems and a low to medium goal directed collaboration." (4) "Problems are experienced as inflicted from the outside; involuntary goal directed collaboration; working together, but feeling forced to." (5) "No insight, complete defense, neglect of problems, goals and goal directed collaboration; no willingness to collaborate." The data are taken from a narrative interview the therapist conducts with the family, referencing to a defined list of three factors with various items building a total score. (1) Conduct and handling of tasks, such as acting out, coming too late, missing sessions, displaying boredom, aggressive transference, fatigue, and negative therapeutic response. (2) Content and form of communication, which can be inadequacy of affects, thematic fixation, avoidance of specific topics, rigidity, secrets, lack of examples, etc. (3) Therapeutic relationship, as e.g., different forms of transferences, depending on withdrawal, resistance, preliminary end of therapy caused by the patient, etc. The interrater reliability of MPF-collaboration has earlier been shown to be 0.75–0.87 and its correlation to the Heidelberg Structural Change Scale (HSCS) has been earlier found at 0.86, constituting a good criterium validity (Bachler, 2013). The interrater reliability of HSCS is 0.77–0.88 (Grande et al., 2009). In the present study, collaboration is assessed once every 6 months by the therapist involved as well as an external observer. This approach has been demonstrated to be more predictive for the outcome rates and more homogeneous in their ES than alliance measured by patients' self-reporting (Bachelor, 2013).

Individual Therapeutic Goals (ITG)

The Individual Therapeutic Goal (ITG) rating follows the ITG module of the Psychotherapy Basis Documentation (PSYBADO; Heuft and Senf, 1998). It facilitates an individual definition of therapeutic goals that are important to the family as well as to the Child Welfare Office. The PSYBADO includes a standardized catalog of goals with five main categories: intrapsychic, interactional, somatic, addiction, and social medicine. The realization of the therapeutic goals is recorded graphically by the Goal Attainment Scaling (GAS) during treatment and is reflected in the supervision sessions. For the GAS, an inter-rater reliability of 0.82 has been reported (95% CI = 0.73–0.91; Steenbeek et al., 2010). Face-, construct-, and social-validity coefficients ranged from 0.62 to 0.83 (Turner-Stokes, 2011). In a study by Winter et al. (2005) the reliability (Cronbach's α) of PSYBADO is estimated between 0.65 and 0.83. The construct validity there is reported with 0.82.

Treatment Outcome Expectations (VH-OFT)

VH is also an integrated part of the routine assessment of OFT. This five-point Likert scale rates one parameter of the family system with respect to the outcome expectancy, with high scores indicating low expectations (Bachler et al., 2014). The data of VH are taken from a narrative interview the therapist conducts with the family, referencing to a defined list of items. The interrater reliability of this rating scale is 0.79.

Family Adversity Index (FAI)

The Family Adversity Index (FAI; Rutter and Quinton, 1977) measures families' psychosocial stress. Based on five items (chronic disharmony in the family, a low socioeconomic status, cramped living quarters, parental criminality, and mental disorder of the mother), the ensuing total value ranges from a minimum value of zero to a maximum value of five. Values ≥ 2 in the FAI reflect considerable socio-familial stress. Reliability has been found at 0.65, and validity in the range of 0.66 to 0.70 (Rutter and Quinton, 1977).

Mannheim Parental Interview (MPI)

The Mannheim Parental Interview (MPI; Esser et al., 1989) is a structured and standardized clinical interview indicating psychological disorders and their severity. The 37 questions regarding child and adolescent psychiatric symptoms combine a cumulative child-psychiatric symptom score and different ICD diagnoses. The interrater reliability is reported by the founders of the questionnaire between 0.71 and 1.0, the kappa coefficient (concurrence) of the diagnoses is 0.71 (percentage of concurrence 79% between professional judgements).

Global Assessment of Functioning Scale for Adults and Children (GAF, CGAF)

The Global Assessment of Functioning Scale (GAF), based on the DSM IV axis 5, is frequently employed in psychotherapy studies as a measure of disability and psychosocial dysfunction (Saß et al., 2003). Interrater reliability scores of 0.74 have been reported (Hilsenroth et al., 2000). The questionnaire is split into an adult version (GAF) and the CGAF for children (aged at 4 and above) and adolescents.

GARF Scale

The Global Assessment of Relational Functioning (GARF) assesses the psychosocial level of functioning of the families. It covers three dimensions: (i) problem solving; (ii) organization; and (iii) emotional climate (Stasch and Cierpka, 2006). The interrater reliability is 0.72, Cronbach's alpha is 0.91, and the generalizability coefficient (GC) is 0.93. The validity coefficients range between 0.50 and 0.73, (Denton et al., 2010).

Subjects (Inclusion/Exclusion Criteria of Families and Index-Child)

Therapeutic OFT generally started after a prior MPF classification by the Child Welfare Office. Data gathering started in 2008 and ended in 2015. The complete sample consisted of N = 810 adolescents. The average duration of therapy was 20.4 months (SD = 13.35, Mdn = 17.65, range = 1–74.5). The sample consisted of 422 boys (52.1%), 386 girls (index patients) and two cases where no contact to the index patient (child) could be established, who remained in the preliminary data-analysis as all other early drop-outs did. The mean age was 14.5 years (SD = 4.87, Mdn = 15.0, range = 1–24). A total of 169 therapists covered an average 4.8 cases (SD = 3.93; Mdn = 4; Min = 1; Max = 21).

At the beginning of the therapy 46% of the primary caregivers fulfilled the criteria for a personality disorder according to the

MPI (Esser et al., 1989). The proportion of uneducated (without completed school education) primary caregivers in the clinical sample was 32%, so that a low wage ratio was to be expected; in particular, families with single-parent families belong to the group with the least social and personal resources (Franz et al., 2003). Personal and social resources are essential to develop child-psychiatric symptoms in the context of the risk increase for children and adolescents (Fryers and Brugha, 2013). The percentage of single parents was 47%. According to the FAI criteria the sample was characterized by the following features: Low socioeconomic status 33%, cramped living quarters 23%, chronic disharmony in the family 77%, parental criminality 7%, and severe mental disorder of the mother (primary caregiver) 58%. The average pre-treatment scores in the clinical sample were: GAF (primary caregiver) 6.1 ($SD = 1.56$), GARF 2.9 ($SD = 1.89$), CGAF 5.7 ($SD = 1.1$), and FAI 2.4 ($SD = 1.1$). MPF show an average GARF score of ($X \leq 4.7$); "families without risk" an average score of ($X = 6.4$) (Stasch and Cierpka, 2006).

From the complete sample, 368 families finished the treatment as planned and by mutual acceptance of clients and therapists. 127 families stopped the treatment due to placement of the child in institutions or foster families. Failure to comply with previously agreed terms of treatment was the reason for 150 families to drop out earlier than originally planned (e.g., due to a high number of failed therapy-sessions), 36 families moved outside our sphere of influence and 29 families are combined under a group that terminated treatment for a mixture of "other reasons."

RESULTS

Intercorrelations of the Measures

Table 1 shows the bivariate correlation matrix of the pre-treatment measures and the respective reliability coefficients of the rating scales, which are all in the acceptable range for Cronbach's alpha and interrater reliability, except for FAI, which is moderately reliable (Cronbach, 1951; McHugh, 2012). There are significant positive correlations of the treatment alliance with treatment expectations [$r(810) = 0.613$, $p < 0.001$] and the FAI [$r(810) = 0.260$, $p < 0.001$]. A negative correlation was found between the baseline scores of MPF Collaboration Scale and the individual therapeutic goals ITG [$r(753) = -0.154$, $p < 0.001$]. Differences in number of participants per scale are due to differences in assessment guidelines of the respective instruments (e.g., MPI is only assessable above an age of 4). A detailed description of the pre- and post-scores and a comparison of these in terms of *t*-tests can be found in Bachler et al. (2014).

The focus of this paper is on patterns of change of collaboration scores and the respective parameters. By subtracting the pre- from the post-scores, difference scores were produced for each parameter. The difference score of the collaboration scale significantly correlates – as hypothesized – with the change scores of all other parameters, except for the CGAF (**Table 2**); the bivariate Pearson's correlations of the change scores for collaboration show a significant reduction of barriers towards treatment expectation, $r(810) = -0.638$, $p < 0.001$, decrease of the FAI, $r(810) = -0.316$, $p < 0.001$ and less severity of problems, $r(792) = -0.169$, $p < 0.001$. Furthermore, patients who positively changed in terms of their collaboration scores also reported to progress more towards their ITG, $r(753) = 0.442$, $p < 0.001$, improve the global assessment of the caregiver $r(747) = 0.096$, $p < 0.001$ and advance in terms of the family's relational functioning $r(572) = 0.134$, $p < 0.001$.

Process of Group Production

The discrimination of collaboration patterns is based on the difference scores of the collaboration ratings (Hersoug et al., 2013). Computing the Reliable Change Index (RCI) with 0.68 for the collaboration variable, a decrease/increase of 1.33 points was used to identify five different collaboration groups: Patients in the deteriorating collaboration ($N = 48$; 5.9% of the complete sample) reduced their collaboration by -4 to -2 and patients in the improving collaboration group ($N = 170$; 21.0%) had an increase of collaboration of at least $+2$ (**Table 3**). Patients whose collaboration did not change more the ± 1.33 points were clustered into the three stable collaboration groups, according to their level of collaboration: stable low collaboration ($N = 228$; 28.1%; collaboration level > 3), stable medium collaboration ($N = 202$; 24.9%; collaboration level $= 3$), stable high collaboration ($N = 162$; 20.0%; collaboration level < 3) (Jacobson et al., 1984; Wise, 2004). These groups were used for the subsequent data analysis.

ANOVA and *Post hoc* Contrasts

Figure 1 shows the mean change scores of all outcome variables, split for the respective collaboration groups. Conducting a one-way independent ANOVA, there was a significant effect of belonging to a specific collaboration group on the treatment effects for the MPI [$F(4,787) = 5.1$, $p < 0.001$] and for achieving individual goals [$F(4,748) = 52.8$, $p < 0.001$]. The Levene's test of homogeneity of variances revealed differences for the change of FAI [*Levene statistic* $(4,805) = 18.94$, $p < 0.001$] and Treatment Expectancy [*Levene statistic* $(4,805) = 4.01$, $p = 0.003$]. After using the Brown-Forsythe test to counter the inequality of variance due to the difference in group sizes by adjusting the degrees of freedom, the respective collaboration group still differed significantly for the FAI scores [$F(4,648.6) = 21.9$, $p < 0.001$] and also on the expectancy change [$F(4,406.7) = 72.3$, $p < 0.001$].

Planned contrasts revealed that the groups of stable low collaboration and decreasing collaboration as compared to the groups of stable high collaboration and increasing collaboration (with stable medium collaboration set to 0 in these contrasts) reached significantly less change on the MPI [$t(787) = 4.0$, $p < 0.001$, $d = 0.31$], on achieving individual goals [$t(748) = -12.6$, $p < 0.001$, $d = 1.17$], on the FAI [with variances assumed unequal; $t(335.6) = 7.0$, $p < 0.001$, $d = 0.55$] and the treatment expectancy [$t(118.8) = 12.3$, $p < 0.001$, $d = 0.96$]. Families with increasing collaboration or good collaboration thus attained significantly more progress in terms of achieving their goals (ITG), their treatment expectancy (VH-OFT), reducing family problems (FAI) and severity of child psychiatric symptoms (MPI).

TABLE 1 | Bivariate correlation matrix of pre-treatment measures and reliability coefficients (on the main diagonal).

Pre-treatment measures	1	2	3	4	5	6	7	8
(1) MPF Collaboration Scale	(0.75)"							
(2) Treatment expectation (VH-TAF)	0.613** $N = 810$	(0.79)"						
(3) Individual therapeutic goals	−0.154** $N = 753$	−0.232** $N = 753$	(0.76)'					
Psycho-social health:								
(4) Family adversity index (FAI)	0.260** $N = 810$	0.287** $N = 810$	−0.105** $N = 753$	(0.65)'				
(5) Severity of problems (MPI)	0.058 $N = 792$	0.081* $N = 792$	−0.05 $N = 747$	0.014 $N = 792$	(0.71)'			
(6) Caregiver (GAF)	0.008 $N = 747$	0.019 $N = 747$	0.003 $N = 704$	−0.043 $N = 747$	−0.015 $N = 735$	(0.74)'		
(7) Child (CGAF)	0.088* $N = 532$	−0.002 $N = 532$	−0.079 $N = 495$	0.031 $N = 532$	−0.072 $N = 523$	0.402** $N = 532$	(0.74)'	
(8) Relation (GARF)	0.047 $N = 572$	0.026 $N = 529$	−0.017 $N = 529$	−0.064 $N = 572$	−0.03 $N = 572$	0.520** $N = 572$	0.451** $N = 532$	(0.82)'

*Significant at 0.05; **significant at 0.01; 'Cronbach's alpha reliability coefficient; "inter-rater reliability.

TABLE 2 | Bivariate correlation matrix of change scores.

	1	2	3	4	5	6	7
(1) MPF Collaboration Scale							
(2) Treatment expectation (VH-TAF)	−0.638**						
(3) Individual therapeutic goals	0.442**	−0.538					
Psycho-social health:							
(4) Family adversity index (FAI)	−0.316**	0.446**	−0.401**				
(5) Severity of problems (MPI)	−0.169**	0.195**	−0.264**	0.126**			
(6) Caregiver (GAF)	0.096**	−0.034	0.046	0.007	−0.043		
(7) Child (CGAF)	0.077	−0.059	0.045	0.027	−0.094*	0.461**	
(8) Relation (GARF)	0.134**	−0.082*	0.08	−0.016	−0.041	0.522**	0.544**

*Significant at 0.05; **significant at 0.01.

TABLE 3 | Number of patients in the five clusters of alliance per collaboration pre-post difference scores.

	Pre-post difference scores of collaboration									
Collaboration group	**−4**	**−3**	**−2**	**−1**	**0**	**1**	**2**	**3**	**4**	**Total**
Decreasing collaboration	2	7	39	0	0	0	0	0	0	40
Stable low collaboration	0	0	0	38	89	101	0	0	0	228
Stable medium collaboration	0	0	0	27	85	90	0	0	0	202
Stable high collaboration	0	0	0	28	84	50	0	0	0	162
Increasing collaboration	0	0	0	0	0	0	123	40	7	170
Total	**2**	**7**	**39**	**93**	**258**	**241**	**123**	**40**	**7**	**810**

Stable low collaboration: collaboration level > 3; stable medium collaboration: collaboration level = 3; stable high collaboration: collaboration level < 3.

Treatment Length and Dropout per Group

The mean length of the treatments was 20.4 months ($SD = 13.3$). When comparing the collaboration groups, differences between the groups in terms of treatment length were found [$F(4,804) = 20.4$, $p < 0.001$]. With a mean of 27.2 month ($SD = 14$), patients who fell into the improving collaboration group had a significantly longer treatment duration compared to all other groups, as Tukey HSD *post hoc* tests revealed. In particular, the treatment length of the improving collaboration group differed from the deteriorating collaboration group ($M = 16.2$ months, $SD = 10.2$, $p < 0.001$, $d = 0.83$), the stable low collaboration group ($M = 16.5$ months, $SD = 12.2$, $p < 0.001$, $d = 0.83$), the stable medium collaboration group ($M = 18.7$ months, $SD = 11.5$, $p < 0.001$, $d = 0.67$), and the stable high collaboration group ($M = 22.1$ months, $SD = 14.1$,

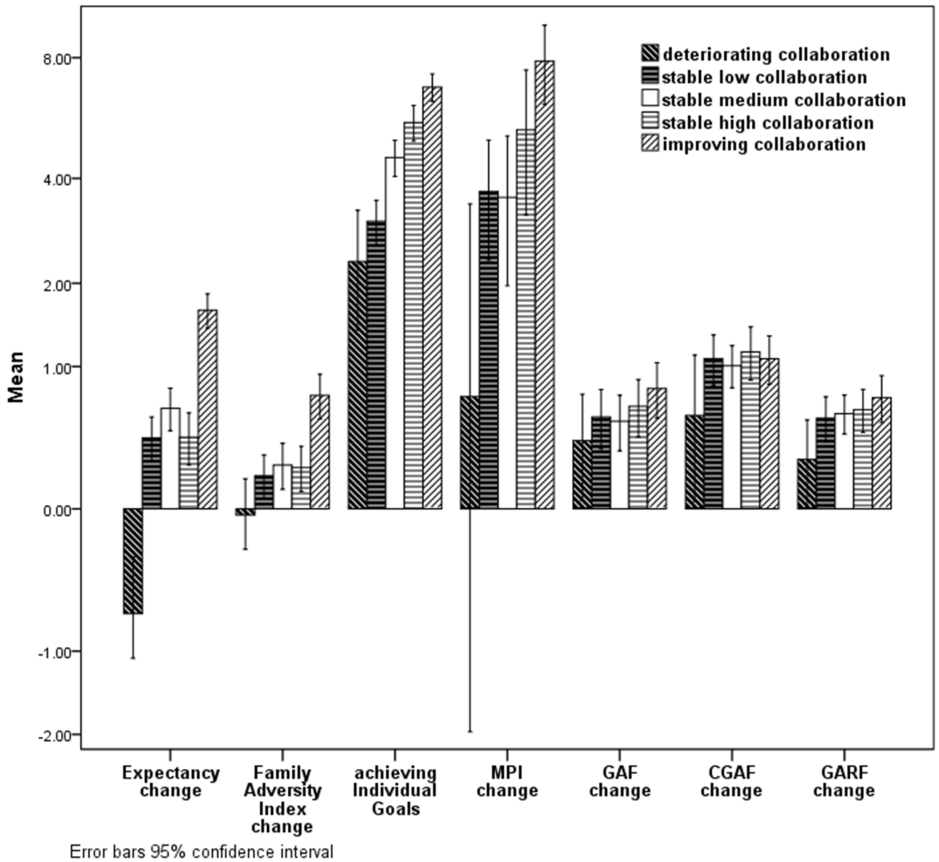

FIGURE 1 | Change scores of the respective outcome measures per collaboration group.

$p < 0.001$, $d = 0.37$). In short, the better the collaboration, the longer the treatment duration.

When comparing the different collaboration groups in terms of the respective reason to end treatment, 'failed compliance' accounted for the majority of 66% of the patients in the deteriorating collaboration group. In contrast, the majority of cases in the improving and stable high collaboration groups ended treatment 'as planned,' with 58.6 and 71.4% per respective group.

Predictors

To test for possible predictors of the respective collaboration groups, we conducted a multinomial logistic regression for the criterion of belonging to one of three groups: high collaboration (combined of stable high collaboration and improving collaboration), medium collaboration, and low collaboration (combined of stable low collaboration and deteriorating collaboration). When entering all initial scores of the measures into the model, we find the initial scores of treatment expectancy ($b = 0.54$, Wald $\chi^2(1) = 18.5$, $p < 0.001$) and the initial scores of the FAI ($b = 0.43$, Wald χ^2 $(1) = 14.8$, $p < 0.001$) to significantly predict whether a patient falls into the high collaboration group or in the low collaboration group. The odds ratio produced the information that per 1-point increase of the initial values of treatment expectancy and FAI, the odds of being in the low collaboration group increased by 1.72 [*CI*: 1.34–2.2] and 1.5 [*CI*: 1.23–1.9], respectively. Thus, the lower the expectancy (that is a high VH value) and the higher the adversity scores in a family, the more likely these were to fall in the low collaboration cluster.

DISCUSSION

Collaboration as one of the core ingredients of psychotherapy differs across patients and within patients in the course of a therapy. In our study, a group of 810 patients could be categorized into 5 change clusters of collaboration: Stable high collaboration (occurs with 20%), improving collaboration (2.1%), stable low collaboration (28.1%), deteriorating collaboration (5.9%), and stable medium collaboration (24.9%). These clusters not only differed in their evolution of collaboration, but also showed significant differences in terms of achieving ITG ($d = 1.17$; $r = 0.50$), changing expectancy of treatment (VH-OFT, $d = 0.96$; $r = 0.43$), and decreasing problems within the family (FAI, $d = 0.55$; $r = 0.26$). A change of the severity of child-psychiatric symptoms was established (MPI, $d = 0.31$; $r = 0.15$), even though the sample includes high rates of diagnoses like

adolescent personality disorders and Asperger-syndrome with lower therapeutic variability (e.g., ICD 10 F60 21%, sever forms of ADHD 19%, and ICD 10 F84-89 special diagnoses 7% of the sample). Taken together, patients who manage to maintain a good collaboration or improve collaboration show a higher impact on therapeutic change in terms of outcome and for the achievement of individually defined treatment goals than those who do not.

Our data show that clients who fell into the groups of families with deteriorating and stable low collaboration were more likely to have low pre-treatment expectations and more familial adversities (interpersonal functioning, pre-treatment symptom level, social/economic status; FAI and VH-OFT). Such alarming pre-treatment scores might therefore be interpreted as an early signal to therapists to focus on the improvement of the collaboration.

Hopelessness in clients has earlier been shown to be related to decreased post-treatment outcomes in psychotherapy (Constantino et al., 2011; overall weighted effect size of $d = 0.24$; $r = 0.11$). Similarly, outcome expectancy (VH-OFT) was correlated in the present sample with collaboration ($r = 0.64$; $d = 1.60$), as well as with individual goal attainment (ITG; $d = 1.2$; $r = 0.54$). One might argue that outcome expectation and less general adversity in a family's surrounding (FAI) fuel the willingness and ability for cooperation (collaboration), which results in reaching individually set goals (ITG). Similarly, Sharabi et al. (2012) showed the clinically relevant connection between family climate, hopelessness, and child development risks in low SES families.

The accumulation and severity of problems, combined with a lack of hope and often cross-generational failures to improve the family's situation, are obstacles for MPFs to start and maintain therapy. Bischoff and Sprenkle (1993) showed connections between drop-out rates and low SES, which has been shown to be predictive for premature termination of treatment (Petry et al., 2000). In our sample, patients with improving collaboration reached the longest treatment duration as well as the highest chance to end treatment as planned. Meta-analysis by Swift and Greenberg (2012) shows a termination rate of 19.7% for adults in psychotherapy, with the specific rate depending on the diagnoses of the patients (Axis II), their ages, and the experience of the therapists (number of studies examined: 699; patient random sample $N = 83{,}834$). In child and adolescent psychotherapy, there is a higher drop-out rate than in adult therapy, ranging from 28 to 85% (Garcia and Weisz, 2002). Our sample shows a total drop-out rate of 18.5%. This low drop-out rate is likely due to the setting of homebased treatment.

Limitations

The study follows a naturalistic design and the treatments were conducted within the usual practice of our institute. In consequence, causal interpretations are, in a strict sense, not possible. But our findings are of high external validity and thus generalizable, especially for long-term home-based treatments with MPF. Descriptive validity (study documentation, use of a case record form, treatment description, and data protection) is given, and treatment adherence was checked. There are only minor threats on the construct validity (to some extent separation of data collection and treatment). Possible rater-biases constitute a limitation for all ratings based on observers.

CONCLUSION

Our data add a strong relationship between collaboration and the achievement of ITG of $d = 0.98$; $r = 0.44$ (weighted effect size for "goal directed collaboration" of $d = 0.69$; $r = 0.33$; Tryon and Winograd, 2011). Friedlander et al. (2011) showed similar results for family-therapy ($d = 0.49$; $r = 0.24$). The present study emphasizes the impact of the collaboration and shows its importance in therapeutic work with MPF, especially in relation to *treatment outcome expectancy* and *adversities within a family*. Changing expectancy of treatment (VH-OFT, $d = 0.96$; $r = 0.43$), and decreasing problems within the family (FAI, $d = 0.55$; $r = 0.26$), are important influencing family-(patient)-related factors in the treatment of MPF, explaining 38,9% (collaboration 19,3%, expectancy of outcome 12,9%, decreasing problems within the family 6,7%) of the variance of individual goal achievement (ITG). Their influence in the treatment of MPF is higher than in other therapeutic settings for various other patient groups.

Research Results and Clinical Implications

With respect to the therapeutic implications, our results suggest that fostering and improving the therapeutic relationship through collaboration is of high importance to the therapeutic process of home-based treatment with MPF (hard to reach families). This statement is supported by the result that the change of collaboration explains 40.7% of change in treatment expectancy and 10% of the change in family adversity. Therefore, a fine-tuning of each individual change process according to the present state of the therapeutic relationship and adapting interventions accordingly might help to increase the willingness of patients and their ability to collaborate. Therapists' activities in fostering the collaboration on goals is influenced bidirectional by a number of further relevant evidence-based technical adaptive features in the treatment of therapy in treatment of MPF: Handling RRPs (rupture repair processes) and thereby fostering the development of the therapeutic bond, emphasizing change by adaptive therapist activity (flexibility, availability and treatment intensity), setting rules and boundaries (consensus on task), processing maladaptive intrapsychic and interpersonal thoughts, behavior and parenting (Lebow, 2005; Bachler et al., 2014); and, as our data show, improving outcome expectations (hope) by encouraging patients and by supporting them in solving adversities within the family. In particular, differentiating "stable collaboration" (low, medium high stable) from improving and deteriorating collaboration helps explaining the therapeutic outcome and offers a valid approach to everyday practice. It stresses the importance of treatment-monitoring (Schiepek et al., 2016b).

The present study is a contribution to treatment aptitude research (Norcross and Wampold, 2011). It intends to widen the empirical evidence and to bridge the gap towards an applicable approach for the practice. Reacting to differences amongst the group of families with multiple problems, it appears favorable to

individually tailor treatments using empirical results and pre-treatment characteristics of patients; a notion in line with the Presidential Task Force on Evidence-Based Practice (American Psychological Association, 2006, p. 273), which emphasized the importance of research on patient characteristics, culture, social classes, and preferences for the future of psychotherapy.

ETHICS STATEMENT

This study was carried out in accordance with the recommendations of WMA Declaration of Helsinki – Ethical Principles for Medical Research Involving Human Subjects. All subjects gave written informed consent in accordance with the Declaration of Helsinki. The study received ethical approval from the Government of Salzburg.

AUTHOR CONTRIBUTIONS

All authors added Contributions to Study design, Proofread and Literatur. BA was responsible for Statistics. EB and AF for data Collection. EB, BA, and GS for writing the paper.

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Longitudinal Relationships between Social Support and Posttraumatic Growth among Adolescent Survivors of the Wenchuan Earthquake

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This study aimed to explore the longitudinal relationships between social support and posttraumatic growth (PTG) among adolescent survivors of the Wenchuan earthquake. Follow-up assessments were conducted with 452 participants at 12, 18, and 24 months after the earthquake. The results showed that the level of social support at 12 and 18 months following the earthquake predicted subsequent PTG, but not vice versa. In addition, multi-group analyses of gender showed no gender differences between social support and PTG in the cross-lagged model. Thus, psychological interventions and care for survivors should focus on improving adolescent perceptions of social support when responding to stressful experiences.

Keywords: adolescent survivors, cross-lagged model, posttraumatic growth, social support, Wenchuan earthquake

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INTRODUCTION

On May 12, 2008, a violent earthquake of 8.0 magnitude on the Richter scale struck the town of Wenchuan, China. It is estimated that more than 60,000 people lost their lives and another 400,000 thousand were injured or missing. The earthquake also resulted in a range of negative and positive psychological consequences for survivors. The negative consequences included posttraumatic stress disorder (PTSD), depression, and anxiety (Fan et al., 2011). The positive consequences, such as, "stress-related growth," "meaning-finding" and "posttraumatic growth," have recently been identified (Xu and Liao, 2011). Posttraumatic growth (or PTG) is a commonly used term that reflects a change in approach that extends beyond the pre-trauma level of psychological functioning (Zoellner et al., 2008). According to Calhoun and Tedeschi (2004), PTG manifests along three dimensions: changes in the perception of self, changes in interpersonal relationships and changes in philosophy of life. These positive changes have been observed in a variety of populations that have suffered traumas related to natural disasters (Xu and Liao, 2011), accidents (Zoellner et al., 2008), bereavement (Kim et al., 2011), and diseases such as, cancer (Schroevers et al., 2010).

In the developing literature on PTG, some studies have indicated that social support is significantly increased following traumatic events and that social support is correlated with PTG (Sheikh, 2004; Zhou and Wu, 2016). A meta-analysis has also shown that there is a moderate correlation between social support and PTG, with a mean effect size of $r = 0.26$ (Prati and Pietrantoni, 2009). However, more recent studies with different samples have not found a connection between the two variables (Kilmer and Gil-Rivas, 2010; Wu et al., 2016; Hill and Watkins, 2017). For example, a study by Hill and Watkins (2017) indicated that social support was not predictive of PTG among women with ovarian cancer.

Thus far, three possible modes of association between social support and PTG have been suggested. In the first mode, social support is regarded as a critical environmental resource in the development of PTG. Schaefer and Moos (1998) argued that PTG is the outcome of a posttraumatic psychological struggle. Personal system factors (e.g., personality traits) and environmental resources (e.g., social support) combine to influence cognitive appraisal and coping responses, which subsequently predict PTG. For example, McDonough et al. (2014) claimed that social support predicted increasing levels of PTG among cancer survivors. Cao et al. (2017) demonstrated that social support might influence PTG via adaptive coping among cancer patients in China. Other studies reported that social support plays a beneficial role in the development of PTG among bereaved adults (Kim et al., 2011) and college students (Swickert and Hittner, 2009). Second, PTG is considered a coping strategy that is used to find meaning in traumatic events (Park and Folkman, 1997). Consistent with this view is the finding that people who experience greater PTG are more likely to engage in helping behaviors and to perceive more social support (Steger et al., 2008). Recent investigations have provided evidence of links between positive personal meaning and social support (Sherman and Simonton, 2012). For example, a study of older adults showed that greater meaning in life was associated with increased social support (Krause, 2007). Finally, social support may in fact be independent of PTG, as some studies have documented no significant relationships between these factors (Cryder et al., 2006; Kilmer and Gil-Rivas, 2010; Wu et al., 2016).

These mixed findings are partially attributed to methodological issues. Major studies in the past have used cross-sectional research designs, which, contrary to prospective designs, prevent the examination of a temporal association between the two variables. In addition, characteristics of different populations may also partly account for the inconsistent results. For example, compared with adults, children and adolescents are particularly vulnerable to trauma. Furthermore, children and adolescents are likely to report both traumatic experiences and growth differently from adults (Meyerson et al., 2011). To the best of our knowledge, no studies have longitudinally examined the association between social support and PTG in a sample of adolescent earthquake survivors. Identifying the relationship between these two variables may contribute to the development of effective intervention plans for earthquake survivors.

This study attempts to address the above limitations by conducting a longitudinal study of adolescent survivors of the Wenchuan earthquake. It examines the relationship between social support and PTG at three time points (i.e., 12, 18, and 24 months after the Wenchuan earthquake). We propose the following competing hypotheses: (1) social support predicts PTG at subsequent assessments; (2) PTG predicts social support at subsequent assessments. Cross-lagged structural equation modeling was used to examine these relationships.

METHODS

Participants and Procedures

Participants were randomly selected from several primary and secondary schools in the counties of Wenchuan, which were the most severely affected by the Wenchuan earthquake. This study was approved by the Research Ethics Committee of Beijing Normal University and complied with the Declaration of Helsinki involving human subjects. Prior to administering the survey, school principals and teachers signed informed consent documents, and all participants agreed to participate in this study. The survey was administered by trained research assistants. Participants were informed that taking the survey was voluntary and that they were free to withdraw from it at any time.

The first data collection was conducted 12 months after the Wenchuan earthquake, at which time 452 participants were recruited (Time 1). A subsequent assessment was conducted 6 months later, in which 438 (96.90%) adolescents participated (Time 2). The third and final assessment was conducted 24 months after the earthquake, with 421 (93.14%) adolescents completing surveys (Time 3). The retention rates did not differ with respect to gender, age, grade or ethnicity.

In the final sample, 146 (34.68%) were males, and 275 (65.32%) were females. In terms of grade level, 137 (32.54%) were in Grade 7, 168 (39.91%) were in Grade 8, 35 (8.31%) were in Grade 10, and 81 (19.24%) were in Grade 11. With respect to ethnicity, 105 (24.94%) were from the Han ethnic group, 111 (26.37%) were from the Tibetan ethnic group, 186 (44.18%) were from the local Qiang people, and 19 (4.51%) were from other ethnicities. The average age was 14.87 ($SD = 1.69$).

Measurement

PTG

A modified Posttraumatic Growth Inventory (PTGI) was used to assess the level of PTG. The modified PTGI was based on an original PTGI developed by Tedeschi and Calhoun (1996) and was composed of three subscales: perceived changes in the self (9 items), the sense of relationship with others (7 items), and changed philosophy of life (6 items; An et al., 2011; Jia et al., 2015). Participants rated items on a 6-point scale from 0 to 5 (0 = "no change" to 5 = "great change"). In a study of earthquake survivors, confirmatory factor analysis with the modified scale yielded a model with fitness indices of $\chi^2/df = 2.35$, CFI = 0.93, RMSEA = 0.07, confirming the validity of the revised scale (An et al., 2011). In this study, the level of internal consistency ranged from 0.93 to 0.95 from Time 1 to Time 3, respectively.

Social Support

A social support scale revised by Zou (1999) was used to assess how participants evaluated the levels of social support they received. This scale assesses support from different sources: parents (4 items), teachers (4 items), and important others (4 items). For each item, the participants scored on a 5-point Likert scale (from 0 = "not at all" to 4 = "always") the extent to which they perceived they had received support since the earthquake We used 16 items to measure support from parents, teachers and friends, with Cronbach's alpha coefficients that ranged from 0.82 to 0.89 across the three time points.

Data Analyses

We conducted a bivariate correlation analysis to examine associations between social support and PTG. As shown in **Table 1**, gender was correlated with three subscales of PTG from

Time 1 to Time 3. Therefore, a multi-group analysis was used to test for gender differences in the relationship between social support and PTG in our cross-lagged model.

To examine our hypotheses, we used structural equation modeling based on a cross-lagged model and employing Mplus 7.0 software (Muthén, and Muthén, 1998–2012). The analysis proceeded in three phases: the measurement model, the structural model and a multi-group analysis. To deal with missing data and non-normality, a maximum likelihood estimation with a mean-adjusted chi-square (MLM) was adopted. The MLM χ^2 test statistic is also known as the Satorra–Bentler χ^2 (Muthén, and Muthén, 1998–2012; Wang et al., 2012).

Model fit was evaluated with the comparative fit index (CFI), the Tucker–Lewis index (TLI), and the root mean square error of approximation (RMSEA). According to the recommendations of Hu and Bentler (1999), CFI values $\geq$ 0.90, TLI values $\geq$ 0.90, and RMSEA values $\leq$ 0.08 are all considered adequate and indicative of good fit.

The corrected and scaled χ^2 difference, along with the change in CFI were used to test for differences in nested model fit (Satorra and Bentler, 2001). A change in CFI >0.01 indicated a poor fit (Cheung and Rensvold, 2002). A test of change in CFI is not affected by sample size, and it has a higher statistical power than the chi-square difference test. When the two results contradicted each other, we relied primarily on results of CFI differences.

RESULTS

Descriptive

Table 1 presents the bivariate correlations among study variables. The results confirmed that three sources of social support and three PTG subscales were significantly associated with one another. Relationships were observed both concurrently and longitudinally, and indicate extensive relationships among these variables.

Measurement Models

Initially, we compared the fit of two measurement models. In the first measurement model, the factor loadings for the two constructs (social support and PTG) were allowed to freely estimate on the three measurement occasions (Model 1); all latent variables were correlated with one another. Error terms for each manifest variable from the different measurement times were correlated to account for the random measurement error. For example, error terms for family support at Time 1 were correlated with the same error terms at Times 2 and 3. These error terms were then correlated with each other. The first measurement model exhibited a good fit (see **Table 2**). The second measurement model was identical except that the factor loadings of the indicators were set as equal on the different time measurements (Model 2). If the constrained model does not significantly worsen the fit of the unconstrained model, then the constraints should be selected. This also indicates that the latent constructs are similar across the three measurement occasions (i.e., factorial invariance).

The chi-square difference test revealed that Model 2 performed significantly better than Model 1 when factor loadings were set equally on three measurement occasions (the CFI difference was <0.01). Although Δ S-B χ^2 (8) = 18.149, $p <$ 0.05, as described above, when the results of the chi-square difference test and change in CFI test contradicted one another, we primarily depended on the latter. Therefore, Model 2 was preferred and retained for subsequent analyses.

Structural Models

Next, we focused on estimating structural cross-lagged models. In cross-lagged models, one construct (e.g., social support) at Time 1 can predict the same variable at Time 2 as well as another construct (e.g., PTG) at Time 2 (cf. **Figure 1**). Cross-lagged effects are the effects of temporally preceding variables on another variable other after controlling for the variables stability on the different measurement occasions. Finally, we set the residual variances of social support and PTG related to each other at each measurement occasion.

A cross-lagged model (Model 3) with estimating all path coefficients freely was examined, and showed a good fit to the data (see **Table 2**). In the next cross-lagged model (Model 4), we set all path coefficients equally on the three measurement occasions. This model also indicated a good fit to the data (see **Table 2**). The difference in fit between Models 3 and 4 was non-significant, as the CFI difference was <0.01, Δ S-B χ^2 (8) = 18.149, $p < 0.05$. Consequently, Model 4 was regarded as the final model.

In **Figure 1**, we see the standardized path coefficients for Model 4. The stability coefficients were 0.672 and 0.666 for social support (all ps < 0.01). The stability coefficients of PTG were 0.500 and 0.477 (all ps < 0.01). The cross-lagged effects from social support to PTG (standardized path coefficients $\beta = 0.132$ and 0.118) were significant (all ps < 0.01), whereas the cross-lagged effects from PTG to social support (standardized path coefficients $\beta = 0.023$ and 0.024) were non-significant.

Multi-Group Analyses

Multi-group analyses were conducted to assess whether Model 4 should be run separately for each gender. Two nested models were examined, starting with the least restricted model first. Unlike the measurement model, the least restricted model (Model 5) allowed all parameters to be estimating freely across groups. This model provided a good fit (see **Table 2**). In Model 6, equality constraints were imposed on the stability paths, the cross-lagged paths, as well as the measurement models across both males and females. This restricted model also provided a good fit (see **Table 2**). A comparison of the two nested models yielded a non-significant chi-square difference, suggesting there were no differences in the model based on gender. Hence, for both males and females, the estimates of path coefficients were similar to estimates for the total sample.

DISCUSSION

Although many studies have indicated that social support is connected to PTG, in the case of different types of trauma, the literature has also presented mixed findings about the

TABLE 1 | Correlations among the main variables.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	M	*SD*
1. Gender	_																			
2. PS T1	0.09	_																	2.49	0.89
3. TS T1	−0.03	0.64**	_																1.97	0.82
4. FS T1	0.17**	0.47**	0.56**	_															2.55	0.78
5. PS T2	0.08	0.64**	0.38**	0.36**	_														2.39	0.86
6. TS T2	−0.01	0.42**	0.60**	0.43**	0.53**	_													1.83	0.80
7. FS T2	0.15**	0.32**	0.37**	0.63**	0.47**	0.58**	_												2.58	0.82
8. PS T3	0.09	0.48**	0.29**	0.27**	0.58**	0.37**	0.27**	_											2.48	0.84
9. TS T3	−0.04	0.31**	0.52**	0.29**	0.32**	0.60**	0.29**	0.53**	_										1.92	0.75
10. FS T3	0.23**	0.27**	0.31**	0.51**	0.32**	0.43**	0.61**	0.42**	0.47**	_									2.69	0.75
11. PTG1 T1	0.10*	0.32**	0.31**	0.29**	0.24**	0.24**	0.25**	0.09	0.11*	0.22**	_								3.17	1.01
12. PTG2 T1	0.12*	0.31**	0.30**	0.38**	0.24**	0.24**	0.28**	0.12*	0.13**	0.24**	0.77**	_							3.12	1.07
13. PTG3 T1	0.05	0.27**	0.27**	0.22**	0.21**	0.19**	0.18**	0.09	0.12*	0.11*	0.72**	0.68**	_						3.00	1.00
14. PTG1 T2	0.12*	0.28**	0.24**	0.27**	0.36**	0.34**	0.36**	0.19**	0.18**	0.34**	0.49**	0.44**	0.38**	_					3.02	0.98
15. PTG2 T2	0.14**	0.28**	0.26**	0.35**	0.37**	0.37**	0.46**	0.22**	0.18**	0.39**	0.43**	0.46**	0.35**	0.80**	_				2.99	1.05
16. PTG3 T2	0.07	0.25**	0.19**	0.25**	0.32**	0.31**	0.34**	0.15**	0.12*	0.26**	0.39**	0.40**	0.42**	0.74**	0.66**	_			2.84	0.99
17. PTG1 T3	0.14**	0.15**	0.22**	0.23**	0.19**	0.25**	0.22**	0.15**	0.24**	0.28**	0.46**	0.41**	0.36**	0.44**	0.41**	0.41**	_		3.07	1.00
18. PTG2 T3	0.14**	0.16**	0.20**	0.25**	0.20**	0.26**	0.27**	0.17**	0.23**	0.34**	0.45**	0.46**	0.40**	0.47**	0.46**	0.43**	0.82**	_	3.16	1.00
19. PTG3 T3	0.10*	0.12*	0.21**	0.23**	0.18**	0.25**	0.19**	0.20**	0.27**	0.27**	0.36**	0.39**	0.39**	0.41**	0.40**	0.45**	0.80**	0.80**	2.95	1.05

*PS, parents' support; TS, teachers' support; FS, friends' support. T1 to T2, different measurement points from Time 1 to Time 3; PTG, posttraumatic growth. PTG1 to PTG3, different subscales of posttraumatic growth representing perceived changes in the self, the sense of relationship with others and changed philosophy of life, respectively. Sex: 0, male; 1, female. *$p < 0.05$, **$p < 0.01$.*

TABLE 2 | Goodness-of-fit indices and model comparisons for tested models.

Models	S-B χ^2	*df*	RMSEA [90% CI]	CFI	TLI
MEASUREMENT MODELS					
Model 1: Free loadings	154.214	102	0.035 [0.023, 0.046]	0.988	0.982
Model 2: Constrained loadings	172.363	110	0.037 [0.026, 0.047]	0.986	0.981
STRUCTURAL MODELS					
Model 3: Free path coefficients	210.242	114	0.045 [0.035, 0.054]	0.978	0.971
Model 4: Constraints on path coefficients	213.591	118	0.044 [0.034, 0.053]	0.979	0.972
MULTI-GROUP ANALYSES					
Model 5: Configural model	382.571	244	0.052 [0.042, 0.062]	0.970	0.962
Model 6: Constraints on structural coefficients across groups	394.265	256	0.051 [0.041, 0.060]	0.970	0.964

S–Bχ^2*, scaled Satorra–Bentler* χ^2.

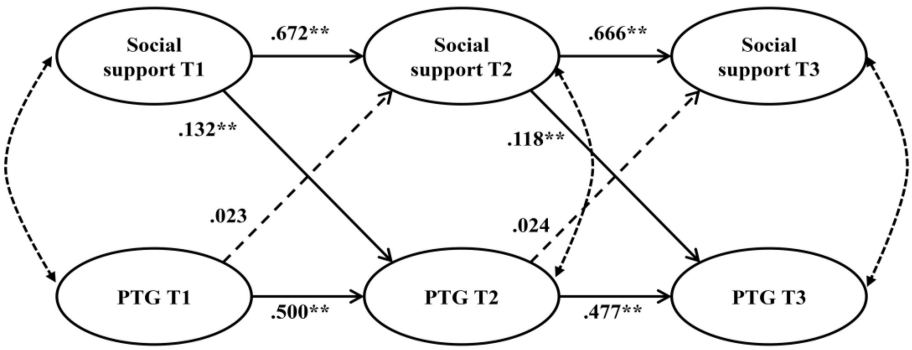

FIGURE 1 | Cross-lagged model of social support and posttraumatic growth (PTG). The structural coefficients shown are standardized coefficients. Dotted lines represent covariates between constructs and/or error terms. Dashed lines represent non-significant predictions. Solid lines represent significant predictions. $^{**}p < 0.01$.

association. The present study examined a temporal aspect of the relationship between social support and PTG in a sample of earthquake survivors. Our main finding is that PTG is an outcome of social support and not vice versa. Social support predicted subsequent PTG from 12–24 months after the Wenchuan earthquake. This result agrees with the Schaefer and Moos (1998) model and is consistent with empirical studies on the relationship between sources of social support and PTG (Schroevers et al., 2010; McDonough et al., 2014). For example, social support from family members and friends was associated with higher PTG scores (Kimhi et al., 2009). As a result, the present study suggests that strong social support is crucial for facilitating and maintaining PTG. In addition, cognitive processing theory offers an important perspective for explaining the significance of social support (Tedeschi and Calhoun, 2004). In responding to the negative emotions following traumatic events, earthquake survivors need to feel more connected with others. Parents, teachers, and friends provide survivors with various forms of intangible support (e.g., emotional support, informational support). In addition, numerous tangible forms of assistance are also offered to cope with such stressors (Swickert and Hittner, 2009). Consequently, earthquake survivors themselves may treat others more positively over time and experience greater self-efficacy in the face of stressful events, which in turn are important to higher levels of PTG (Tedeschi and Calhoun, 2004; Cryder et al., 2006; Zhou and Wu, 2016).

Contrary to previous studies (Krause, 2007; Sherman and Simonton, 2012), we were unable to show that PTG promoted social support. In addition, contrary to models of PTG as a coping strategy, initial PTG levels reported 12 and 18 months after the Wenchuan earthquake did not predict subsequent social support levels. However, this result does not indicate that such models are false. Many theorists have framed PTG as both a coping outcome and a coping strategy (Zoellner and Maercker, 2006; Cao et al., 2017). One explanation for our inability to detect an effect of PTG on social support lies in the 24-month time frame itself. It was simply too short, as such a relationship would not likely emerge until much later (perhaps even 10 or more years after the trauma). Typically, studies describe two phases of coping with trauma, especially wide-ranging trauma (Kaniasty and Norris, 2008). In the initial phase, social support may be beneficial, helping survivors to recover from traumatic experience or grow, an outcome that has been demonstrated in many disaster studies (Sheikh, 2004; McDonough et al., 2014; Zhou and Wu, 2016). In the next stage, in light of changing and socially shared schemas, a person with a high level of PTG may come to see society more positively, and may become

more likely to thrive in social relationships and generate mutual support. This outcome is consistent with social selection theory (Kaniasty and Norris, 2008). In fact, a study of PTSD showed that more severe PTSD symptoms lead to less social support at 18 to 24 months (Kaniasty and Norris, 2008). However, with respect to PTG, the specific time point where it predicts later social support, needs to be examined further in future research.

In addition, our results indicated that gender was significantly related to PTG and that females reported more PTG than did males. The magnitude of this association was similar to previous findings (Park et al., 1996; Linley et al., 2008). Why is gender associated with PTG? We believe the association of gender with PTG is related in part to the mediating influence of social support, as females are more willing to seek help from others in times of stress (Swickert and Hittner, 2009). Our data showed that females reported greater levels of support from friends than did males ($r = 0.15$–0.23) and that they did so at different time points. Thus, when coping with stressors, females may form richer social connections, which can lead to greater levels of PTG. However, when examining the cross-lagged model between social support and PTG, we found that both males and females followed the same pathway from social support to PTG. It seems that the facilitative role of social support in PTG is equal for males and females. In light of the different roles played by both global and relationship-specific support, future research should explore the relationship between the latter and PTG, as well as any associated gender differences. Ascertaining the pathways between relationship-specific social support and PTG as well as the influence or lack of influence of gender on them may yield important information relevant to promoting PTG among earthquake survivors.

Several limitations of the current study warrant mentioning. First, like trauma studies, social support and PTG were typically assessed using self-reports. It is possible that the observed relationships stemmed from a shared variance related to method. Future research should employ multiple measures from different informants, as well as additional objective measures of PTG and social support (e.g., partner ratings of relationship quality). Second, our results were constrained by its focus on adolescent survivors assessed from 12–24 months after an earthquake. Future longitudinal studies should examine the association between PTG and social support within different trauma populations and at more time points. Finally, the lack of a pre-trauma assessment of social support limited our ability to determine causality.

Despite these limitations, our results offer insight into the relationship between social support and PTG among adolescent survivors of the Wenchuan earthquake, 12–24 months after the earthquake. Furthermore, the findings in this study have important clinical implications. For instance, increased social support predicts the PTG levels for both men and women. Hence, it is necessary for clinicians and teachers to help survivors recognize those upon whom they can rely in moments of crisis, improving the perceptions of social support in the context of responding to stressful experiences.

ETHICS STATEMENT

This study was carried out in accordance with the recommendations of the Research Ethics Committee of Beijing Normal University with written informed consent from all subjects. All subjects gave written informed consent in accordance with the Declaration of Helsinki. The protocol was approved by the Research Ethics Committee of Beijing Normal University.

AUTHOR CONTRIBUTIONS

Conceived and designed the experiments: XJ and CL. Performed the experiments: LY and XL. Analyzed the data: XJ and LY. Wrote the paper: XJ, XL, and CL.

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Rumination as a Mediator between Childhood Trauma and Adulthood Depression/Anxiety in Non-clinical Participants

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Objective: Although there is strong evidence that childhood trauma is associated with the development of depression and anxiety, relatively few studies have explored potential mediating factors for this relationship. The present study aimed to evaluate the mediating role of rumination in the link between childhood trauma and mood status such as depression, anxiety and affective lability.

Materials and Methods: Two hundred and seven non-clinical participants completed the Childhood Trauma Questionnaire, the Ruminative Response Scale, the Beck Depression Inventory, the State Anxiety Inventory, and the Affective Lability Scale. Structural equation modeling was used to evaluate the results.

Results: Our results supported that rumination is a meaningful mediator between childhood trauma and depression/anxiety in non-clinical participants. The mediation model indicated that childhood trauma and its subtypes are linked to depression and anxiety through three subtypes of rumination, thereby supporting a significant indirect relationship (Standardized coefficient [SC] = 0.56, $p < 0.001$ for the path from trauma to rumination; SC = 0.67, $p < 0.001$, from rumination to mood). The direct relationship between childhood trauma and mood symptoms was also significant in a model including rumination (SC = 0.68, $p < 0.001$). The mediation effect of rumination in the relationship between childhood trauma and mood was more predominant in female participants.

Conclusions: The present study found that rumination mediates the influence of childhood trauma on the development of mood symptoms in non-clinical participants. Childhood trauma appears to be a critical determinant for developing symptoms of depression and anxiety.

Keywords: childhood trauma, rumination, mood, mediation, structural equation modeling

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INTRODUCTION

Childhood trauma in terms of abuse and neglect has been quite common not only in pathological conditions but also in community population (Kilpatrick and Saunders, 2000). Moreover, childhood trauma has been regarded as an origin for various psychopathologies (Hetzel and McCanne, 2005; Nanni et al., 2012). In particular, childhood trauma has been associated with the

development of depression and anxiety (Chapman et al., 2004; Sachs-Ericsson et al., 2006; Lok et al., 2013). Recently, it was revealed that the affective lability or bipolar disorder as well as the unipolar depression have also been associated with childhood traumatic experiences (Aas et al., 2014; Noto et al., 2015; Marwaha et al., 2016).

Although relatively few studies have explored potential mediating mechanisms of the relationship between childhood trauma and mood status, some mediating candidates have been reported. Maladaptive cognition and negative cognitive styles have been suggested to mediate the link between childhood maltreatment and depression (Gibb et al., 2001; Kaysen et al., 2005; Hankin, 2006). Recently, dysfunctional emotional regulation has been suggested as an underlying mediator of the association between childhood trauma and depression (Hopfinger et al., 2016). In addition, rumination has been another plausible candidate in this relationship (Raes and Hermans, 2008). Rumination is defined as the tendency to constantly focus on negative mood and on the possible causes and implications of depressed feelings (Nolen-Hoeksema, 1991). Rumination has been regarded as one of the underlying mechanisms for developing and maintaining depression (Nolen-Hoeksema et al., 2008). Rumination affects the development of depression by reducing the specificity of autobiographical memory (Raes et al., 2006). That is, compared with controls, people with depression respond relatively more often with overgeneral or categoric memories that summarize across categories of similar events (Raes et al., 2006). Therefore, rumination might mediate developing of depression by extortion and re-production of the childhood traumatic experiences. In this context, previous studies have reported that rumination played a mediating role between emotional abuse and depression (Spasojevic and Alloy, 2001; Raes and Hermans, 2008). Although other subtypes of childhood abuse could also mediate the development of depression (Al Odhayani et al., 2013), the role of rumination as a mediator for depression remains unclarified in other types of childhood trauma.

Most previous studies applied two-factor model for rumination including brooding and reflection (Nolen-Hoeksema et al., 2008; Raes and Hermans, 2008). However, three-factor models for rumination showed better fit for the Korean population compared with two–factor models (Kim et al., 2013). Furthermore, most of the previous research has focused on depression, disregarding a variety of other mood conditions such as anxiety or mood lability. This is the first study that aims to evaluate the mediating role of three subtypes of rumination including self-reproach, contemplation, and depressive rumination, in the relationship between five subtypes of childhood trauma and various mood-related conditions, namely depression, anxiety and affective lability, using structural equation modeling in the general population. This study considered depression, anxiety and affective lability as mood-related conditions for convenience of readers. Moreover, previous studies have reported that female participants tend to use more ruminative response than males (Nolen-Hoeksema et al., 1999; Johnson and Whisman, 2013). Therefore, the study additionally accounted for sex and investigated its influence on the mediating role of rumination in the relationship between childhood trauma and mood-related condition.

The present study hypothesized that subtypes of rumination mediate the effect of childhood trauma on adult's mood-related conditions such as depression, anxiety, and affective lability. Furthermore, the study hypothesized that this mediating role is predominantly evident in female participants.

MATERIALS AND METHODS

Participants

The study was performed on 207 non-clinical volunteers (84 men and 123 women) with a mean age of 27.86 $\pm$ 6.36 (years). They were recruited from the local community through local newspapers and posters. Participants with any history of neurological or other mental diseases were excluded from the study through the initial screening interviews. After an explanation of this study, all participants signed an informed consent that was approved by the Institutional Review Board at Inje University Ilsan Paik Hospital prior to their participation (IRB no. 2015-07-026-001).

Psychological Measures

Participants completed the Korean version of Childhood Trauma Questionnaire-Short Form (K-CTQ) (Bernstein and Fink, 1998) to assess their childhood traumatic experiences. The Childhood Trauma Questionnaire-Short Form (CTQ-SF) is a 28-item self-report inventory developed to measure five subtypes of abuse or neglect in childhood or adolescence: sexual abuse, physical abuse, emotional abuse, physical neglect, and emotional neglect (Bernstein et al., 2003). Each Item has a five-point, Likert-type answer format ranging from "never true" (score = 1) to "very often true" (score = 5). Good to excellent internal consistency for each subscale except physical neglect has been obtained from community populations (Scher et al., 2001). The K-CTQ showed adequate reliability and validity (Kim et al., 2011). Its coefficient alpha was 0.90 in this study. The coefficients of each subtype of K-CTQ were 0.92 (emotional neglect), 0.78 (physical abuse), 0.78 (sexual abuse), 0.77 (emotional abuse) and 0.52 (physical neglect) in this study.

For the evaluation of rumination, the Ruminative Response Scale (RRS) was conducted. RRS is a validated scale composed of 22 items for measuring the ruminative responses to depressed moods (Nolen-Hoeksema, 1991; Kim et al., 2010). Each item is rated on a 4-point scale ("almost never" to "almost always"). The Korean version of RRS (K-RRS) has good internal consistency in community samples (Kim et al., 2010). The K-RRS consists of three subscales and each subscale has an adequate internal consistency (Cronbach's alpha = 0.80 for self-reproach, 0.79 for contemplation, 0.86 for depressive rumination; Kim et al., 2010). The three factors of rumination were self-reproach, contemplation, and depressive rumination. The self-reproach means blaming by one's own conscience and the contemplation is defined by profound thinking about depressed mood or personality. The depressive rumination is the focused attention on the symptoms of one's depressive mood (Kim et al., 2010). Previous exploratory and confirmatory factor analysis

for K-RRS indicated that the above-mentioned three-subscale model was more suitable for both Korean non-clinical and clinical populations (Kim et al., 2010, 2013) than two-subscale (brooding/reflection) model (Raes and Hermans, 2008). The K-RRS coefficient alpha in this study was 0.92. The coefficients of each subtype of K-RRS were 0.85 (self-reproach), 0.87 (contemplation) and 0.81 (depressive rumination) in this study.

For the assessment of mood variables, the State Anxiety Inventory (SAI), Short form of Affective Lability Scale (ALS-SF), and Beck Depression Inventory (BDI) were used. The SAI is a subscale of State and Trait Anxiety Inventory, and is comprised of 20 items (Kim and Shin, 1978; Spielberger, 1983) that measure an immediate emotional status caused by concern or tension, which are changeable depending on the patient's current status. SAI consists of a four-point scale and each item is rated from "not at all" to "very much so" (Hahn et al., 1996). The Korean version of SAI showed adequate reliability and validity (Hahn et al., 1996). Its coefficient alpha was 0.92 in this study.

The ALS-SF was utilized to estimate instability of mood (Harvey et al., 1989; Aas et al., 2015). It is consist of three subscales such as anxiety/depression scale, depression/elation scale, and an anger scale. It is comprised of 18 items and assessed with a 4-point likert scale. Its coefficient alpha was 0.93 in this study.

The BDI is a validated scale composed of 21 items for measuring the severity of depressive symptoms (Beck et al., 1961; Rhee et al., 1995). BDI showed good internal consistency and validity (Song et al., 2012). Its coefficient alpha was 0.87 in this study.

Statistical Analysis

Descriptive statistics for demographic and psychological characteristics of participants were performed using SPSS 21 (SPSS, Inc., Chicago, IL, USA). The significant level was set at $p < 0.05$ (two-tailed).

Normality was tested for each variable before further analysis. The skewness over 2.0 and kurtosis over 7.0 are considered to be a moderately non-normal distribution (Curran et al., 1996). All variables in our results were within the range of normal distribution except for sexual abuse (skewness was 3.51 and Kurtosis was 14.59) and emotional abuse (skewness was 2.22).

Independent *t*-test was used to compare the scores of psychological data between the male and female group. The psychological data were normally distributed in both the male and female group. Pearson's correlation analysis was performed with psychological measures that showed a normal distribution.

Structural equation modeling (SEM) was used to assess hypothesized relationships between childhood traumatic experiences, rumination, and mood status in a non-clinical population. SEM is defined as the combination of confirmatory factor analysis and multiple regressions to determine relationships between variables (Sergi et al., 2006). Regarding the factor-analytic properties of SEM, *unobserved variables* are estimated by factor analyses of data from theoretically related measures, *observed variables*. Factor loadings are used to specify the association between *unobserved variables* and *observed variables* (Kline, 2011). The relations between the *unobserved variables* were analyzed by regression analysis. Additionally, the study conducted the bootstrap procedure to estimate the size of the indirect effects ($n = 5{,}000$ resamples) (Preacher and Hayes, 2004). The study also used the bias-corrected bootstrap sampling for the maximum likelihood estimation to minimize potential bias to model fits (Preacher and Hayes, 2004). The confidence interval (CI) for the indirect effect was a BCa bootstrapped CI, and the significance of the point estimate ($p < 0.05$) was determined by the absence of zero within the CI (Preacher and Hayes, 2004; Hopfinger et al., 2016).

As the data were non-normal in distribution and we used the Mardia's test (Mardia, 1970). The result of Mardia's test of multivariate normality was highly significant ($z = 27.04$, $p < 0.001$). Clearly, these data are not multivariate normal. However, the model in this study was examined via SEM using the maximum- likelihood method that applies the bootstrapping approach, which does not require a distributional assumption and estimates the standard errors for parameter estimates using the bootstrap algorithm of Efron (1982). Previous researchers suggested that the maximum likelihood method with large sample sizes could be used if the data were non-normal in distribution (Hu et al., 1992; Yuan and Bentler, 1999). Additionally, the parameter estimation could be reliable when the used maximum likelihood method although the multivariate normality assumption was not satisfied (Hair et al., 2010). Therefore this study the used maximum likelihood method with bootstrapping as parameter estimation owing to acceptable skewness and kurtosis (Curran et al., 1996).

The present model consisted of three unobserved variables: childhood trauma, rumination, and mood. The variable called *childhood trauma* has five observed variables: emotional abuse, emotional neglect, physical abuse, physical neglect, and sexual abuse. The second unobserved variable is *rumination* and has three observed variables: self-reproach, contemplation, and depressive rumination. The third unobserved variable, *mood*, has three observed variables: depression, anxiety, and affective lability. Two models, a basic model and a mediation model, were evaluated. The basic model verified the direct relationship between childhood trauma and mood. The mediation model evaluated both direct and indirect relationships between childhood trauma and mood through mediation of rumination.

Overall model fit was evaluated using the following criteria. First, the present study calculated the ratio of x^2 to degrees of freedom that should be less than three as an acceptable data-model fit (Fino et al., 2014). In addition, the study also used the Comparative Fit Index (CFI) and the Root Mean Square Error of Approximation (RMSEA). Indicators of adequate-fitting model are evidenced by an CFI greater than 0.95 and an RMSEA less than 0.08 (MacCallum et al., 1996).

Additionally, to test the significance of a mediation effect, this study conducted the Sobel test (Sobel, 1982), which is an interactive method for testing whether a mediator variable significantly carries the influence of an independent variable to a dependent variable.

The study examined the hypothesized relations in our model using AMOS 21 for SEM (SPSS Inc.) (Arbuckle, 1994). Statistical

analyses were performed using SPSS 21 (SPSS, Inc., Chicago, IL, USA).

RESULTS

The means and standard deviations (SD) of the psychological characteristics related to the observed variables are presented in **Table 1**. The correlation analyses of the psychological measures are displayed in **Table 2**. Correlation analyses demonstrated that associations between observed variables were in the expected directions.

On the basis of our previous hypothesis, the basic and mediation models were estimated with the maximum likelihood method. The basic model showed a direct relationship between childhood trauma and mood (**Figure 1A**). Therefore, the basic model is satisfied with an adequate fit for the data, and produced fit indices as follows: $x^2/df = 1.95$; CFI = 0.96; RMSEA = 0.06. As the authors expected, childhood trauma, indicated by the subtypes of childhood trauma questionnaire, predicted mood status indicated by BDI, SAI, and ALS in the basic model (Standardized coefficient = 0.68, $p < 0.001$).

TABLE 1 | Psychological characteristics of the participants.

Psychological measures	Total ($N = 207$)	Men ($N = 84$)	Women ($N = 123$)	
		Mean ± *SD*		*p*-value
Childhood trauma questionnaire (CTQ)	43.29 ± 12.20	41.77 ± 11.35	44.33 ± 12.69	0.14
Emotional abuse	6.42 ± 2.57	5.93 ± 2.01	6.76 ± 2.85	0.02
Emotional neglect	17.01 ± 6.73	15.86 ± 6.49	17.80 ± 6.81	0.04
Physical abuse	7.24 ± 2.99	7.37 ± 2.90	7.15 ± 3.06	0.61
Physical neglect	6.69 ± 2.32	6.96 ± 2.55	6.50 ± 2.15	0.16
Sexual abuse	5.93 ± 2.15	5.65 ± 1.52	6.11 ± 2.49	0.13
Ruminative response scale	33.25 ± 9.04	32.24 ± 8.26	33.93 ± 9.51	0.05
Self-reproach	11.61 ± 3.81	11.33 ± 4.07	11.80 ± 3.63	0.39
Contemplation	11.15 ± 3.94	10.90 ± 3.91	11.80 ± 3.97	0.46
Depressive rumination	10.66 ± 3.18	10.43 ± 2.98	10.82 ± 3.31	0.38
State anxiety inventory (SAI)	36.84 ± 8.30	35.69 ± 7.99	37.63 ± 8.45	0.09
Beck Depression Inventory (BDI)	8.26 ± 5.91	7.30 ± 5.67	8.91 ± 6.01	0.05
Affective lability scale (ALS)	16.78 ± 9.89	13.48 ± 9.38	19.03 ± 9.63	< 0.001

SD, standard deviation.

TABLE 2 | Correlations of psychological measures in the participants.

	r										
Measures	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
CHILDHOOD TRAUMA											
1. Emotional abuse[a]	-										
2. Emotional neglect	0.46**	-									
3. Physical abuse	0.39**	0.34**	-								
4. Physical neglect	0.24**	0.29**	0.14	-							
5. Sexual abuse[a]	0.35**	0.30**	0.37**	0.22**	-						
RUMINATION											
6. Self-reproach	0.45**	0.34**	0.38**	0.21**	0.13	-					
7. Contemplation	0.40**	0.32**	0.24**	0.15	0.16*	0.47**	-				
8. Depressive rumination	0.45**	0.40**	0.59**	0.17*	0.14	0.63**	0.61**	-			
MOOD											
9. State Anxiety	0.29**	0.37**	0.29**	0.25**	0.09	0.50**	0.30**	0.41**	-		
10. Beck Depression	0.43**	0.44**	0.26**	0.17*	0.10	0.60**	0.37**	0.59**	0.54**	-	
11. Affective Lability	0.38**	0.30**	0.23**	0.13	0.24**	0.45**	0.40**	0.51**	0.46**	0.47**	-

*$p < 0.05$, **$p < 0.01$.
[a]*Spearman correlation analysis was performed.*

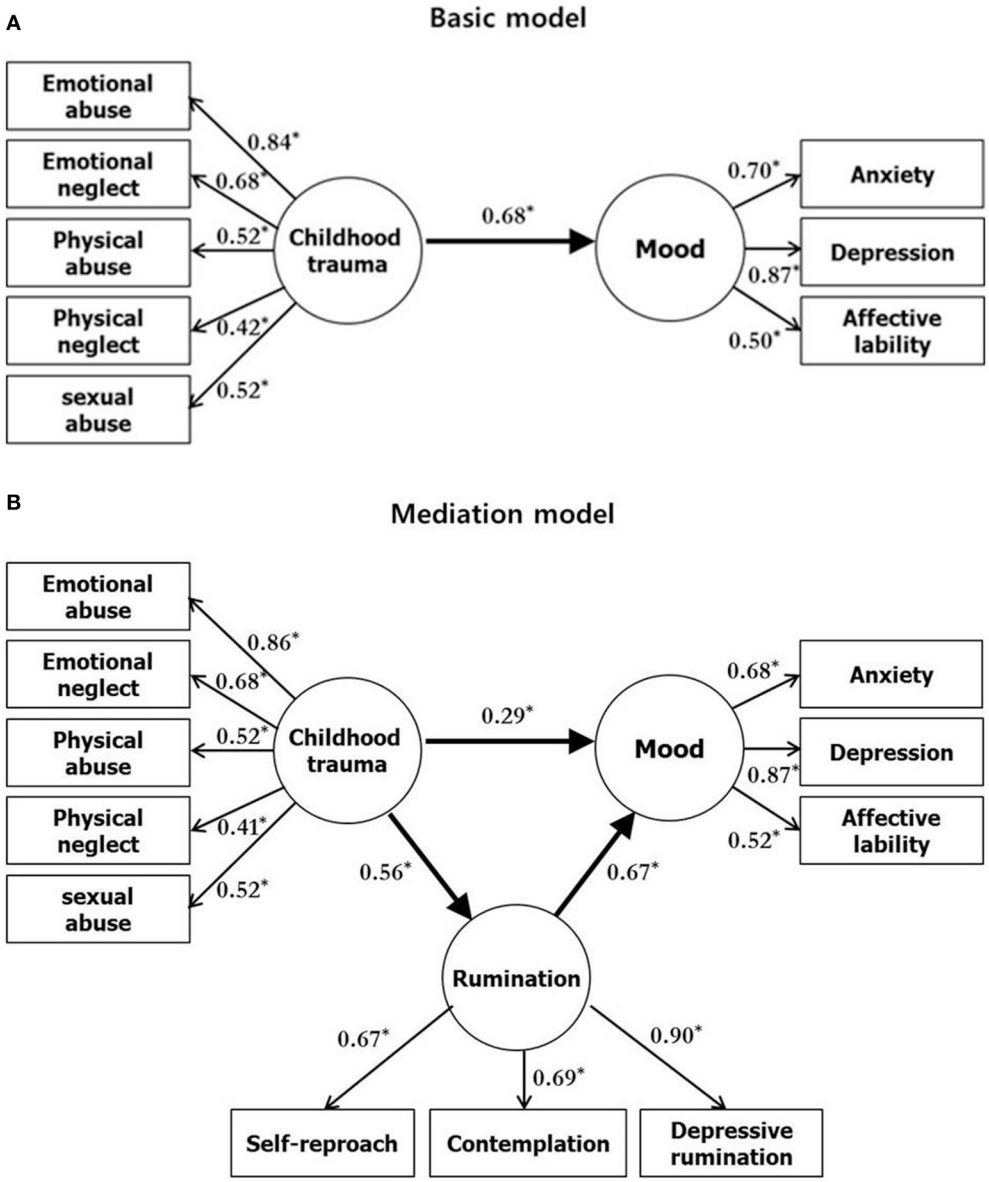

FIGURE 1 | Basic model of the relationship between childhood trauma and mood **(A)**, and mediation model showing rumination as a mediator of the relationship **(B)**. Rectangles represent observed variables. Circles represent latent variables. Numbers on single-headed arrows indicate standardized regression weights. *$p < 0.05$, multiple regression analysis.

The mediation model showed the strength of a direct relationship between childhood trauma and mood status, as well as an indirect relationship mediated by rumination (**Figure 1B**). The model produced adequate fit indices as follows: x^2/df = 2.18; CFI = 0.94; RMSEA = 0.07. Similarly to the basic model, all observed variables included in the mediation model had moderate to high loadings in their respective unobserved variables, except for *physical neglect*. Rumination and its three observed variables (subtypes of rumination) were predicted by childhood trauma (Standardized coefficient = 0.56, $p < 0.001$) and were predictive of mood status (Standardized coefficient = 0.67, $p < 0.001$). Rumination mediated the relationship between the predictor and outcome variables, as indicated by the significant indirect path between K-CTQ and mood (mood: $p = 0.006$, ALS: $p = 0.008$, SAI: $p = 0.003$, BDI: $p = 0.004$). The Sobel test, which was conducted in order to evaluate the significance of the mediation effect, resulted in a high 4.19, suggesting that the mediating effect of rumination was significant.

The basic model (**Figure 1A**) showed a significant direct effect ($p = 0.01$, $b = 0.68$) while the mediation model (**Figure 1B**) showed both significant direct ($p = 0.01$, $b = 0.29$, CI [0.003, 0.49]) and indirect ($p = 0.01$, $b = 0.38$, CI [0.25, 0.56]) effects between childhood trauma and mood through the mediation of rumination. In the model (**Figure 1B**), the total effect was 0.67. The direct effect was 0.29 and indirect effect was 0.38.

The study further conducted the analysis with sex as a factor. The analysis conducted only on male participants is presented in **Figure 2**. The analysis conducted only on female participants is presented in **Figure 3**. The mediation model in male participants produced very good fit indices as follows: x^2 /df = 1.30; CFI = 0.95; RMSEA = 0.06. The mediation model in female participants produced adequate fit indices as follows: x^2/df = 1.90; CFI = 0.93; RMSEA = 0.08. In male participants, the basic model (**Figure 2A**) showed a significant direct effect ($p = 0.04$) and the mediation model (**Figure 2B**) showed a significant direct ($p = 0.04$, b = 0.40, CI [0.06, 0.75]) and indirect ($p < 0.001$, $b = 0.29$, CI [0.12, 0.58]) effect between childhood trauma and mood through the mediation of rumination. In female participants, the basic model (**Figure 3A**) showed a significant direct effect ($p = 0.04$) and the mediation model (**Figure 3B**) showed a significant direct ($p = 0.04$, $b = 0.20$, CI [0.02, 0.40]) and indirect ($p < 0.001$, $b = 0.45$, CI [0.28, 0.69]) effect between childhood trauma and mood through the mediation of rumination. In the analysis conducted by taking the sex variable into account, the standardized indirect effect size was larger in female participants than in male participants (female = 0.45, male = 0.29).

DISCUSSION

The present study aimed to clarify whether rumination would mediate the path from childhood trauma to a mood-related condition in a non-clinical population. As expected, rumination acted as a mediator between various types of childhood trauma and mood-related condition. Additionally, this mediation effect has been observed more predominantly in female participants.

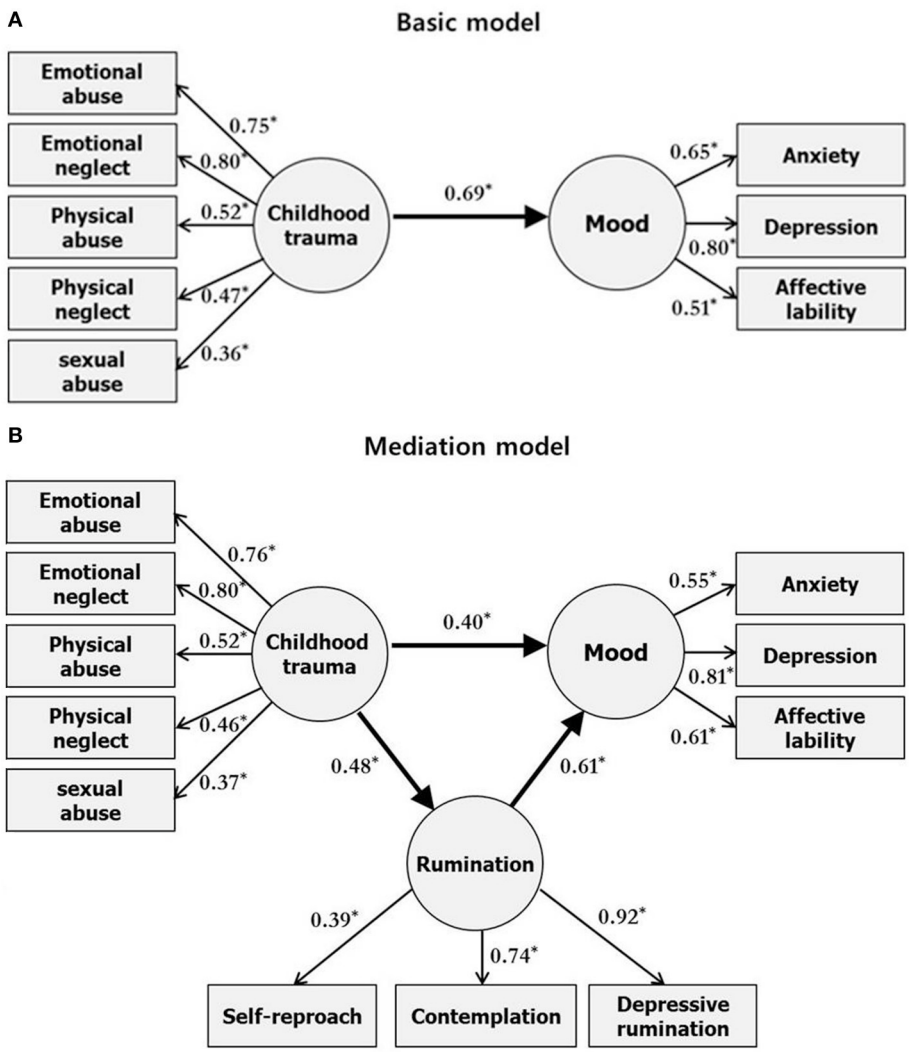

FIGURE 2 | Basic model of the relationship between childhood trauma and mood **(A)**, and mediation model showing rumination as a mediator of the relationship **(B)** in male participants. Rectangles represent observed variables. Circles represent latent variables. Numbers on single-headed arrows indicate standardized regression weights. *$p < 0.05$, multiple regression analysis.

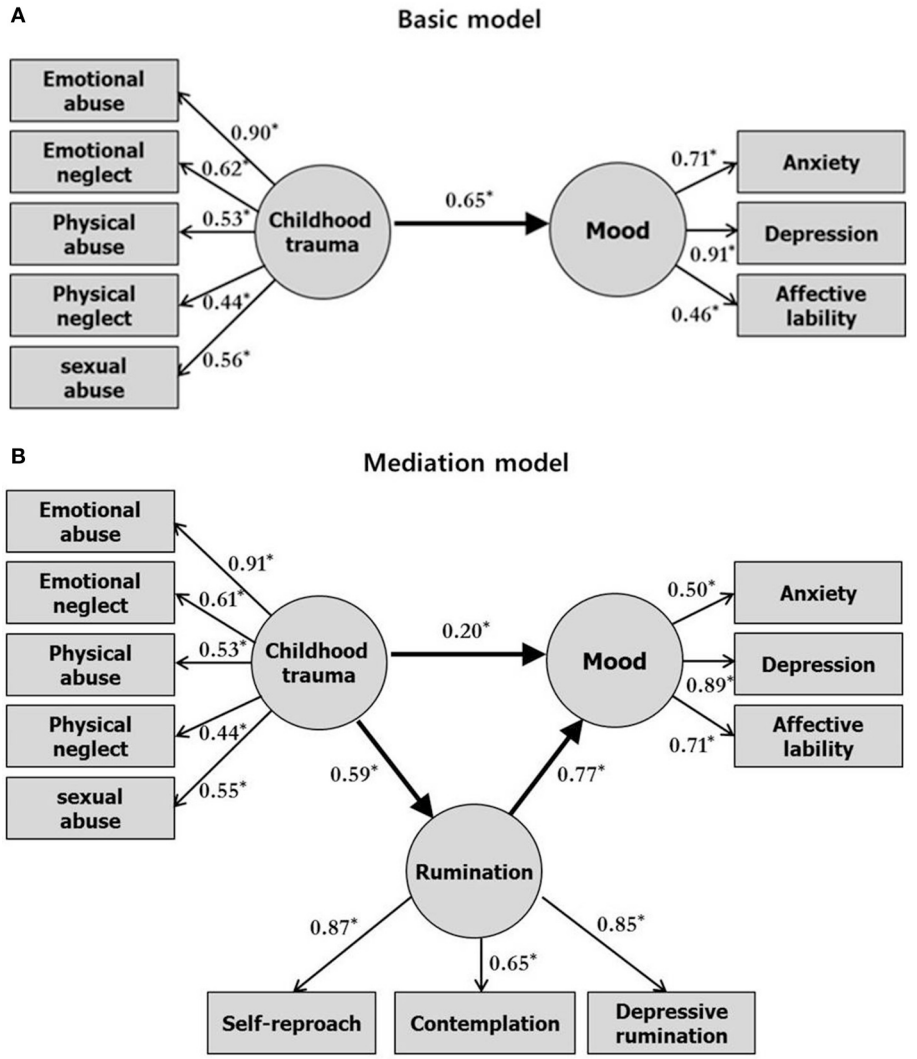

FIGURE 3 | Basic model of the relationship between childhood trauma and mood **(A)**, and mediation model showing rumination as a mediator of the relationship **(B)** in female participants. Rectangles represent observed variables. Circles represent latent variables. Numbers on single-headed arrows indicate standardized regression weights. $^{*}p < 0.05$, multiple regression analysis.

Does Childhood Trauma Induce Depression, Anxiety and Affective Lability?

The model showed a direct relationship between childhood trauma and mood. All observed variables included in this model had moderate to high loadings on their respective unobserved variables, except for the physical neglect variable of the childhood trauma questionnaire. The physical neglect variable showed lower factor loading in a confirmatory factor analysis of childhood trauma questionnaire (Scher et al., 2001). Previous studies reported that the subscale physical neglect was loaded in different factors (Villano et al., 2004; Gerdner and Allgulander, 2009; Klinitzke et al., 2012). Researchers insisted that this problem may be due to the poor differentiation between physical neglect and emotional neglect or because these two separate factors are conceptually intermingled in the construct of physical neglect (Kim et al., 2011; Grassi-Oliveira et al., 2014).

Individuals with a history of childhood trauma often struggle with various symptom complexes including depression, anxiety and lability (Gillespie and Nemeroff, 2005; Aas et al., 2014). A lot of studies suggest that disruption of stress-related neural systems, which might be induced by early childhood trauma, plays a critical role in the development of depression and anxiety (Heim et al., 2004). In this process, the role of corticotropin-releasing factor (CRF) is preeminent (Gillespie and Nemeroff, 2005). A previous study observed that childhood sexual abuse was associated with an increased sensitivity to the depressogenic effects of stressful life events (Kendler et al., 2004). Moreover, genetic polymorphism and brain structural findings suggest that depression or anxiety related to early life stress might be

a distinct form of depression (Hasler et al., 2004; Kim and Lee, 2016). Among the several risk factors related to affective lability, the childhood trauma was specially regarded to relevant one. Moreover, a recently reported study suggested that higher affective lability leading from childhood trauma even affected poor clinical outcomes of mood disorders such as suicidal attempts (Aas et al., 2017). Our study was in line with previous studies suggesting that childhood trauma can directly predict adulthood mood status.

Does Rumination Reliably Mediate the Effect of Childhood Trauma on Depression, Anxiety and Affective Lability?

Besides these apparent associations between early traumatic experiences and later life mood problems, data on the causal mechanisms of this pathway are scarce. Our results showed that rumination is an important factor in the pathway between childhood trauma and mood-related condition later in life. Previously, it has been revealed that childhood traumatic experiences are related to the development of depression mediated by rumination (Spasojevic and Alloy, 2001; Raes and Hermans, 2008). Importantly, our results extend the previous findings by evaluating other stressful symptoms such as anxiety (Nolen-Hoeksema, 2000; Marcus et al., 2008), and mood lability (Marcus et al., 2008). Moreover, our results show that the indirect model of rumination has a significant mediating effect for mood symptoms. It suggests that rumination could be an important mediator underlying the development of various mood problems including affective lability, anxiety, and depression caused by early traumatic experiences. Furthermore, it gives us an important clinical implication that the ruminative cognitive styles should be targets for treatment in childhood trauma victims to prevent mood disorders.

Why the Rumination Is Important as a Mediator?

Our study revealed that all subtypes of ruminative response such as self-reproach, contemplation, and depressive rumination could be associated with childhood trauma. This is the first demonstration that showed possibilities for the mediating role of subtypes of rumination in the relationship between various subtypes of childhood trauma and development of depression, anxiety and affective lability. A previous study has revealed that emotional abuse is associated with the development of emotional dysregulation with rumination as a mediator (Raes and Hermans, 2008). Traumas that have not been fully discussed and ventilated are linked to increased ruminations about that traumatic event (Pennebaker and Susman, 1988). Generally, childhood trauma is not easily discussed and is suppressed, so that it might lead to a ruminative cognitive style. Previous studies have demonstrated that childhood maltreatment might be one developmental antecedent of rumination (Gold and Wegner, 1995; Nolen-Hoeksema, 2004). Rumination after stress predicted non-habituation of hypothalamic–pituitary–adrenal (HPA) axis responses (Gianferante et al., 2014). Increased rumination after experiencing a novel stressor was predictive of increased cortisol reactivity to second-time stress. These evidences suggest that rumination is one possible mechanism mediating maladaptive stress response patterns, and it might offer a pathway to lead to negative health outcomes such as depression (Gianferante et al., 2014). Unexpectedly, the sexual abuse subtype was not associated with rumination and depression/anxiety in our correlational analysis. It might have caused the characteristics of study population or data distribution (skewed). Despite of skewed distribution of sexual abuse, the present study chose "sexual abuse" as a factor to confirm the role of the development of mood-related symptoms regarding the importance of sexual abuse as a subtype of the CTQ. Further studies in general population with less skewed distributed data are needed to clarify the role of sexual abuse.

The present study showed the mediating role for rumination including each subtype from childhood trauma to various mood related conditions. Depressed mood has been triggered by life events that were associated with self-reproach (Maj and Sartorius, 2002). The self-reproach is closely associated with depressed mood and high distress (Zahn et al., 2015). The contemplation, another subtype of rumination, was associated with levels of anxiety symptoms (Dozois et al., 2004). Moreover, higher Contemplation was also related to significantly greater recognition of the negative consequences of worry (Dozois et al., 2004).

The focused attention on the symptoms of one's mood was associated with the mood conditions in bipolar disorder (Gruber et al., 2011).

Possible Female Dominance in the Role of Rumination

In the present study, the mediation effect of rumination was more predominant in females compared with male participants. In male participants, the direct effect in path model was much larger than that of female (0.40 vs. 0.20). Moreover, the moderating effect of sex in the path model was different in our additional analysis regarding to sex ($p = 0.11$ for the limitation model of moderating effect analysis for sex). It means that the influence of sex on the mediating role of rumination is different in the relationship between childhood trauma and mood status. Women have a higher tendency to ruminate on their depressive symptoms and distress than do men (Nolen-Hoeksema, 2012; Johnson and Whisman, 2013). Our results showed that, in women, childhood traumatic experiences could result in more ruminative cognitive responses and cause more distress and frequent development of mood problems compared with men. Indeed, women are twice as likely as men to develop mood instability (Leach et al., 2008). Our results suggest that female victims of childhood trauma are highly prone to mental health problems and that they require clinical interventions to their ruminative cognitive styles in order to prevent future mood problems. Our results should be interpreted with caution because there was also a significant indirect effect of rumination in the relationship between childhood trauma and

mood-related conditions in male cases and our larger sample sizes of female participants might affect the size of indirect effect. However, in the mediation model, the direct effect in male participants was larger than that of female participants. Regarding the proportion of direct/indirect effect in both sex groups, the female dominance in the role of rumination is plausible.

Cognitive behavioral interventions to reduce ruminative responses may help to prevent mood disturbances in individuals who have experienced childhood trauma.

There are some caveats in this study. First, subjects of the present study were non-clinical volunteers with various severity range of childhood trauma. Our results should be replicated in clinical subjects. Secondly, there was relatively small sample size for analysis of sex differences in the mediating role of rumination. Moreover, unequal sample sizes in each sex group might affect the results and limit interpretation of our results. A larger number of participants is a prerequisite to confirm our evidence. Thirdly, childhood trauma history was assessed retrospectively by self-report measures. However, regarding the stability and validity of retrospective self-reports of CTQ (Paivio, 2001), the chosen measure was suitable for our study. Additionally, our mediation model was cross-sectional in nature, which limits the causal relations among the assessed variables. Although our results suggest that rumination is a crucial mediator of the childhood trauma on various mood-related conditions, longitudinal prospective studies are needed to rule out other possible alternative mediators in the path model. Lastly, the present study did not use a structured clinical interview for screening possible psychiatric illness.

CONCLUSIONS

To our knowledge, this is the first study that elucidates a comprehensive model from childhood trauma to depression, anxiety and affective lability with mediating factors of rumination including each subtype. Our data showed that childhood trauma caused mood changes, which then induced anxiety, depression, and affective lability through direct and indirect paths. Additionally, female subjects showed a higher mediating effect of ruminative cognitive styles to the path between childhood trauma and above mood-related condition. Our results present an insight on intervention for ruminative cognitive styles to prevent of development of mood problems in individuals with childhood trauma.

AUTHOR CONTRIBUTIONS

JK is the first author. JK analyzed the data and wrote the paper. SL and SH designed the study and wrote the paper. WJ and MJ collected the data. SH reviewed and revised the paper. SL and SH are co-corresponding author and equally contributed to this study.

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Coping with Childbirth: Brain Structural Associations of Personal Growth Initiative

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Major life events require psychological adaptations and can be accompanied by brain structural and functional changes. The goal of the current study was to investigate the association of personal growth initiative (PGI) as a form of proactive coping strategy before childbirth, with gray matter volume after delivery. Childbirth is one of the few predictable major life events, which, while being one of the most positive experiences for many, is also accompanied by multidimensional stress for the mother. Previous research has shown that high stress is associated with reductions in gray matter volume in limbic cortices as well as the prefrontal cortex (PFC). We hypothesized that PGI before childbirth is positively related to gray matter volume after delivery, especially in the ventromedial PFC (vmPFC). In a prospective study, 22 first-time mothers answered questionnaires about their PGI level 1 month before birth (T1) and 1 month after delivery (T2). Four months after giving birth, a follow-up assessment was applied with 16 of these mothers (T3). Structural brain data were acquired at both postpartal measurement occasions. Voxel-based morphometry was used to correlate prenatal PGI levels with postpartal gray matter volume. Higher PGI levels before delivery were positively associated with larger gray matter volume in the vmPFC directly after childbirth. Previous structural neuroimaging research in the context of major life events focused primarily on pathological reactions to stress (e.g., post-traumatic stress disorder; PTSD). The current study gives initial indications that proactive coping may be positively associated with gray matter volume in the vmPFC, a brain region which shows volumetric reductions in PTSD patients.

Keywords: personal growth initiative, structural MRI, vmPFC, proactive coping, PTSD, childbirth, posttraumatic growth, postecstatic growth

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INTRODUCTION

Major life events are often accompanied by high stress (Price and van Stolk-Cooke, 2015). They can disrupt our assumptions about the world in a way that requires fundamental cognitive changes to accommodate these experiences (Cann et al., 2010). One of the most impactful events across the life course of a woman is giving birth to a child (Mangelsdorf and Eid, 2015). Generally, most women consider childbirth as a positive experience (Neuhaus et al., 2002). However, it is accompanied by intense multidimensional stress for the mother (e.g., physical pain, emotional arousal, and psychological distress; Lowe, 2002) that can sometimes result in PTSD (4.6–6.3%; Dekel et al., 2017).

There are four psychological reactions that individuals show as an outcome of being exposed to highly stressful experiences. First, some individuals react with resilience and show nearly no psychological impairment (McFarlane and Yehuda, 1996). They bounce back to their original level of psychological functioning. Second, some people are affected by the experience to a degree, but are able to recover. They experience psychological impairment as a consequence of high stress and core belief disruption, but after a while find their way back to their original level of psychological functioning (Bonanno, 2005). In a recent study, Infurna and Luthar (2016) questioned the distinction between resilience and recovery trajectories, since depending on the analytical approach, they found less different trajectories than Bonanno (2005) using the same data. Third, the most extensively studied reaction to trauma exposure is post-traumatic stress disorder (PTSD; e.g., Foa et al., 2000; Yehuda, 2002). Individuals suffering from PTSD experience severe psychological impairment as a consequence of highly stressful events and recover very slowly, or not at all. In a meta-analysis on PTSD and childbirth, the prevalence of PTSD ranged from 1.3 to 2.4% at 1–2 months and 0.9 to 4.6% at 3–12 months postpartum (Andersen et al., 2012). Thus, for some women, childbirth can be a highly challenging event, associated with the risk of traumatization and post-traumatic stress.

Finally, some individuals react to high stress and core belief disruption with cognitive changes that excel their original level of psychological functioning. They not only recover from high stress, but also – after a period of adaptation – show posttraumatic (Tedeschi and Calhoun, 1996) or postecstatic growth (Roepke, 2013). Tedeschi and Calhoun (1996) introduced the concept of posttraumatic growth as a possible outcome of exposure to trauma. They found that some individuals report psychological benefits including deepened relationships, higher appreciation of life, more personal strengths, a stronger sense of meaning and spirituality, and more openness toward new possibilities. For a long time, this unidirectional approach established the idea that suffering might be a prerequisite for growth. Roepke (2013) revised this assumption by investigating the psychological consequences of life events with positive emotional valence. She found that also positive emotional peak experiences can be a catalyst for beneficial developments, especially in the areas of relationships, self-esteem, meaning, and spirituality. Roepke (2013) framed this psychological reaction to major life events with positive valence post-ecstatic growth.

Most studies that investigate posttraumatic as well as postecstatic growth were based on measures that rely on the retrospective self-perception of change (e.g., Tedeschi and Calhoun, 1996, 2004; Roepke, 2013). This circumstance has been identified by influential researchers in the field as one of the most critical methodological aspects in growth research since it entangles genuine growth with cognitive illusions (Frazier et al., 2009; Tennen and Affleck, 2009; Jayawickreme and Blackie, 2014, 2016). Thus, a critical question is how to measure the outcomes of stressful life events with other approaches but self-reports.

Whether individuals react to a stressful experience with resilience, recovery, PTSD, or growth depends on multiple factors, which all influence psychological reactions to stress.

Moderators of Stress

Various psychological, medical, and situational moderators that alter the stress level during labor, and consequently its psychological outcomes, have been investigated. De Schepper et al. (2016) examined obstetric, midwifery team care and personal risk factors for the development of PTSD after childbirth. They found that an external locus of control during labor as well as low socio-economic status were associated with higher PTSD scores, while spontaneous vaginal birth, the perception of the midwife being in control of the situation, and the possibility to ask questions were important preventive factors. In accordance with these findings, Cipolletta and Sperotto (2012) found in a qualitative study that further humanization in hospital settings (e.g., less machines in the room and a close relationships to the midwife) and the possibility of more personal agency improve women's experiences during childbirth.

Moreover, active coping has been identified as a critical mediator of exposure to highly stressful events, neuroendocrine regulation, and development of psychopathology in general (Olff et al., 2005). It is associated with good adaptation to stress, and thus can prevent psychological disorder (North et al., 2001; Olff et al., 2005) and may foster positive outcomes of stressful experiences. Schwarzer and Knoll (2003) distinguish four coping strategies: reactive coping (alluding to harm or loss), anticipatory coping (pertaining to imminent threat in the near future), preventive coping (focusing on uncertain threat in the distant future), and proactive coping (involving upcoming challenges that are self-promoting). They highlight the critical role of proactive coping as the prototype of positive coping that does not require negative appraisal, threat, or loss, but includes all efforts to develop general resources that facilitate processes striving for personal growth (Schwarzer and Knoll, 2003). Following this definition, one important proactive coping strategy and positive resource that can help people to cope and function successfully facing adverse events is personal growth initiative (PGI; Robitschek, 1998; Robitschek et al., 2012), which we have addressed in this research.

Previous neuroimaging studies mainly focused on brain structural differences relating to negative (traumatic) life events and possible negative consequences, including mental disorders (see Smith, 2005; Karl et al., 2006; Kühn and Gallinat, 2013). In contrast, structural MR studies related to the above-mentioned protective buffering factors, such as proactive coping mechanisms to brain structure, are lacking. The current study investigated the association of PGI, as a skill set that supports proactive coping, with the brain structure of young mothers.

Personal Growth Initiative

Critical life events such as childbirth pose a challenge to the individual. Schwarzer and Knoll (2003) distinguish the four different, above-mentioned coping strategies depending on two dimensions: (a) certainty of the event and (b) timing of the coping strategy. Reactive coping describes coping processes

following the event. Meanwhile, anticipatory coping, preventive coping, and proactive coping are prospective coping strategies, which are built and used before the event takes place. The authors define proactive coping as all efforts that a person undertakes in order to build universal resources which promote the advancement of personal growth and the accomplishment of critical goals (Schwarzer and Knoll, 2003). In contrast to reactive coping, proactive coping summarizes coping strategies which are developed and used before a challenging event occurs and are independent from the valence of the event encountered.

Robitschek (1998) introduced the concept of PGI as a critical antecedent for coping effectively with life challenges. PGI can be defined as a developed skill set for self-improvement that includes cognitive and behavioral aspects (Robitschek et al., 2012; Meyers et al., 2015).

Personal growth initiative (PGI) is a multidimensional concept that encompasses four subdomains: readiness for change, planfulness, using resources, and intentional behavior (Robitschek et al., 2012). Individuals with high PGI levels strive for personal growth, set realistic goals for their change processes, ask for help, and actively work on themselves to realize their goals. Individuals who display high levels of PGI experience more emotional, social, and psychological well-being (Robitschek and Keyes, 2009) and are less likely to suffer from depression, anxiety, and emotional distress (Robitschek and Kashubeck, 1999).

The main assumption underlying the concept is that individuals have an active and intentional role in their personal change processes (Robitschek et al., 2012). The PGI concept is based on the premise that effective coping and positive development following psychological challenges are at least partially based on intentional and motivational aspects. In summary, positive development does not happen by chance, but can be the result of intentionally striving for self-improvement.

Robitschek et al. (2012) state that PGI is expected to prevent psychological distress by providing a mindset that facilitates effective handling of difficulties. They argue that individuals with high PGI are more likely to perceive stressful events as opportunities for growth instead of threats. PGI encompasses cognitive and behavioral skills that include the belief that one can change one's circumstances, active planning, and goal-setting strategies directed toward attaining improvement (Robitschek et al., 2012). PGI enables individuals to assert some psychological control over their lives even under otherwise uncontrollable conditions. It may therefore represent a particularly adaptive mindset in adverse situations, which is conceptually similar to the construct of hope (Shorey et al., 2007; Blackie et al., 2015) and might therefore even go beyond the scope of a mere prospective coping strategy. Thus, possessing the skill set of PGI before stress exposure might prevent the development of high stress levels after major life events, and by this means buffer stress-related physical consequences.

It is important to distinguish psychological growth, as referred to in the concept of PGI, from growth concepts such as posttraumatic (Tedeschi and Calhoun, 1996, 2004) or postecstatic growth (Roepke, 2013). While PGI implies an ongoing process, thriving for self-improvement (Robitschek et al., 2012), posttraumatic and postecstatic growth can be defined as multidimensional psychological change processes caused by disruptive cognitive processes through major life events.

Brain Structural Changes after Highly Stressful Life Events

Most research on brain structural consequences of major life events focused on traumatic experiences, especially in individuals suffering from PTSD. Traumatic experiences are extraordinarily stressful events, and thus the research concerned dealt with the effects of high stress on the brain. Basic knowledge about the brains' response to stress comes from functional neuroimaging studies. These studies revealed that four brain areas are fundamentally involved in processing and regulating stressors in humans, namely hippocampus, prefrontal cortex (PFC), amygdala, and brainstem (cf., Dedovic et al., 2009).

Structural alterations in highly stressed populations (i.e., PTSD patients) are localized in similar areas: patients suffering from PTSD have smaller gray matter volume in cingulate, frontal, temporal, and limbic cortices (including the hippocampus and amygdala) compared to trauma-exposed and nontrauma-exposed healthy participants (Smith, 2005; Karl et al., 2006; Kühn and Gallinat, 2013). In a recent meta-analysis by Kühn and Gallinat (2013), four regions were found to show smaller volumes in PTSD patients compared to trauma-exposed controls: the anterior cingulate cortex, the ventromedial PFC (vmPFC), the hippocampus, and the temporal pole/temporal gyrus. Since most of these studies were cross-sectional, the question remains unanswered, if smaller gray matter volumes are an antecedent or consequence of PTSD.

Longitudinal data from animal studies depict various neurobiological effects of stress exposure on the function and structure of different brain regions such as the hippocampus and PFC (e.g., Magarinos and McEwen, 1995; McEwen and Morrison, 2013). Mediated among others by cortisol, stress exposure leads to cell atrophy and consequent decrease in brain volume in the affected regions (Magarinos and McEwen, 1995). Animal data indicate that volumetric differences observed in PTSD patients might reflect volume reductions due to psychopathological development following traumatic events.

In contrast to the literature focusing on traumatic events and highly stressed populations, few studies explored neuronal association of successful coping with stressful life events (e.g., Rabe et al., 2006). Rabe et al. (2006) investigated the relationship between posttraumatic growth and frontal brain asymmetry in survivors of motor vehicle accidents. They found that increased relative left frontal activation was positively associated with PTG. Meanwhile, no study has measured structural brain correlates of coping or resilience.

Aims of the Current Research

Major life events often cause high stress for the affected individual, which in turn requires effective coping and adjustment (Mangelsdorf and Eid, 2015). One of the main challenges of research which investigates the outcomes of major

life events is the unpredictability of many of these events. Giving birth is an exception in this regard, given that it is a relatively predictable life event associated with intensive multidimensional stress for the mother.

The present study investigates the association of PGI and brain structure in pregnant women transitioning into motherhood. The current investigation is the first study known to the authors that systematically investigated the association of PGI as a preventive coping strategy with gray matter volume.

Previous research on brain structural correlates of major life events has mainly focused on neural change relating to pathological development, such as PTSD (e.g., Smith, 2005; Karl et al., 2006; Kühn and Gallinat, 2013). In contrast, research into preventive factors that may buffer stress and counteract brain volume reductions is scarce. We hypothesized that prenatal proactive coping as a preventive factor for pathological reactions to stress is particularly associated with PFC volume. The PFC plays a critical role in the perception of controllability of stressful experiences (Salomons et al., 2007; Maier and Watkins, 2011; Maier and Seligman, 2016). Activation of the PFC enables top-down inhibitory control over limbic and brainstem responses to stressful situations (e.g., pain), while perceived controllability extenuates experienced stress (Maier and Watkins, 2011). Maier et al. (2006) exposed rats to uncontrollable shocks in a shuttle box escape task. These rats were not able to learn to escape shocks in a different situation that was controllable. Seligman and Maier (1967) termed this effect of inactiveness in the face of traumatic shock learned helplessness (Maier et al., 2006). Interestingly, Maier et al. (2006) added an experimental group that was also exposed to uncontrollable shock but received picrotoxin to activate vmPFC during experimental treatment. This group, even though previously exposed to high stress through inescapable shock, did not react with learned helplessness, but actively escaped the shock.

The prospective coping strategy PGI can be linked to the concept of controllability of stressful situations. Individuals with high levels of PGI should in theory have a stronger feeling of control over stressful situations. Hence, we hypothesized that prenatal PGI might be positively associated with brain volume in the PFC after childbirth.

MATERIALS AND METHODS

Participants

The participating women were a subsample of a larger study focusing on cognitive and neural changes throughout pregnancy and childbirth (peripartum period). Women who participated in the original study were invited to take part in the psychological online assessment in addition to the on-site tests and MR scans. Only healthy pregnant women who had never been pregnant previously beyond 8 weeks were enrolled. None of the participants had a history of neurological or psychiatric conditions. The study was conducted according to the Declaration of Helsinki, with approval from the Ethics Committee of the German Society for Psychology and the ethics commission of the Max Planck Institute for Human Development. The initial sample of the present investigation consisted of 22 women (age: $M = 28.09$, $SD = 3.15$). One subject had not only an outlier PGI score exceeding the 75 percentile by 1.5 times the interquartile range but also a conspicuous response style. The person answered nearly all items of the provided questionnaires with the highest possible option, with nearly no variance between the different items and finished the online questionnaire in a very short time. Therefore, this subject was excluded from further analyses. The results of the full sample including the outlier are provided in the Supplementary Table 1 for comparison. The final sample that took part in the prenatal online assessment (T1) and in the postpartal MR scans consisted of 21 women (age: $M = 28.19$ years, $SD = 3.19$). Some women ($n = 5$) dropped out after the first MR scan and did not take part in the follow-up assessment.

Design and Procedure

The present investigation was embedded in a longitudinal study assessing neural and cognitive change during the peripartum period. Within that study, women underwent cognitive and psychological assessment in the last weeks of pregnancy (T1). Structural imaging data were acquired from the same women about 1–2 months (T2) and about 4 months (T3) after childbirth. MR scans took place solely after delivery, due to medical concerns over scanning pregnant women. Participants who agreed to take part in the online-questionnaire assessment and underwent an MR scan in the first months after delivery were included in the present investigation. For these participants, PGI scores accessed before childbirth (T1) were correlated with postpartal gray matter volume (T2) in a whole-brain regression analysis. Additionally, PGI scores before childbirth were correlated with gray matter volume in the same area at T3. The online assessment at T1 was carried out about 20 days before delivery ($M = 19.69$, $SD = 10.66$). The imaging session at T2 was carried out 39 days after delivery ($M = 38.68$, $SD = 13.67$), while the imaging session with the reduced sample at T3 was carried out about 4 months after childbirth ($M = 135.59$, $SD = 29.17$).

Questionnaires and Online Assessment

Participants who took part in the psychological assessment were contacted via email and provided with a link to the online questionnaire, which was hosted on the survey software site Qualtrix. All questionnaires were provided in German. For that we used a translation–retranslation approach.

Personal Growth Initiative – Personal Growth Initiative Scale-II (PGIS-II; Robitschek et al., 2012)

The PGIS-II is a multidimensional 16-item scale that measures the degree to which individuals actively show initiative to thrive for personal growth. It includes four subscales: readiness for change (e.g., "I can tell when I am ready to make specific changes in myself."), planfulness (e.g., "I set realistic goals for what I want to change about myself."), using resources (e.g., "I ask for help when I try to change myself."), and intentional behavior (e.g., "I actively work to improve myself."; Robitschek et al., 2012). Participants indicated to which extent they agree with each of the 16 statements (Likert's scale ranging from 0 "disagree strongly"

to 5 "agrees strongly"). With $\alpha = 0.91$, the scale had a good internal consistency, which is comparable to the results of other studies (e.g., Thoen and Robitschek, 2013; $\alpha = 0.90$ and 0.91). The stability coefficient of the PGIS-II between T1 and T2 was $r = 0.64$ and $r = 0.74$ between T1 and T3.

As described above, one outlier PGI score was excluded before further analysis due to extreme data in all questionnaires and PGI scores exceeding 75th percentile by more than 1.5 times the interquartile range. The results of all analyses including the outlier can be found in the Supplementary Table 1.

MRI Data Acquisition

Magnetic resonance imaging (MRI) scans were acquired using a 3T Magnetom Tim Trio MRI scanner system (Siemens Medical Systems, Erlangen, Germany) using a 12-channel radiofrequency head coil. High-resolution anatomical images were collected using a T1-weighted 3D MPRAGE sequence (TR = 2500 ms, TE = 4.77 ms, TI = 1100 ms, acquisition matrix = 256 × 256 × 192, sagittal FOV = 256 mm, flip angle = 7°, voxel size = 1.0 mm × 1.0 mm × 1.0 mm).

MRI Data Analysis

Anatomical data were processed by means of the VBM8 toolbox[1] with default parameters by Gaser and the SPM8 software package[2]. The VBM8 preprocessing involves bias correction, tissue classification, and registration. The 'non-linear only' modulation was applied in order to preserve the volume of a particular tissue within a voxel by multiplying voxel values in the segmented images by the Jacobian determinants derived from the spatial normalization step. Images were smoothed with a full-width half-maximum kernel of 8 mm. Statistical analysis was carried out by means of whole-brain regression implemented in SPM8. Age and total intracranial volume were entered as covariates of no interest. The resulting maps were thresholded with $p < 0.001$ and a statistical extent threshold ($k > 1000$ voxels), correcting for non-stationary smoothness (Hayasaka and Nichols, 2004).

RESULTS

Descriptive Statistics

Table 1 displays the descriptive statistics of the different scales and the MR results at each time point. Further analyses focused on the PGI results of T1 in order to measure PGI as a preventive proactive coping strategy.

MRI Results

Due to the small sample size and the occurrence of tied ranks, Kendall's tau-b correlation coefficient (τ_b; Howell, 2006) was used to estimate the association of prenatal PGI level and postpartal gray matter volume. A whole-brain voxel-based morphometry (VBM) regression analysis revealed a cluster in the left vmPFC with a significant positive correlation with PGI scores at T1 ($\tau_b = 0.38$, $p = 0.02$; brain data acquired at T2; $p < 0.001$, $k > 1000$ voxels corrected for non-stationary smoothness; see **Figure 1**). No other regions were found to correlate positively or negatively with PGI. This effect also remained significant after Bonferroni correction.

In a confirmatory approach, the same vmPFC cluster, revealed in the whole-brain VBM regression with brain data acquired at T2, was used to estimate the association of PGI and vmPFC volume at T3. One-tailed Kendall's tau-b correlation confirmed a positive relation of prenatal PGI and vmPFC volume, but failed to meet statistical significance ($\tau_b = 0.20$, $p = 0.13$) in the reduced sample assessed 4 months after delivery.

DISCUSSION

The current study systematically investigated the relationship between prenatal PGI and postpartal brain structure. Mothers-to-be were provided with an online assessment approximately 1 month before birth, 1–2 months after delivery, and 3 months later. At the latter 2 time points, complementing MRI scans were realized. Individual differences in PGI scores were associated with gray matter volume in the vmPFC. Women with higher PGI scores before childbirth had larger vmPFC gray matter volume after delivery than those with lower PGI scores. The relation of prenatal PGI level and postpartal vmPFC volume was significant directly after delivery. However, it failed to meet significance at the follow-up assessment. This difference might be caused by participants dropping out, and consequently the diminished power of the analyses at T3. It is important to note that the correlational approach of this study does not allow assumptions about within-subject associations or causal relationships. However, the current findings give an initial indication of a positive connection between proactive coping and vmPFC volume, a brain region that is known to be impaired in individuals suffering from PTSD (Kühn and Gallinat, 2013).

The results allow different explanations, which will be addressed in more detail below.

Personal growth initiative (PGI), as a proactive coping strategy, might buffer the effects of exposure to high stress. This explanation is supported by psychological and neural evidence found in other studies. Proactive coping includes all efforts to build resources that promote successful mastering of future challenges and personal growth (Schwarzer and Knoll, 2003). Individuals with a high PGI level perceive potential stressors as opportunities for growth and cope with them by applying goal-directed and self-regulatory behaviors (Robitschek et al., 2012). This ensures a constructive path of action and increases the quality of functioning in the face of future challenges (Schwarzer and Knoll, 2003). Hence, individuals with higher PGI might be more resilient and experience less stress in critical and demanding situations, due to the resources and assets they have built.

The vmPFC is known to play a critical role in coping and resilience (Maier and Watkins, 2011). Studies on fear extinction in humans have found that the amygdala and vmPFC play

[1] http://dbm.neuro.uni-jena.de/vbm.html

[2] http://www.fil.ion.ucl.ac.uk/spm

TABLE 1 | Descriptive statistics.

PGIS-II T1		PGIS-II T2		PGIS-II T3		vmPFC T2		vmPFC T3	
M	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
4.11	0.37	4.12	0.46	4.15	0.42	0.5036443116	0.0517414991	0.5063973605	0.0510023263

PGIS-II, Personal Growth Initiative Scale-II, [1-6]; vmPFC, gray matter volume in the vmPFC.

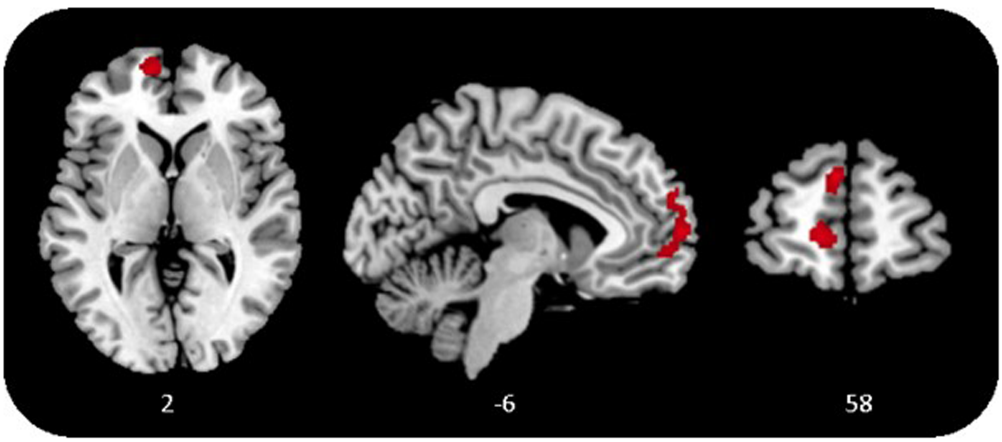

FIGURE 1 | Gray matter in the ventromedial prefrontal cortex (vmPFC) correlates positively with personal growth initiative (PGI), $p < 0.001$, $k > 1000$ voxels, corrected for non-stationary smoothness.

a critical role in the acquisition and extinction of fear (e.g., Phelps et al., 2004; Milad and Quirk, 2012). While amygdala activation is associated with acquisition and early extinction of conditioned fear, the vmPFC is related to the long-lasting retention of extinction (Phelps et al., 2004). In their recently published article, Maier and Seligman (2016) introduced their revised theory of learned helplessness. They stated that passivity in response to inescapable prolonged stress is the default reaction to stressful events. This automated response is mediated by the serotonergic activation of the dorsal raphe nucleus (DRN), which can be turned off by the vmPFC when a stressor is detected as controllable. Maier and Seligman (2016) conclude that the key mechanism in response to inescapable stressors is not learned helplessness but learned controllability, which is detected and exerted by the vmPFC. Hence, proactive coping strategies, such as PGI, may lead to vmPFC activation in the face of stressful experiences by increasing perceived controllability. Since brain function can shape the brain structure within the same region (May, 2011), it is likely that this process also influences vmPFC volume. Maier and Seligman (2016) identified the presence of control confronted with stressors as "the active ingredient, leading to the inhibition of threat-induced changes in limbic and brainstem structures." (*p*. 361). Since (chronic) high stress levels possibly cause structural changes (i.e., dendritic shrinkage) in the PFC (McEwen and Morrison, 2013), perceived control and resulting lower stress could mediate the association of PGI and vmPFC volume. Maier et al. (2006) found that preceding experiences with behavioral control over stress changes the vmPFC response to later stressors by also activating the vmPFC when the subsequent experience is uncontrollable. Maier and Watkins (2011) report that the experience of control over stressors alters the function of the vmPFC and associated brain regions: The changed activity of the vmPFC than inhibits stress-responsive structures and leads to stress resistance. Possibly, successful proactive coping that provides individuals with a sense of control over stressful experiences changes the vmPFC activation and consequently, in the long run, causes larger gray matter volume in this area. Hence, successfully coping with life challenges could influence their impact on the brain. From this explanation, PGI can be seen as a resilience factor, preventing stress and consequent neural losses.

An alternative explanation for the finding is that interpersonal differences in vmPFC gray matter volume are associated with cognitive and psychological functions that allow for a different extent of PGI. Yehuda et al. (2006) proposed that less gray matter volume could make individuals more vulnerable to the development of PTSD. The vmPFC plays an important role in counterfactual representations for future planning (Barbey et al., 2009). Hence, larger volumes might relate to differences in cognitive functions that are part of the PGI construct such as planfulness and intentional behavior. Participants who have greater PFC volume in the first place might – because of this biological asset – also have a greater capability for PGI. Following that explanation, PGI might not prevent individuals from losing brain volume under stress, but vmPFC volume might drive PGI levels, independently of the effects of stress.

Personal Growth Initiative and Resilience

The stability coefficients of the PGIS-II, which were lower for the second measurement time point than for the third, suggest that the birth experience has a short-term influence on PGI level. The data indicate that some mothers show increased PGI scores directly after birth, while others react with a drop in the PGI level or maintained their PGI scores. These transitions can be explained by the challenging character of the childbirth experience and the resulting short-term effects on coping strategies. The majority of young mothers consider their delivery retrospectively as a very positive (65.5%) experience (Neuhaus et al., 2002). Meanwhile, in some cases, the birth process itself is connected to high negative stress for the mother and in the worst case might be experienced as traumatic. In a prospective study with pregnant women, about 5.6% of young mothers experienced acute postpartum trauma symptoms that met the DSM-IV criteria for PTSD (Creedy et al., 2000). The large range of possible birth experiences and following psychological reactions, such as resiliency, recovery, PTSD, or growth, might explain why PGI measured shortly after childbirth drops, increases, or maintains its former level. It is likely that women who experience recovery or PTSD react with impaired PGI, while resilient mothers or those who experience growth might show no changes or increased PGI scores. At the same time, it would not be likely that these short-term psychological changes in PGI are instantly accompanied by changes in brain volume. Therefore, only PGI scores assessed before childbirth were included in the analyses, which mirror proactive coping strategies and not reactions to stress exposure. Since we cannot test these explanations in the current sample, because of the small sample size and its cross-sectional MRI design, these associations should be investigated in future studies with larger samples that have the power to measure the impact of different childbirth experiences and its outcomes on proactive coping in the form of PGI.

Limitations

Cross-sectional MRI Data

Even though the current study had a longitudinal design, ethical considerations prohibit scanning women during pregnancy. Therefore, it was not possible to acquire neural pre- and post-event MRI data (i.e., before and after childbirth). This methodological limitation prevents us from drawing definite conclusions about the causal relationship of the association between brain and PGI. Future longitudinal studies should aim to disentangle the association of PGI and vmPFC, as well as further investigate the association of both variables to the effects of stress.

Small Sample Size

An additional limitation of the study is its small sample size. Since childbirth is a highly stressful experience, emotionally and physically, for many women, recruitment for post-event MRI research is a challenge. However, since the described effects were found despite of the small sample size and the subsequent reduced power of the analyses, future studies should aim to replicate the findings.

Selectivity and Dropout

For this study, we recruited women who took part in the postpartum MRI scan. It can be assumed that this group is selective, since women who suffered from very high stress levels after birth or were longer hospitalized might not be included in this sample. The variance of the results might be limited by this fact. The additional dropout of five women might be responsible for the insignificant result at T3. Future studies should involve the hospitals in which the women give birth in order to reduce attrition rate and trace back systematic drop-out.

Outlook

The current findings complement studies investigating how vulnerability and resilience after trauma exposure affect the brain. While the present study does not allow to draw causal conclusions, the possibility that PGI might be a buffer against stress caused by major life events and a source of gray matter changes in the vmPFC should be further explored. It might be possible that enhancing PGI before highly stressful life events, such as childbirth, enables individuals to cope more effectively, influences stress as well as vmPFC volume, and decreases the risk of developing PTSD symptoms. These possibilities must be further investigated in appropriately designed studies in order to draw final conclusions.

The effect of specific trainings that aim to promote PGI, such as the intentional growth training (Thoen and Robitschek, 2013), should be investigated in longitudinal neuroimaging studies. Thoen and Robitschek (2013) developed the Intentional Growth Training (IGT) with the goal to enhance PGI and thus enable cognitive and behavioral self-change, leading to better mental health. Future research should not only investigate the psychological benefits of such training but also systematically assess its effect on coping with high stress and its effect on the brain. PGI might be a valuable resiliency factor, especially for normative life events where preparation is possible.

While childbirth is a life event with high stress, it is also connected to various other hormonal, psychological, and physical changes which might also influence gray matter plasticity. Therefore, the association of PGI and gray matter volume after major life events should also be studied in other contexts (e.g., military deployment, natural disaster, or severe illnesses).

Finally, future research should explore the relationship of PGI and PTSD, since both might relate to the same neural structure. Assessing PGI, brain volume and PTSD prevalence in a longitudinal study design would allow the investigation of potential causal relationships between the three variables. This could help to discover preventive mechanisms for PTSD development and thus be of high clinical relevance.

CONCLUSION

The current study set out to investigate how PGI and gray matter volume after childbirth are interrelated. PGI before birth was positively associated with postpartal gray matter volume in

the vmPFC. This relation was significant in the larger sample assessed directly after delivery, and positive but not significant in the smaller sample 4 months later. Therefore, the current study should be seen as an initial indication and critical first step in broadening our understanding of neural correlates of proactive coping. Since a smaller volume of gray matter in this region is known to be related to high stress and PTSD, the finding suggests a new perspective on neural correlates of stress, focusing on coping and resilience. A broad body of research described the relation of small gray matter volume and potential neural losses after trauma exposure. Starting from our findings, future research should in addition consider the possibility of psychological and neural protection factors concerning major life events. The skill set of PGI is not specific to childbirth, but rather a universal tool. Hence, it can be presumed that it would also be beneficial in various other contexts. Investigating coping and protective psychological factors might not only inform research on PTSD prevention, but also unveil how to foster positive development across the life span.

AUTHOR CONTRIBUTIONS

JM developed the original research idea, collected the questionnaire data, and collaborated with the team of the MotherBrain study at the MPIB, Berlin, who provided the brain data. Additionally, JM performed the statistical analyses reported in the article except for the extraction of the brain data and the whole-brain regression analyses that were conducted by the MPI team. JM wrote and submitted the article.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2017.01829/full#supplementary-material

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The Role of Co-occurring Emotions and Personality Traits in Anger Expression

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The main aim of the current study was to examine the role of co-occurring emotions and their interactive effects with the Big Five personality traits in anger expression. Everyday anger expression ("anger-in" and "anger-out" behavior) was studied with the experience-sampling method in a group of 110 participants for 14 consecutive days on 7 random occasions per day. Our results showed that the simultaneously co-occurring emotions that buffer against anger expression are sadness, surprise, disgust, disappointment, and irritation for anger-in behavior, and fear, sadness and disappointment for anger-out reactions. While previous studies have shown that differentiating one's current affect into discrete emotion categories buffers against anger expression (Pond et al., 2012), our study further demonstrated the existence of specific interactive effects between the experience of momentary emotions and personality traits that lead to higher levels of either suppression or expression of anger behavior (or both). For example, the interaction between the trait Openness and co-occurring surprise, in predicting anger-in behavior, indicates that less open people hold their anger back more, and more open people use less anger-in behavior. Co-occurring disgust increases anger-out reactions in people low in Conscientiousness, but decreases anger-out reactions in people high in Conscientiousness. People high in Neuroticism are less likely to engage in anger-in behavior when experiencing disgust, surprise, or irritation alongside anger, but show more anger out in the case of co-occurring contempt. The results of the current study help to further clarify the interactions between the basic personality traits and the experience of momentary co-occurring emotions in determining anger behavior.

Keywords: anger expression, anger in and anger out, experience sampling, personality, momentary emotions, co-occurring emotions, cross-level interactions

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THE ROLE OF CO-OCCURRING EMOTIONS AND PERSONALITY TRAITS IN ANGER EXPRESSION

Anger is one of the most common negative emotions and it is experienced about 10% of the time (Trampe et al., 2015). The experience of anger has been described as an emotional reaction to a perceived threat to an individual's emotional well-being (Beck, 1999) and can be summarized as "the experience of something unpleasant and that has obstructed one's reaching one's goals, which event was felt to be unfair but inevitable, and for which someone else is to blame"

(Frijda et al., 1995, p. 139). Anger has been conceptualized as a social emotion that emerges in response to the actions of other people (Averill, 1982; Frijda, 1993).

The experience of anger may vary from mild irritation to intense fury, and is accompanied by physical reactions indicating autonomic nervous system arousal (Spielberger, 2010). Previous research has suggested many factors as antecedents to, or moderators of, the anger experience, such as the perception of a threat to, or an injustice against, oneself (Skarlicki and Folger, 1997). The experience of anger may also result from an appraisal of external stimuli as threatening (Huesmann, 1998), or from the perceived violation of a socially acceptable behavior or other social stressor (Berkowitz and Harmon-Jones, 2004). In the context of close relationships, anger can be triggered by a fear of being abandoned, reflecting an underlying continuing desire for connection (Dallos and Vetere, 2009).

The experience of anger, however, must be separated from the expression of anger. Differently from other biologically-based response tendencies (e.g., reflexes), emotions only predispose people to act in a certain manner: they do not force people to do so (Gross and John, 1997). Thus, appraisal of an anger-provoking or frustrating situation triggers the anger experience which, in turn, generates different behavioral responses. In research on anger expression, the distinction between "anger-in" and "anger-out" behavioral reactions is most frequently made. People are classified as "anger in" if they tend to suppress their anger or to direct it toward themselves or "anger out" if they direct their anger outward and express it toward other people or the environment (Funkenstein et al., 1954; Spielberger et al., 1985). Anger-in and anger-out reactions are not conceptualized as opposite poles of one dimension, but rather as two distinct processes that may even have different genetic mechanisms (Guo et al., 2015). The expression of anger is argued to be highly controlled and frequently suppressed or replaced by socially appropriate expressions, and, as a result, only a small proportion of anger experience results in overtly aggressive behavior (Averill, 1983). The purpose of anger-out expression is often to correct injustice, to stand up for oneself, or to change a situation in order not to feel antagonistic emotions. In general, the overt expression of anger may have a negative effect on social interactions, except in some specific situations, such as short term negotiations among strangers (Van Kleef et al., 2004). Anger-in expression, however, often refers to anger suppression for the sake of maintaining good relationships.

What are the factors that lie behind people's reactions if they experience anger? It has been suggested that both anger experience and expression depend on situational (e.g., another person's misdeeds, physical and psychological distress) and dispositional factors (e.g., intrapersonal demands, low agreeableness, high neuroticism); there is, however, little insight into the interplay between the two (Affleck et al., 1999; Mazerolle et al., 2003; Kashdan et al., 2016). It has also been suggested that experiencing one emotion (i.e., anger) can instantly elicit other emotions that interact with the prevailing emotion (Izard, 1972). Emotions are experienced in a mixed way as a response to the contrasting affective qualities of one external event (Russell, 2003). There is also some evidence from anger communication studies that the expression of anger may be influenced by a wide array of situational and contextual factors (Sanford, 2012), but further evidence is needed about the effects of the specific interactions between underlying personality traits and concurrent feelings. Among other things, a better understanding of the influence of the emotional palette co-occurring with anger would be useful for emotion-focused intervention programs. This is why, in the current study, we aim to examine the role of co-occurring emotions and personality traits in anger expression. The use of an experience sampling research design allows us to explore anger behavior in an everyday context, and to include personality traits as individual explanatory characteristics. Below we explain how co-occurring emotions and personality traits might be relevant in anger expression.

The Role of Co-occurring Emotions in Anger Expression

There is growing interest in the interplay between emotions that are experienced and the way in which they affect people's behavior. Co-occurring emotions are simultaneously arising emotional states which maintain their discrete characteristics of valence and intensity (Harley et al., 2012). Concurrent feelings about the same object or event are also defined as mixed emotions, usually a pair of emotions with the opposite valence (Berrios et al., 2015). For instance, the expression of emotions has been found to depend on the general affective context, which reflects the emotional experiences of previous periods, averaged across multiple assessments (Sanford, 2012). Previous research has suggested that the experience of anger is frequently blended with the experience of other emotions, such as sadness, fear, disgust, and surprise (Berkowitz and Harmon-Jones, 2004; Trampe et al., 2015). It has also been found that the perception of so-called "hard" emotions (e.g., anger, irritation) expressed during communication dominates co-occurring "soft" emotions (e.g., sadness, disappointment) (Sanford, 2012). In addition, anger has been found to be frequently accompanied with disappointment. Both of these emotions are similar in valence and intensity, but are linked to different appraisals and elicit different behaviors (Lelieveld et al., 2012). Trampe et al. (2015) found that the experience of anger most frequently co-occurs with the feelings of sadness and disgust, while the experience of anger tends to inhibit the experience of joy and other positive emotions. Sanford (2012) reported that the simultaneous experience of soft negative emotions (i.e., sadness) has no effect on the expression of hard emotions (i.e., anger), but the presence of hard emotions affects the expression of soft emotions. Previous studies have also shown an interaction between the expression of anger and the experience of fear, with angry communications themselves inducing fear in a communication partner (Van Kleef et al., 2004). The feeling of fear is related to perceptions of risk (Lerner et al., 2015). A fear of retaliation and an expectation of social disapproval have also been found to inhibit the expression of anger (Bandura, 1973; Berkowitz, 1993; Beck, 1999). It has been shown that induced fear leads to higher levels of anger, and induced sadness leads to lower levels of aggression (Zhan et al., 2015). Additionally, a study on the function of mixed

emotions (i.e., two opposing emotions) found that the experience of secondary mixed emotions promotes adaptive coping in stressful situations by lowering the perceived negativity of an adverse event (Davydov et al., 2011), and by supporting solution-oriented actions to handle adversity (Braniecka et al., 2014). For example, concurrent negative emotions in victims of stalking have been found to lead to the use of more effective coping strategies (Ngo and Paternoster, 2013). Thus, experiencing mixed emotions has been suggested to decrease distress felt, to help find meaning in life's stressors (Larsen et al., 2003), and to lead to greater emotional resilience (Tugade and Fredrickson, 2004). In addition, Bosch and D'Mello (2014) found that co-occurring affective states influence success in learning. Berrios et al. (2015) point to the need for further information about different situational activation patterns in mixed affective responses and the functionality of affective co-activation of emotion-related behavior. Although previous studies have implied what the functional effects of co-occurring and mixed emotions are, they cannot be detected in detail unless modeled explicitly. The current study aims to enrich the existing research by examining the role of co-occurring or simultaneously experienced emotions in anger expression.

The Role of Personality Traits in Anger Expression

Studying the associations between personality traits and affective states would enable us to detect which personality traits predispose individuals to the expression of anger. Previous research has shown that there are considerable individual differences in the disposition to experience anger ("anger-proneness") as well as to express it (Jones et al., 2011). State-Trait Anger Theory describes state anger as an immediate subjective experience and trait anger as a personality trait characterized by the tendency to experience frequent state anger (Spielberger, 2010). Accordingly, different constructs, such as trait aggressiveness, trait irritability, and trait anger, Type A personality, dissipation-rumination, impulsivity, and narcissism (Bettencourt et al., 2006) have been examined in relation to the experience and expression of anger. The Big Five personality traits are also often examined with regard to anger experience and expression, with anger experience being typically related to neuroticism and anger expression to agreeableness (Costa et al., 1989). It should be noted, however, that a recent study on anger experience in everyday life did not find any significant associations between the Big Five personality traits and daily anger experiences (Kashdan et al., 2016). A recent study by Pease and Lewis (2015) showed that neuroticism and agreeableness were associated with the trait-level components of the expression of anger, whereas conscientiousness and extraversion were linked to the more focal components of anger expression. In addition, the relationship between neuroticism and the expression of anger was moderated by agreeableness and conscientiousness. It has also been shown that emotion differentiation as a trait moderates aggressive responding by weakening the relationship between anger and aggressive reactions (Pond et al., 2012). Although personality research suggests an interaction between basic personality traits and emotion states (Costa et al., 1992; Pease and Lewis, 2015), almost no attention to date has been paid to interactive influences between personality and momentary emotions on the one hand and anger expression on the other. In the current study, it was predicted that the relationship between co-occurring emotions and anger expression would be moderated by personality traits. As previous studies have stressed the different pathways in anger expression-out vs. expression-in (Pease and Lewis, 2015), we expected emotion-personality moderators to be different for anger-in and anger-out behaviors. However, a more detailed picture of the influence of the specific emotions co-occurring with the anger experience would provide useful information about the exact nature of the links between co-occurring emotions and anger behavior.

The Aim of the Study

The main aim of the current study was to examine the role of co-occurring emotions, the Big Five personality traits, and the interaction between these in anger expression. First, based on the earlier research described above (e.g. Pond et al., 2012; Sanford, 2012; Pease and Lewis, 2015; Trampe et al., 2015), we predicted that the experience of fear, sadness, happiness, irritation, surprise, contempt, disgust, and disappointment would uniquely influence anger-in and anger-out behaviors. It was expected that so-called "hard" co-occurring emotions (i.e., irritation) would increase anger-out expression, and "soft" co-occurring emotions increase anger-in expression (i.e., sadness, fear), whereas emotions with the opposite valence (i.e., happiness, surprise) would decrease both anger-in and anger-out behaviors.

Second, we expected that the Big Five personality traits would improve the model fit in explaining anger behavior when also taking into account accompanying momentary emotions. Personality traits have been found to influence anger expression (Jones et al., 2011; Pease and Lewis, 2015), but there is little research to date on whether and which personality traits can explain any additional variance in anger behavior beyond the co-occurrence of anger and other affective states. It was predicted that high neuroticism and low agreeableness predict higher levels of anger expression, and conscientiousness would lead to lower levels of both anger-in and anger-out expressions.

Third, we were interested in examining possible cross-level interactions between the Big Five personality traits and momentary emotional experiences in predicting anger expression in everyday life. Previous studies have highlighted the importance of emotion differentiation in predicting aggressive responses (Pond et al., 2012) and the significance of interactions between personality traits (Pease and Lewis, 2015) and the experience of anger. Interactions may indicate inverse relationships between a predictor (e.g., discrete momentary emotions) and a dependent variable (e.g., anger-in vs. anger-out behavior), when moderated by a third variable (e.g., personality traits).

Taken together, the aim of the present study was to examine how the co-occurrence of momentary anger and other emotions, the Big Five personality traits, and cross-level interactions between the two factors are associated with anger-in and anger-out expressions in daily life.

METHOD

This study is a part of a broader research project exploring emotion experience in daily life (see also Kööts et al., 2011, 2012; Mill et al., 2016). The sample consisted of 110 participants (70 females and 40 males) with ages ranging from 19 to 84 years. All participants were ethnic Estonians and received about EUR 33 for taking part in the study. The sample was made up of two subsamples: one of older adults and one of university students. The older participants consisted of 42 females and 13 males and the age of participants in this group ranged from 61 to 84 years, with a mean age of 68.2 ($SD = 5.5$). The majority (73%) of the respondents was retired; about one-third (36%) of older respondents had higher education. The student group ($n = 55$; 28 females and 27 males) was made up of undergraduates from the University of Tartu; those majoring in psychology were not eligible to participate. The mean age of students was 21.3 ($SD = 1.0$), ranging from 19 to 23 years.

Procedure

The study consisted of 14 days of experiment by the experience sampling method (ESM) using iESP software. Participants were signaled 7 times per day (the time point was randomly chosen by the iESP software) during the average waking time from 8 a.m. to 8 p.m. to report their current emotions (i.e., up to 98 possible assessments per participant). There were 10,667 measurement trials across all participants, with an average of 97 measurement trials per participant. The response rate was 82.8%, which is considered to be in the normal range for an experience-sampling study (Zelenski and Larsen, 2000).

Measures

State-Level Measures

Participants were asked to indicate on a 4-point Likert-type scale (1–*not at all* to 4–*to a large extent*), as used in other ESM studies (Mroczek et al., 2003; Gerstorf et al., 2009; Thompson et al., 2011), the extent to which each of the measured emotions (anger, happy, contempt, disgust, fear, sadness, disappointment, irritation and surprise) described their current emotional state as quickly and accurately as possible.

The expression of anger was measured by the following three statements. When I was angry, (1) I kept the anger inside me; (2) I expressed my anger; (3) I tried to maintain self-control (The three options describe anger in, anger out, and anger control, respectively). All three statements were answered on a four-point scale from 1–*not at all* to 4–*to a large extent*. In the current study, the anger-in and anger-out behaviors are the main factors of interest.

Trait-Level Measures

At the beginning of the experiment, participants filled in the Estonian version (Kallasmaa et al., 2000) of the Revised NEO Personality Inventory (NEO-PI-R; Costa et al., 1992). The NEO PI-R consists of 240 items that measure five broad factors—Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness—and their 30 facets. Each facet is measured by 8 items, and items are answered on a 5-point Likert scale, ranging from 0 *(strongly disagree)* to 4 *(strongly agree)*.

Analyses

As anger behavior episodes are nested within individuals, the data were analyzed by way of a multilevel regression analysis (Nezlek, 2007). The experience of anger and its co-occurring emotions, as well as the expression of anger, are measured at level 1 (state level), whereas personality traits are measured at level 2 (trait level). Methodologically, the aim was to carry out a multilevel regression analysis of the two distinct types of anger expression (anger in vs. anger out), by including the experience of anger and other momentary emotions as Level 1 explanatory variables, and personality traits as Level 2 measures. The multilevel model makes it possible to establish the increase in the explanation of individual differences in state anger implied by Level 2 factors. Also, it is possible to determine the specific contribution of different explanatory factors and interactions. More specifically, the aim of the multilevel regression analysis was to find the best predictors for the two types of anger expression, but also to determine what set of variables comprises the best model fit, providing the best explanation for momentary anger-in and anger-out behaviors (the parsimony of the different independent variables). The model included anger-in and anger-out behaviors as outcome variables; predictor variables consisted of momentary ratings of the experience of co-occurring emotions and their interactions with momentary anger (Level 1 predictors), and personality traits, and age were entered as Level 2 predictors. As is common in the predictive approach, variables were retained in the model on the basis of statistical significance and model efficiency (Heck et al., 2010). To assess improvement in model fit by comparing three successive models, maximum likelihood estimation was used (Heck et al., 2010). A series of multilevel models was conducted in the Mixed module of IBM SPSS 20.0: first the null-model was created, followed by the Level 1 predictors model (momentary emotions), and the Level 2 predictors model (personality and age) including cross-level interactions as predictors. In the equations of multilevel models predicting anger behavior, the (*i*) refers to momentary recordings of anger behavior and (*j*) refers to each individual, as the observations were nested within participants. The anger behavior *i* of participant *j* can be represented as follows, with β_{0j} as the intercept and ε_{ij} as variation in estimating the momentary anger behavior of participants:

$$Y_{ij} = \beta_{0j} + \varepsilon_{ij}$$
$$\beta_{0j} = \gamma_{00} + u_{0j}.$$

The null model, providing the estimated mean anger behavior for all participants and partitioning variance between Level 1 (ε_{ij}) and Level 2 (u_{0j}), is represented as:

$$Y_{ij} = \gamma_{00} + u_{0j} + \varepsilon_{ij}$$

Next, a Level 1 model was built with momentary emotions (i.e., anger plus the other six basic emotions) as within-person predictors of anger behaviors. The within-person random

intercept model was defined as follows, suggesting that, at the within-person level, anger behavior is related to experienced momentary emotions:

$$Y_{ij} = \beta_{0j} + \beta_1(\text{anger})_{ij} + \beta_2(\text{fear})_{ij} + \beta_3(\text{sadness})_{ij} + \beta_4(\text{surprise})_{ij} + \beta_5(\text{disgust})_{ij} + \beta_6(\text{disappointment})_{ij} + \beta_7(\text{contempt})_{ij} + \beta_8(\text{irritation})_{ij} + \beta_9(\text{happiness})_{ij} + \beta_{10}(\text{anger*fear})_{ij} + \beta_{11}(\text{anger*sadness})_{ij} + \beta_{12}(\text{anger*surprise})_{ij} + \beta_{13}(\text{anger*disgust})_{ij} + \beta_{14}(\text{anger*disappointment})_{ij} + \beta_{15}(\text{anger*contempt})_{ij} + \beta_{16}(\text{anger*irritation})_{ij} + \beta_{17}(\text{anger*happiness})_{ij} + \varepsilon ij.$$

As the research model of the current study proposes that the relationship between momentary emotions and anger behavior may vary across individuals, a person-level random intercept model was built, based on the assumption that dispositional factors (i.e., personality traits and age) impact the remaining variability in anger behavior between people. At the between-person level, the facets of the Big Five personality traits and age were added to the model to explain the remaining variability in anger behaviors between individuals:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}(\text{fear})_{ij} + \gamma_{02}(\text{sadness})_{ij} + \gamma_{03}(\text{happiness})_{ij} + \gamma_{04}(\text{surprise})_{ij} + \gamma_{05}(\text{contempt})_{ij} + \gamma_{06}(\text{disgust})_{ij} + \gamma_{07}(\text{disappointment})_{ij} + \gamma_{08}(\text{irritation})_{ij} + \gamma_{09}(\text{anger})_{ij} + \gamma_{10}(\text{anger*fear})_{ij} + \gamma_{11}(\text{anger*sadness})_{ij} + \gamma_{12}(\text{anger*surprise})_{ij} + \gamma_{13}(\text{anger*disgust})_{ij} + \gamma_{14}(\text{anger*disappointment})_{ij} + \gamma_{15}(\text{anger*contempt})_{ij} + \gamma_{16}(\text{anger*irritation})_{ij} + \gamma_{17}(\text{anger*happiness})_{ij} + \gamma_{18}(\text{neuroticism})_j + \gamma_{19}(\text{extraversion})_j + \gamma_{20}(\text{openness to experience})_j + \gamma_{21}(\text{agreeableness})_j + \gamma_{22}(\text{conscientiousness})_j + \gamma_{23}(\text{age})_j + u_{0j}.$$

For all analyses, the control variable of age was used, as it has been shown that emotion behaviors can be associated with aging effects (John and Gross, 2004; Mill et al., 2009). In terms of centering, grand mean centering (GMC) was used for all person-level variables, and, for continuous state-level variables, group mean centering (CWC) was used (Enders and Tofighi, 2007; Nezlek, 2007).

RESULTS

The Frequency of the Experience of Anger

The experience of anger (altogether recorded 660 times) was as follows: 475 incidences of slight anger (2–*to some extent*), 138 incidences of moderate anger (3–*to a moderate extent*), and 47 incidences of strong anger (4–*to a large extent*), $M = 2.27$ ($SD = 0.32$). On average, anger was experienced 5.98 times per person during the 2 weeks ($SD = 5.62$, ranging from 1 to 30 anger occasions).

First, the frequencies of experienced anger and other emotions were computed as the percentage of the time that people reported feeling an emotion. On average, people reported experiencing anger on 6.19%, fear on 8.13%, sadness on 21.50%, surprise on 22.76%, disgust on 8.21%, happiness on 67.95%, disappointment on 19.90%, contempt on 6.93%, and irritation on 25.95% of all measurement occasions. In general, the amount of time experiencing specific emotions in everyday life was similar to that reported in a previous study by Trampe et al. (2015).

We were also interested of co-occurrence of different emotions, referring to the frequency of situations in which participants rated the experience of respective emotions greater than 1 (*not at all*). The frequencies of co-occurring emotions when anger was experienced (660 episodes) were the following: fear 24.09%, sadness 58.79%, surprise 37.27%, happiness 46.36%, disgust 35.44%, disappointment 67.42%, contempt 33.03% and irritation 77.27%. The extent of co-occurrence of mixed and same valence emotions was at similar level as reported by previous studies for the mixed experience of sadness and happiness (Larsen et al., 2001; Moeller et al., 2018). When experiencing anger, people used anger-in behavior on 86% (568 cases) and anger-out behavior on 60% (393 cases) of measurement occasions; thus, anger is usually both held back and expressed (the correlation between anger-in and anger-out expressions was as high as $r = 0.78$, $p < 0.001$). The correlations between the experience of anger and anger-in/anger-out expressions were $r = 0.84$ and 0.85, respectively ($p < 0.001$). The descriptive statistics of predictor and dependent variables are shown in Appendix 1 in Supplementary Material.

Anger Behavior Explained by Experienced Momentary Emotions and Personality Traits

Next, we examined the effects of the co-occurrence of anger and other emotions and the Big Five personality traits on anger expression (in vs. out). In addition, we explored the mechanisms underlying the interaction effect of personality traits on the relationship between co-occurring momentary emotions and anger behavior.

To this end, a series of multilevel regression analyses were conducted.

In the first step of the multilevel regression analysis, we examined whether anger behaviors varied across people. The residual parameters of the no predictors model, describing the variance to be explained within groups, suggested that there was a significant variance to be explained at the within-person level both for anger-in and anger-out expression ($Z = 65.97$, $p < 0.001$ and $Z = 65.97$, $p < 0.001$, respectively). Also, the intercept parameters indicated that the intercepts varied significantly across people ($Z = 6.14$, $p < 0.001$, and $Z = 6.09$, $p < 0.001$, respectively for anger-in and anger-out expression). Thus, people differed from one another as well as varied within themselves in anger behavior, and we expected to understand these differences by exploring the effects of momentary and trait-level predictors.

The results of mixed models analysis, in terms of significance of predictors, are presented in **Table 1**.

The intercepts adjusted for Level 1 predictors were $Y = 0.25$ ($p < 0.001$) for anger-in and $Y = 0.15$ ($p < 0.001$) for anger-out expression. The experience of anger [$\beta_1 = 2.05$, $t_{(8,710)} = 120.53$, $p < 0.001$], disappointment [$\beta_6 = 0.04$, $t_{(8,687)} = 4.26$, $p < 0.001$], irritation [$\beta_8 = 0.04$, $t_{(8,688)} = 4.05$, $p < 0.001$] and momentary happiness [$\beta_6 = -0.01$, $t_{(8,687)} = -2.53$, $p < 0.05$], significantly predicted anger-in expression. This suggests that anger-in behavior is greater given the moment-to-moment increases in momentary disappointment and irritation over and above that is predicted by anger. Whereas, in case of co-occurring happiness there is less cognitive effort in holding anger inside oneself.

TABLE 1 | The null model and Level 1 fixed effects model of anger-in and anger-out behaviors.

Model	Predictors	Anger-in					Anger-out				
		Estimates of fixed effects					Estimates of fixed effects				
		Estimate	Std. Error	*df*	*t*	Sig.	Estimate	Std. Error	*df*	*T*	Sig.
Null model	Intercept	0.22	0.02	108	10.52	**0.000**	0.15	0.01	110	10.32	**0.000**
Level 1 predictors	Intercept	0.25	0.02	109	10.44	**0.000**	0.15	0.02	109	10.28	**0.000**
	Fear	0.01	0.01	8,687	1.12	0.262	−0.02	0.01	8,687	−2.01	**0.045**
	Sadness	0.01	0.01	8,687	0.61	0.540	−0.01	0.01	8,687	−0.82	0.410
	Happiness	−0.01	0.01	8,687	−2.53	**0.011**	−0.01	0.00	8,687	−1.89	0.059
	Surprise	0.00	0.01	8,687	−0.57	0.566	0.01	0.01	8,687	1.46	0.143
	Contempt	0.03	0.01	8,687	1.78	0.075	0.01	0.01	8,688	0.52	0.600
	Disgust	0.02	0.01	8,689	1.51	0.130	0.02	0.01	8,689	1.70	0.089
	Disappointment	0.04	0.01	8,687	4.26	**0.000**	0.01	0.01	8,687	2.20	**0.028**
	Irritation	0.04	0.01	8,688	4.05	**0.000**	0.05	0.01	8,688	7.39	**0.000**
	Anger	2.05	0.02	8,710	120.53	**0.000**	1.27	0.01	8,717	105.28	**0.000**
	Fear*Anger	−0.01	0.02	8,701	−0.31	0.754	−0.09	0.01	8,705	−6.22	**0.000**
	Sadness*Anger	−0.04	0.02	8,700	−2.34	**0.019**	−0.08	0.01	8,705	−7.34	**0.000**
	Happiness*Anger	−0.02	0.02	8,700	−1.17	0.243	−0.02	0.01	8,704	−1.48	0.139
	Surprise*Anger	−0.08	0.01	8,695	−5.34	**0.000**	0.02	0.01	8,698	1.72	0.086
	Contempt*Anger	0.01	0.02	8,696	0.67	0.502	0.00	0.01	8,699	−0.14	0.885
	Disgust*Anger	−0.19	0.02	8,702	−10.26	**0.000**	−0.07	0.01	8,707	−5.59	**0.000**
	Disappointment*Anger	0.07	0.02	8,698	4.77	**0.000**	−0.03	0.01	8,702	−2.29	**0.022**
	Irritation*Anger	−0.35	0.01	8,708	−23.47	**0.000**	0.00	0.01	8,715	−0.21	0.831

Bold values outline the significant results.

However, were also interested of within-person interactions of momentary emotions (Level-1 predictors) in order to assess the effects of emotions that co-occur with anger on anger-in and anger-out expression. There were following significant interactions between anger and co-occurring emotions of sadness [$\beta_{11} = -0.04$, $t_{(8,700)} = -2.34$, $p < 0.05$], surprise ($\beta_{12} = -0.08$, $t_{(8,685)} = -5.34$, $p < 0.001$], disgust [$\beta_{13} = -0.19$, $t_{(8,703)} = -10.28$, $p < 0.001$], disappointment [$\beta_{14} = 0.07$, $t_{(8,699)} = 4.76$, $p < 0.001$], and irritation [$\beta_{16} = -0.35$, $t_{(8,708)} = -23.47$, $p < 0.001$], in predicting anger-in behavior. Thus, the stronger the experience of anger, the more one tries to hold it back. In addition, the co-occurrence of several other emotions with anger seems to influence anger-in behavior—people are more likely to use anger-in behavior when feeling not only angry but also disappointed, whereas the co-occurrence of anger and sadness, surprise, irritation, or disgust leads to lesser engagement in anger-in behavior.

For anger-out expression, the significant predictors were the momentary experience of anger [$\beta_1 = 1.27$, $t_{(8717)} = 105.28$, $p < 0.001$], irritation [$\beta_8 = 0.05$, $t_{(8688)} = 7.39$, $p < 0.001$], fear [$\beta_2 = -0.02$, $t_{(8687)} = -2.01$, $p < 0.05$], and disappointment [$\beta_6 = 0.01$, $t_{(8687)} = 2.20$, $p < 0.05$]. There were also significant interactions between anger and following co-occurring emotions in predicting anger-out behavior: fear [$\beta_{10} = -0.09$, $t_{(8705)} = -6.22$, $p < 0.001$], sadness [$\beta_{11} = -0.08$, $t_{(8705)} = -7.34$, $p < 0.001$], disgust [$\beta_{13} = -0.07$, $t_{(8707)} = -5.59$, $p < 0.001$], and disappointment [$\beta_{14} = -0.03$, $t_{(8702)} = -2.29$, $p < 0.001$]. Thus, simultaneously experienced emotions have a significant influence on anger-out behavior–anger is less overtly expressed when the experience of anger is accompanied by fear, sadness, disgust, and disappointment. Interestingly, the direction of the effect of disappointment on anger-out reaction depends on levels of simultaneously experienced anger. Taken together, co-occurring emotions may influence anger-in and anger-out behaviors in different ways. Sadness and disgust, for example, make one hold anger expression back less, but also decrease the anger-out reaction. Disappointment, increases efforts to hold back anger, and also decreases anger-out reactions. Irritation decreases anger-in behavior, whereas sadness decreases only anger-out reactions.

The addition of within-person predictors did not reduce the within-group variability in anger-in and anger-out behaviors significantly. The intraclass correlation (ICC) as the ratio of between-groups variance to the total variance was also calculated (Heck et al., 2010). The ICC was $\rho = 0.28$ for anger-in, and $\rho = 0.23$ for anger-out, expression. There was considerable change in likelihood function between the null model and the level 1 model for anger-out behavior, suggesting that Level 1 predictors improved the model fit:−2*LL (-2*Log Likelihood) decreased from 20901 to 9600 for anger-in, and from 14488 to 3506 for anger-out, models. Yet, there was still significant variability to be explained both within and between people (at $p < 0.001$). This suggested that it would be meaningful to add person-level predictors that could explain this remaining residual variability in intercepts.

The addition of Level 2 predictors did not improve the models, the−2*LL was increased from 9600 to 9644 for anger-in and from 3506 to 3562 for anger-out behavior. The results of the

mixed models analysis with fixed predictors are presented in **Table 2**.

Regarding the predictors, anger-in behavior was influenced by Extraversion [$\gamma_{19} = 0.003$, $t_{(103)} = 2.35$, $p < 0.05$], Agreeableness [$\gamma_{21} = -0.003$, $t_{(102)} = -2.31$, $p < 0.05$] and Conscientiousness [$\gamma_{22} = -0.003$, $t_{(103)} = -2.22$, $p < 0.05$]. Significant predictors for anger-out were Neuroticism [$\gamma_{18} = 0.001$, $t_{(102)} = 2.03$, $p < 0.05$] and Agreeableness [$\gamma_{21} = -0.003$, $p < 0.01$]. The main effects for both anger-in and anger-out Level 2 models were statistically significant at $p < 0.001$, suggesting that anger-in and anger-out behaviors vary significantly as a function of co-occurring emotions and personality traits.

Moderating Effects of Personality Traits on the Association between Co-occurring Emotions and Anger Behavior

One of the main predictions of our study was that personality traits act as moderating factors on the relationship between co-occurring emotions and personality traits. It is possible that co-occurring emotions influence anger expression in a certain way for people with specific levels of personality traits. In order to investigate this, two-way interactions with a simple slope analysis between momentary emotions and personality traits were added to the Level 2 model. Interactions were probed across values of moderator variables according to techniques described by Dawson (2014).

As expected, the analyses revealed statistically significant Momentary Co-occurring Emotion x Personality interactions for both anger-in and anger-out behaviors, as presented in **Figures 1**, **2**.

A variety of interaction effects between momentary emotions and personality traits emerged for both anger-in and anger-out behaviors (Reinard, 2006). For anger-in behavior, there was an interaction between Conscientiousness and disgust, with people high in Conscientiousness using less anger-in behavior when feeling both angry and disgusted [$\hat{y} = -0.002$, $t_{(8,704)} = -2.54$, $p = 0.011$]. There was also an interaction between Conscientiousness and contempt—people low in Conscientiousness tended not to hold back anger when feeling contempt, whereas people high in Conscientiousness rather held their anger in, in the case of co-occurring contempt [$\hat{y} = 0.002$, $t_{(8,704)} = 2.22$, $p = 0.027$]. The co-occurrence of sadness, however, made people low in Conscientiousness not hold anger

TABLE 2 | The estimates of the Level 2 fixed effects model of anger-in and anger-out behaviors.

Model	Predictors	Anger-in					Anger-out				
		Estimates of fixed effects					Estimates of fixed effects				
		Estimate	Std. Error	*df*	*T*	Sig.	Estimate	Std. Error	*df*	*t*	Sig.
Level 2 predictors model	Intercept	0.25	0.02	103	11.57	**0.000**	0.15	0.01	103	11.05	**0.000**
	Fear	0.01	0.01	8,687	1.13	0.260	−0.02	0.01	8,687	−2.00	**0.045**
	Sadness	0.01	0.01	8,687	0.61	0.543	−0.01	0.01	8,687	−0.83	0.408
	Happiness	−0.01	0.01	8,687	−2.53	**0.011**	−0.01	0.00	8,687	−1.89	0.059
	Surprise	0.00	0.01	8,687	−0.57	0.567	0.01	0.01	8,687	1.47	0.142
	Contempt	0.03	0.01	8,687	1.78	0.076	0.01	0.01	8,688	0.52	0.602
	Disgust	0.02	0.01	8,689	1.52	0.128	0.02	0.01	8,689	1.71	0.087
	Disappointment	0.04	0.01	8,687	4.26	**0.000**	0.01	0.01	8,687	2.20	**0.028**
	Irritation	0.04	0.01	8,688	4.07	**0.000**	0.05	0.01	8,688	7.41	**0.000**
	Anger	2.05	0.02	8,707	120.56	**0.000**	1.27	0.01	8,712	105.32	**0.000**
	Fear*Anger	−0.01	0.02	8,703	−0.33	0.739	−0.09	0.01	8,707	−6.25	**0.000**
	Sadness*Anger	−0.04	0.02	8,702	−2.32	**0.021**	−0.08	0.01	8,705	−7.34	**0.000**
	Happiness*Anger	−0.02	0.02	8,701	−1.15	0.250	−0.02	0.01	8,704	−1.47	0.142
	Surprise*Anger	−0.08	0.01	8,696	−5.34	**0.000**	0.02	0.01	8,699	1.72	0.086
	Contempt*Anger	0.01	0.02	8,697	0.70	0.483	0.00	0.01	8,699	−0.11	0.909
	Disgust*Anger	−0.19	0.02	8,703	−10.28	**0.000**	−0.07	0.01	8,707	−5.61	**0.000**
	Disappointment*Anger	0.07	0.02	8,699	4.76	**0.000**	−0.03	0.01	8,701	−2.31	**0.021**
	Irritation*Anger	−0.35	0.01	8,707	−23.53	**0.000**	0.00	0.01	8,712	−0.28	0.783
	Neuroticism	0.00	0.00	102	1.67	0.098	0.00	0.00	102	2.03	**0.045**
	Extraversion	0.00	0.00	103	2.35	**0.021**	0.00	0.00	103	1.94	0.055
	Openness to Experience	0.00	0.00	102	−0.02	0.983	0.00	0.00	102	0.45	0.651
	Agreeableness	0.00	0.00	102	−2.31	**0.023**	0.00	0.00	102	−2.99	**0.003**
	Conscientiousness	0.00	0.00	103	−2.22	**0.029**	0.00	0.00	103	−0.96	0.337
	Age	0.00	0.00	102	0.49	0.626	0.00	0.00	102	1.12	0.267

Bold values outline the significant results.

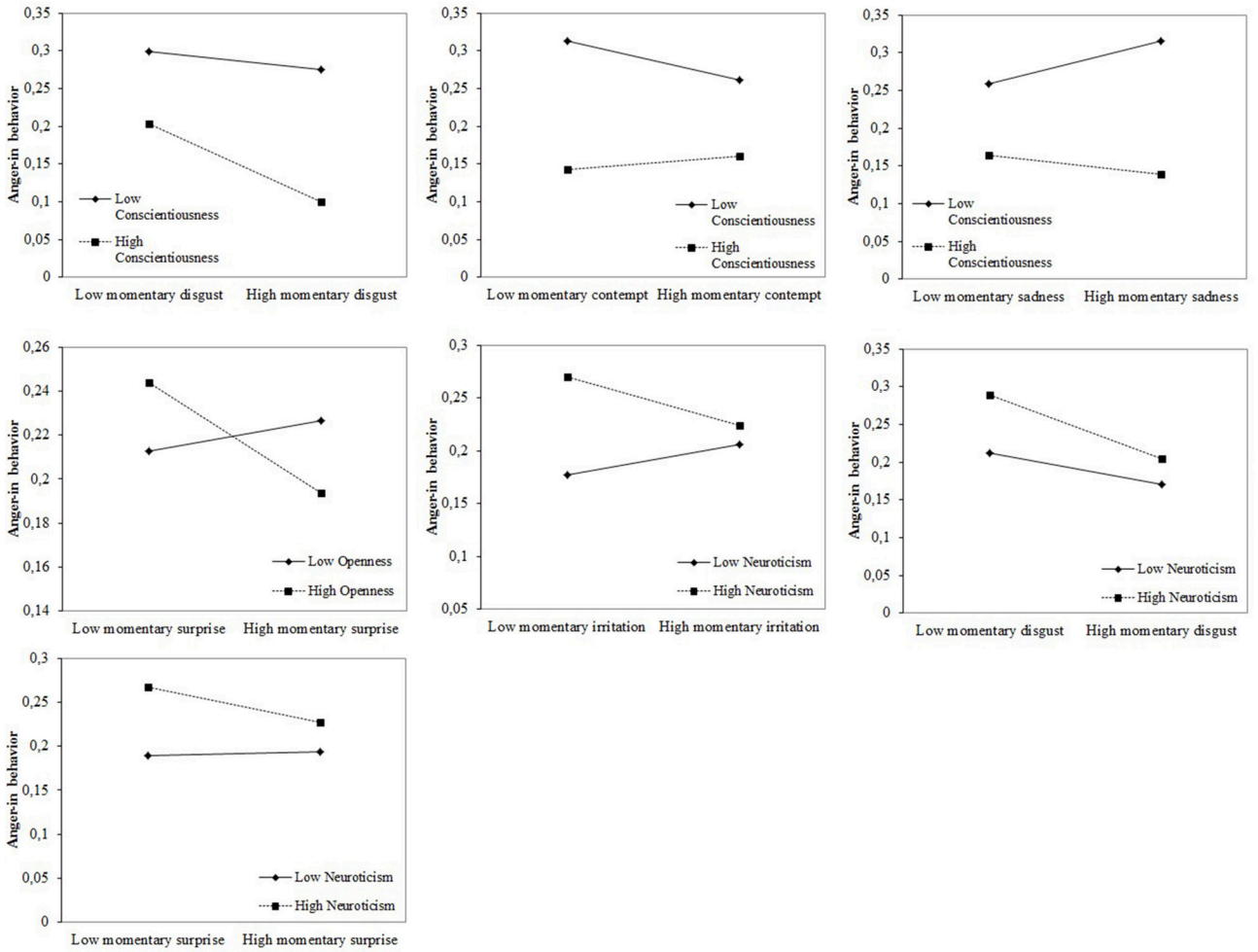

FIGURE 1 | Statistically significant interactions between momentary emotions and personality traits in predicting anger-in behavior.

in, whereas, for people high in Conscientiousness, there was the opposite effect [$\hat{y} = -0.001$, $t_{(8,704)} = -2.87$, $p = 0.004$; see **Figure 1**]. There was also an interaction effect between Openness and surprise, with people high in Openness holding less anger in when feeling momentary surprise, whereas for people low in Openness, the experience of momentary surprise made them more engaged in anger-in behavior [$\hat{y} = -0.001$, $t_{(8,704)} = -2.40$, $p = 0.016$]. There was an interaction effect between Neuroticism and irritation, with people high in Neuroticism holding less anger in when not being irritated at the time, whereas people low in Neuroticism showed more anger-in behavior when also experiencing irritation [$\hat{y} = -0.001$, $t_{(8,704)} = -3.15$, $p = 0.002$]. People high in Neuroticism hold anger less in when feeling both disgust [$\hat{y} = -0.001$, $t_{(8,704)} = -2.05$, $p = 0.041$] and surprise [$\hat{y} = -0.002$, $t_{(8,704)} = -2.24$, $p = 0.025$].

For anger out, there were also significant interactions between co-occurring momentary emotions and personality traits in determining anger reactions. There were interactions between conscientiousness and the momentary emotions of irritation [$\hat{y} = -0.002$, $t_{(8,704)} = -4.53$, $p < 0.001$] and disgust [$\hat{y} = -0.002$, $t_{(8,704)} = -4.35$, $p < 0.001$], with high Conscientiousness attenuating the link between irritation and anger-out reactions and disgust increasing anger-out reactions in people low in Conscientiousness, but decreasing anger-out reactions in people low in Conscientiousness. There was a similar interaction effect between Extraversion and disgust [$\hat{y} = 0.002$, $t_{(8,704)} = 4.01$, $p < 0.001$], the co-occurring feeling of disgust making introverted people not engage in anger-out behavior, whereas the effect was the opposite for more extraverted people. There was also an interaction between Openness and contempt [$\hat{y} = -0.001$, $t_{(8,704)} = -2.63$, $p = 0.008$], where the feeling of contempt reduced anger-out expression for people high in Openness. The influence of co-occurring momentary disgust is also moderated by Neuroticism [$\hat{y} = -0.001$, $t_{(8,704)} = -4.52$, $p < 0.001$], with people high in Neuroticism having lower levels of anger-out behavior when accompanied by disgust. More neurotic people have higher levels of anger-out behavior in the case of contempt [$\hat{y} = 0.001$, $t_{(8,704)} = 2.40$, $p = 0.017$], and less anger out when feeling surprise [$\hat{y} = -0.001$, $t_{(8,704)} = -2.47$, $p = 0.014$] or sadness [$\hat{y} = -0.002$, $t_{(8,704)} = -2.06$, $p = 0.039$].

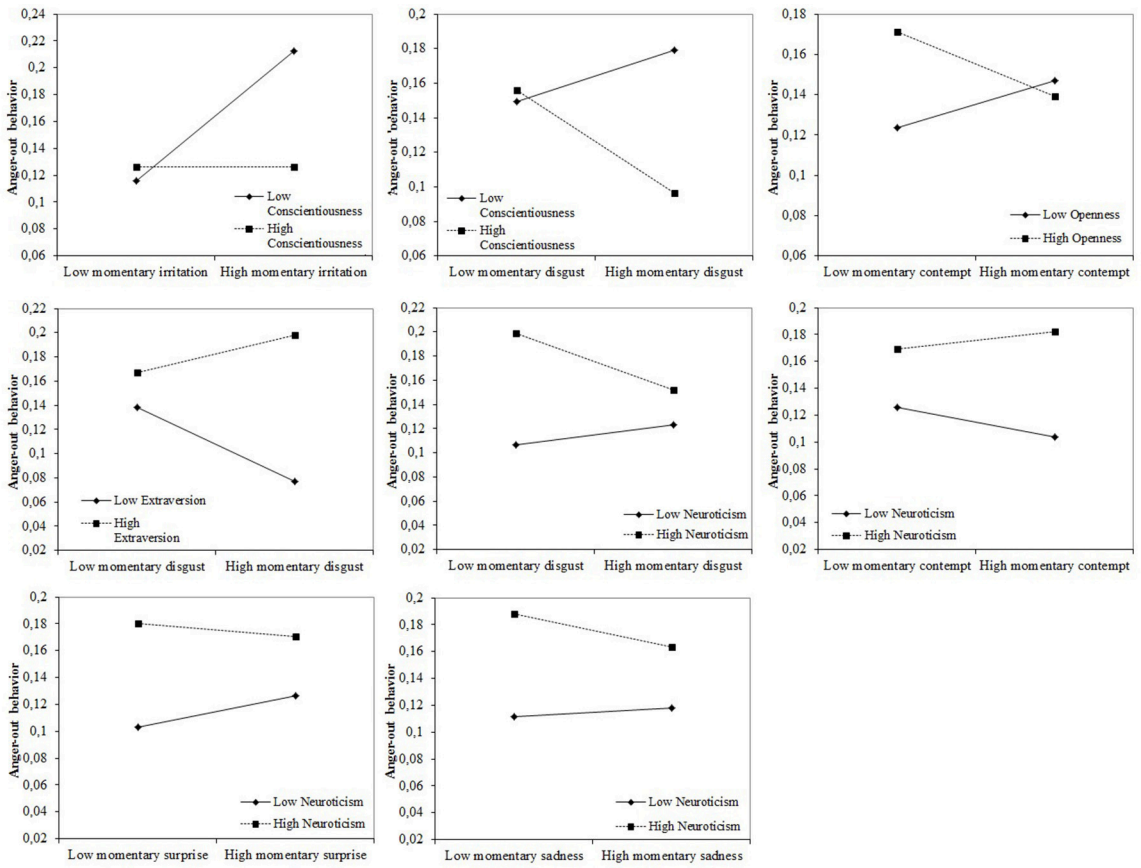

FIGURE 2 | Statistically significant interactions between momentary emotions and personality traits in predicting anger-out behavior.

DISCUSSION

The main objective of the current study was to capture and explore the functional role of co-occurring emotions, personality traits, and the interaction of these in explaining the anger behavior (anger in and anger out) in people's everyday lives. By using an experience sampling approach, we conducted a comprehensive examination into how discrete momentary emotions are related to anger behavior. The results suggest that some co-occurring emotions are important predictors of both anger-in and anger-out behaviors, such that disgust, for instance, reduces both anger-in and anger-out reactions. Thus, it can be that when one is feeling disgusted together with anger, there is less cognitive effort directed to not displaying one's feelings, and the overt display of anger is also weaker. The pattern is similar for sadness. Disappointment, however, has different effect, meaning that when people are not only angry but also disappointed, they are more likely to direct their anger inwards and less outwards. Also, the co-occurring emotions of sadness or irritation result in a stronger anger-in behavior, making it harder to deal with experienced anger. Whereas co-occurring fear reduces just the overt expression of anger.

Co-occurrence of Emotions and Anger Behavior

Anger is a multifaceted construct that can be experienced and expressed in a various ways, and anger behavior can be expected to be modified and influenced by different trait- and state-level interactions (Pease and Lewis, 2015). Previous studies have suggested that mixed emotions are felt about 33% of time, and there is interplay between emotions that are experienced simultaneously, where some emotions stimulate same-valence emotions and inhibit opposite-valence emotions (Trampe et al., 2015). Regarding anger expression, a study by Sanford (2012) suggested that only co-occurring "hard" negative emotions (averaged across different emotions, including irritation) have an effect on anger expression. However, our study aimed to explore the effect of specific co-occurring emotions on anger-in and anger-out reactions separately. Our analyses suggest that the pattern of influence of simultaneously felt negative emotions is more detailed and may lead to both anger expression and inhibition. Anger is less overtly expressed (anger out) when accompanied by feelings of disappointment, disgust, fear and sadness. Anger out is higher for people high in Neuroticism and low in Agreeableness. More neurotic people report expressing more, and more agreeable people less, anger out. People higher

in Extraversion report trying to hold back their anger (anger-in), whereas people high in Agreeableness and Conscientiousness report less effort in doing so. Thus, it appears that personality traits have a direct influence on anger in everyday life over and above momentary emotions, with distinct profiles for the effects on anger in vs. anger out. Our findings broadly support previous studies suggesting that there are dispositional factors that influence the etiology of anger experience and expression, personality traits of Neuroticism, Agreeableness, Extraversion and Conscientiousness can be seen as temporally stable psychobiological basis of behavior. Although a connection between personality traits and anger has been suggested in previous studies (Hofmans et al., 2008; Jones et al., 2011), a recent daily diary study by Kashdan et al. (2016) did not find a link between personality traits and the regulation of everyday anger.

The conclusions of our study are partly in accordance with the findings of a previous study by Sanford (2012): our results similarly indicate that the co-occurring hard emotion of irritation influences anger behavior by reducing anger-in reaction. However, in terms of the soft negative emotions, Sanford (2012) concluded that the presence of these has little influence on the expression of hard emotions. The results of our study clearly show that sadness and disappointment, which were included as soft emotions in Sanford's (2012) study, have a significant influence on anger expression, with disappointment increasing the effort required in holding anger back and decreasing the strength of the anger expression. It has been suggested that communicating disappointment instead of expressing anger has more positive consequences in social communication (Wubben et al., 2011). Disappointment is conceptualized to be felt as a response to unfulfilled positive expectations (an appraisal of self-blame for creating too high expectations), and is associated with a tendency to do nothing (Van Dijk and Van Harreveld, 2008; Reisenzein, 2009). Our results show that even the feeling of disappointment has an effect on anger communication. Thus, our study also suggests that co-occurring emotions should be considered in a detailed way, rather than as simply falling into the two categories of "soft" and "hard" negative emotions. Regarding the influence of specific emotions, surprise, disgust, sadness, disappointment, and fear have a significant effect on anger reactions not explained by personality traits. The direct role of these emotions in buffering anger behavior is in line with previous studies about the experience of mixed emotions, suggesting that there is a constant interplay between simultaneously felt emotions (Trampe et al., 2015). Taken together, our results demonstrate that the understanding of the effect of mixed emotions can be broadened to also include an influence on anger behavior.

Interaction between Co-occurred Emotions and Personality Traits in Predicting Anger Behavior

Although anger is an emotion that is experienced and expressed quite frequently by most people during everyday life, the general proneness to angry feelings has been found to differ widely across individuals (Kuppens et al., 2007). In the current study we observed evidence for moderation between co-occurring emotions and personality traits. Recent study by Moeller et al. (2018) has shown that specific positive and negative emotions tend to occur together during daily life and people are often feeling different and opposite valence emotions at the same time. It is important to understand the effects of co-occurrence of emotions. In our study, the emotions simultaneously felt together with anger had a moderating effect on the pathway between personality and anger expression. It was found that anger is less held back (anger in) when accompanied by happiness and disgust, and held back more when accompanied by disappointment. At the dispositional level, people with higher Extraversion and lower Agreeableness and Conscientiousness report more anger-in expression. Additionally, interactions between personality traits and momentary emotions indicate that the influence of some emotions (i.e., disgust, contempt, sadness, surprise, and irritation) is moderated by personality traits.

The effect of the co-occurrence of certain emotions with anger on anger expression, however, is moderated by specific personality traits, with some emotions increasing anger-in or anger-out reactions only in the case of specific trait levels (i.e., irritation increases anger-out reactions only in people low in conscientiousness). For some emotions, the effect is stronger in the case of specific trait levels (i.e., people tend to hold their anger in less when it is accompanied by disgust, but the effect is stronger for people high in conscientiousness, and there is a similar interaction between disgust and neuroticism). In some cases however, there is an antagonistic moderating effect, suggesting that the effect of emotion on anger behavior is high vs. low depending on personality trait levels (i.e., people high in Extraversion show more anger out compared to people low in Extraversion, but the effect is much stronger in the case of co-occurring disgust). In addition, the effect of co-occurring emotion on anger behavior can be reduced by an interaction with personality (i.e., people high in Openness express more anger out compared to people low in Openness, but that difference is reduced in the case of co-occurring contempt). Thus, the results are the first to demonstrate interactions between the co-occurring emotions and personality traits that influence anger behavior, and these interactions are different for anger-in and anger-out behaviors. Taken together, previous studies have suggested that emotion differentiation buffers against anger expression (Pond et al., 2012). Our study provides more detailed evidence of how co-occurring feelings together with personality traits differentially influence anger behavior in everyday life. This means that stable traits and variable states together create the emotional reaction during anger-inducing situations. Possible mechanisms underlying the obtained results are related to emotion processes and situations when blends of same or different valence emotions are elicited (Gonzalez et al., 2017). Appraisal theories argue that emotion episode is a dynamic process during which the organism evaluates the events and consequences in a series of appraisal checks that results in a unique, context- and individual-specific feeling state (Scherer, 2013). The co-occurrence of different emotions can be explained by differing or even contradictory evaluations given during the appraisal checks. In the context of our results,

the co-occurring emotions reflect the context can be expected to be related to relevance and implication assessments. Whereas, personality traits can be expected to influence the coping potential determination and normative significance evaluations that take place during the appraisal process of experiencing emotions. These appraisal results drive the response patterning of intra- or inter-directed anger expression.

CONCLUSIONS, IMPLICATIONS, LIMITATIONS

While much of the research to date addressing the links between personality traits and anger has focused on between-person analyses, almost no attention has focused on whether personality traits show interactive influences with momentary emotions in terms of their effects on anger behavior. The model of the Big Five personality traits (Watson, 2000) as well as models of anger (Wilkowski and Robinson, 2008; DeWall et al., 2011) explicitly contain interactive elements between the two phenomena. Two main findings emerged in current study, which can serve to fill this gap in the literature. First, the co-occurrence of anger and disgust, fear, sadness and disappointment has a direct influence on anger behavior. The second main finding was that there are complex interactions between the momentary emotions of anger and disgust, contempt, surprise, sadness, and irritation, and the Big Five personality traits on anger expression. This demonstrates the complexity of the predictors of anger behavior in people's daily lives. In addition, our study also supported previous studies (Guo et al., 2015), suggesting that although anger in and anger out are clearly related emotion processes, there are also significant differences between the two, by demonstrating that anger in and anger out are influenced by different co-occurring emotions and emotion-personality interactions. Taken together, the current study is the first to date to show how multifaceted anger behavior in the real-world setting is. It is not the feeling of anger that makes one behave angrily, but rather it is the complex interplay of momentary emotions and personality traits.

The results have important implications for psychological interventions aiming to influence anger behavior. Anger behavior is a common problem not only in intimate relationships, but also in workplace communications, and there are different treatment programs aimed at dealing with anger (Wilkowski and Robinson, 2010). It is has been argued that there is a need to expand what is offered in anger management courses, which typically consist of psychoeducation, understanding anger appraisals and triggers, the experiences of anger, and its consequences (Illman and Brown, 2016). Our study suggests that anger management programs could also include an analysis of the emotions experienced simultaneously with anger and take into account people's personality traits at the facet level in order to understand their emotional reactions.

Lastly, it is important to consider the limitations of the current study. The use of self-reports in anger research may be influenced by social desirability and they depend on how people interpret the anger experience, their level of insight into their behavior, and the overall interpretation of the term "anger." In addition, the sample consisted of two age-groups, future studies could also include middle-aged subjects. Also, the use of single-item measures, not capturing the full spectrum of a construct, can be considered as a limitation of current study, and further research could expand the results using multi-item measures of anger expression.

Nevertheless, despite these limitations, we believe that our study helps reveal the interplay between the momentary emotions and personality dispositions behind anger behavior, and shows the advantages of including a range of co-occurring emotional states and dispositional traits in any effort at understanding daily anger.

ETHICS STATEMENT

The Research Ethics Committee of the University of Tartu approved the study, and all participants provided written informed consent. All the research procedures were conducted in accordance with the Declaration of Helsinki.

AUTHOR CONTRIBUTIONS

Conception and design of the work, the acquisition, analysis, and interpretation of data for the work: AM, LK-A, JA, and AR. Drafting the work or revising it critically for important intellectual content: AM, LK-A, JA, and AR. Final approval of the version to be published: AM, LK-A, JA, and AR.

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Work Stress and Depressive Symptoms in Fishermen With a Smoking Habit: A Mediator Role of Nicotine Dependence and Possible Moderator Role of Expressive Suppression and Cognitive Reappraisal

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This study examined pathways of influence between work stress, depressive symptoms, nicotine dependence, expressive suppression, and cognitive reappraisal in fishermen with smoking habits in Qionghai, Hainan province, China (N = 1068). These fishermen responded to multiple assessments a week before leaving on a deep-sea fishing trip, including a Mental Stressor Investigation Questionnaire (MSIQ), the Center for Epidemiological Studies Depression Scale (CES-D), the Russell Reason for Smoking Questionnaire (RRSQ), and an Emotion Regulation Questionnaire (ERQ). Structural equation modeling (SEM) analyses of the collected data in Mplus 7 showed that work stress and nicotine dependence were independent predictors of depressive symptoms. The relationship between work stress and depressive symptoms was found to be partially mediated by nicotine dependence and be moderated by cognitive reappraisal. The evidence suggests it advantageous to examine the need of work stress, nicotine dependence, and cognitive reappraisal when attempting to understand depressive symptoms in fishermen with a smoking habit. These findings suggest that improving nicotine dependence through work stress management and training in cognitive reappraisal could be utilized as effective modalities for improving depressive symptoms.

Keywords: work stress, depressive symptoms, nicotine dependence, expressive suppression, cognitive reappraisal, fishermen, smoking habit

INTRODUCTION

Fishing is a major traditional occupation, and fishermen often face difficult and dangerous working conditions at sea. Reported fatality rates in commercial fishing are high, relative to other occupations, in many countries, including China (214/100,000; China Fisheries Association), Australia (143/100,000; Cavalcante et al., 2017), and Poland (130.6/100,000; Jaremin et al., 1997b). Notably, Alaskan commercial fishermen in the United States have a mortality rate that is 28

times that of Alaskan workers as a whole (Thomas et al., 2001). The major causes of death at sea include vessels sinking, poor life-saving facilities, trauma, and limited access to qualified medical assistance (Jaremin et al., 1997a; Casson et al., 1998; Thomas et al., 2001; Garrone Neto et al., 2005). Fishermen are also at an elevated risk for several diseases, including musculoskeletal problems, noise-induced hearing loss, circulatory system diseases, and skin injuries (Jaremin et al., 1997a; Kaerlev et al., 2007; Percin et al., 2012). In addition, fishermen's health can be harmed by the dysregulated serum cortisol, cumulative sleep deprivation, and self-destructive behaviors as a result of persistent overwork at sea (Allegri et al., 1996; Szymanska et al., 2006; Gander et al., 2008). As to the depression in fishermen, two small-sample surveys of fishermen with otoneurological symptoms yielded high rates of depression (23.0 and 16.7%, respectively) (Zeigelboim et al., 2014, 2015).

Work-related stressors including heavy workloads, intense time pressures, latitude in decision-making, occupational risks, and lack of support from co-workers may have negative physical and psychological health effects (Melchior et al., 2007; Meszaros et al., 2013; Fan et al., 2015). Numerous studies have examined the effects of work stress in the development of depressive symptoms. For example, Wieclaw et al. (2006) observed that employees that were exposed to work-related threats and violence were more inclined to depression. Similarly, Magnavita and Fileni (2014) study in radiologists found that awareness of work-related stress was accompanied by a marked increase in depression risk. In addition, in nursing, work stress has been shown to contribute to low self-esteem, high perceived stress, and serious occupation burnout; factors that have been related to depressive symptom levels (Lee et al., 2013; Lin et al., 2016). Although fishermen work in an unpredictable and high-risk environment, few studies have addressed the work stress and the incidence of depression among fishermen.

High rates of cigarette consumption among fisherman could be related to their high occupational stress and long work hours (Fort et al., 2010). Physically, smoking is the main cause of several serious diseases, such as emphysema, chronic bronchitis, heart disease, and lung cancer. Psychologically, the relationships between smoking, stress, and depression are complicated. On one hand, nicotine dependence has been reported to be related to occupational stress, especially in high-stress fields (John et al., 2006; Chopra et al., 2015; Sandhu et al., 2016), and the use of tobacco has been found to be employed as a coping mechanism to maintain good performance despite stress and fatigue (Ndiaye et al., 2001; Lapeyre-Mestre et al., 2004; Dawson et al., 2012). On the other hand, in a study of 197 currently smoking and employed participants, Schmidt et al. (2010) found an inverse correlation between work pressure and nicotine dependence. Meanwhile, work-associated stress was found to be unrelated to nicotine dependence among law enforcement personnel (Priyanka et al., 2016). However, the relationship between smoking and stress in fishermen is rarely reported.

Persons with more severe nicotine dependence have been found to have higher rates of major depression (Breslau et al., 1991, 1994; Son et al., 1997; Khaled et al., 2009; Pedersen and von Soest, 2009). Additionally, a 2-year study of psychiatric patients showed that nicotine dependence also affected the severity of depressive symptom (Jamal et al., 2012). Likewise, persons with severely depressive symptoms may have an increased risk of nicotine dependence (Breslau et al., 1993; McKenzie et al., 2010; Trosclair and Dube, 2010; Scherphof et al., 2013). Some studies argue that nicotine dependence can predict depressive symptoms (Brown et al., 2000; Loprinzi et al., 2014), while others insist that depressive symptoms increase a risk of nicotine dependence (Lerman et al., 1996; Currie et al., 2001; Ong and Walsh, 2001; Dierker et al., 2015; Wang et al., 2016). The recent notion that comorbidity between nicotine dependence and depressive symptoms may reflect common factors related to both outcomes is widely accepted. Two twin studies suggested that nicotine dependence-depression comorbidity was influenced by common genetic risk factors (Fu et al., 2007; Lyons et al., 2008). Edwards et al.' 2011 study indicated that nicotine dependence and depression shared genetic and unique environmental influences, and the shared genetic liability resulted in co-variation between nicotine dependence and depression, with the former predicting the latter (Edwards and Kendler, 2012).

Beck's Developmental Model of Depression is one of the better models to explain the development mechanism of depression. According to Beck (2008), cognitive vulnerabilities such as dysfunctional attitudes constitute a predisposition to depression. On the basis of Beck's theoretical model, more cognitive vulnerabilities, including emotion regulation strategies have been reported.

Depression is a disorder of impaired emotion regulation, which is to say that the emotion regulation strategies are working as crucial components in the onset and maintenance of depressive symptoms (Campbell-Sills et al., 2006a,b; Kashdan et al., 2006). A dysfunction in the neural circuitry supporting adaptive regulation, including regions of the prefrontal cortex and amygdala, may play a decisive role in vulnerability to depression (Davidson et al., 2002; Drevets, 2003). In Gross' (1998) and Gross and Thompson (2006) process model of emotion regulation, two regulation strategies are represented as follows: Expressive suppression, referring to the inhibition of external cues to one's internal emotional state, is associated with reduced positive affect and life satisfaction, impaired interpersonal communication, and greater negative emotion in response to negative affective stimuli (Gross and Muñoz, 1995; Butler et al., 2003; Kashdan et al., 2006), which are common risk factors for depression (Sperberg and Stabb, 1998). Cognitive reappraisal, which is involved in reframing emotion-eliciting experiences or stimuli that dampen their impact, is effective in reducing negative feelings and corresponding physiological responses in the amygdala (Ochsner et al., 2002; Gross and John, 2003; Phillips et al., 2008). Reappraisal is associated with less negative affect, increased life satisfaction (Gross and John, 2003; Garnefski et al., 2004; Garnefski and Kraaij, 2006; Kashdan et al., 2006), and less physiological arousal (Dandoy and Goldstein, 1990), all of which are protective factors for depressive symptoms.

Many studies have discussed the association between expressive suppression and depressive symptoms. On the whole, lower levels of expressive suppression appear to be protective

against depression in Europeans and Chinese adolescents (Moore et al., 2008; Soto et al., 2011; Boyes et al., 2016; Sai et al., 2016). Larsen et al. (2012) study found that the depressive symptoms predicted expressive suppression in adolescents, whereas expressive suppression predicted depressive symptoms in adolescents (Zhao and Zhao, 2015; Juang et al., 2016). In addition, research also shows that emotion suppression does not always have a negative effect on depression. For example, inhibiting emotional response is effective in reducing depressive symptoms in Chinese adults (Yuan et al., 2014). Eftekhari et al. (2009) using cluster analysis found that individuals who reported low emotion regulatory style and moderate levels of suppression had the most severe depression. Moreover, expressive suppression was found to moderate the relationship between positive feelings and emotional exhaustion (Bassal et al., 2016; Norberg et al., 2016).

Cognitive reappraisal is particularly useful in stressful environments, and its use has been associated with lower rates of depression (Gross, 1998; Troy et al., 2010). In general, more use of cognitive reappraisal could lower the levels of depressive symptoms (Joormann and Gotlib, 2010). While findings indicate that cognitive reappraisal predicts depressive symptoms (Zhao and Zhao, 2015; Juang et al., 2016; Sai et al., 2016), depression has also been demonstrated to have a direct effect on cognitive reappraisal (Richmond et al., 2017). In addition, cognitive reappraisal has proposed an effective moderator between negative living condition and unfavorable outcomes. For example, Flouri and Mavroveli (2013) found that cognitive reappraisal moderated the relationship between heavy life stress and serious problem behaviors in a functionally positive manner. Similarly, Boyes et al. (2016) found that cognitive reappraisal was a moderator between adverse life experiences and psychological distress.

The Present Study

The aim of this study is to examine how expressive suppression and cognitive reappraisal strategies interact with work stress, depressive symptoms, and nicotine dependence in a population of deep-sea fishermen. Although the deleterious effects of work stress on depressive symptoms have been observed in various other groups, including managers, military personnel, and medical professionals (Pflanz and Ogle, 2006; Magnavita and Fileni, 2014), there is rare study regarding the effects of work stress on depressive symptoms in fishermen (Thomas et al., 2001; Garrone Neto et al., 2005). Thus, information gained in this kind of research would be useful in the development of professional and pertinence intervention programs for depressive fishermen.

Both cross-sectional and longitudinal studies have suggested that work stress positively predicts nicotine dependence (Chopra et al., 2015; Sandhu et al., 2016), and that nicotine dependence and depressive symptoms share genetic and environmental risk factors (Boden et al., 2010; Edwards et al., 2011; Dierker et al., 2015). However, a mediating role of nicotine dependence upon the relationship between work stress and depressive symptoms is lacking. This is the first study to examine a potentially effect of nicotine dependence between work pressure and depressive symptoms.

Finally, expressive suppression and cognitive reappraisal have been related to depressive symptoms (Aker et al., 2014; Sai et al., 2016). Cognitive reappraisal has been reported to act as a moderator between life stress and problem behaviors in adolescents, as well as between adverse life experiences and psychological distress in high school students (Flouri and Mavroveli, 2013; Boyes et al., 2016). Meanwhile, although expressive suppression has been shown to affect stress-related symptomology, its role in the relationship between work pressure and depressive symptoms, particularly in smoking fishermen, has not been clarified.

Hypothesis 1: Work Stress Is Positively Related to Depressive Symptoms

Given the previous research indicating that work stress as a strong predictor of depressive symptoms (Lee et al., 2013; Magnavita and Fileni, 2014; Lin et al., 2016), we hypothesize that work stress may be a direct predictor of depressive symptoms in fishermen.

Hypothesis 2: Nicotine Dependence Is a Mediator Between Work Stress and Depressive Symptoms

A relationship between work stress on nicotine dependence has been extensively documented (Chopra et al., 2015; Sandhu et al., 2016). Meanwhile, associations between nicotine dependence and depressive symptoms are complicated with the former being a predictor of the latter (Edwards et al., 2011; Edwards and Kendler, 2012; Dierker et al., 2015). We therefore hypothesize that work stress may increase the risk of nicotine dependence, and subsequently increase depressive symptoms in fishermen.

Hypothesis 3: Expression Suppression Moderates the Relationship Between Work Stress and Depressive Symptoms

A previous study in Chinese adolescents suggests that the more use of expressive suppression means the higher levels of depressive symptoms (Sai et al., 2016). In contrast, study in Chinese adults showed that the more use of expressive suppression means the lower levels of depressive symptoms (Yuan et al., 2014). Study in students from Hong Kong indicates that the expressive suppression was not associated with depressed mood (Soto et al., 2011). Furthermore, expressive suppression is strongly related to stress-related symptoms (Moore et al., 2008; Richmond et al., 2017) and it moderates the relationship between positive feelings and emotional exhaustion (Bassal et al., 2016). Then, we proposed that expressive suppression may not have direct relationship with depressive symptoms, but it may be a moderator between work stress and depressive symptoms in fishermen.

Hypothesis 4: Cognitive Reappraisal Moderates the Relationship Between Work Stress and Depressive Symptoms

Cognitive reappraisal can affect stress-related symptoms and has a close relationship with depressive symptoms (e.g., Juang et al., 2016; Richmond et al., 2017). Cognitive

reappraisal can act as a moderator between negative living conditions and psychological/behavioral problems (Flouri and Mavroveli, 2013; Boyes et al., 2016). Thus, we hypothesized that cognitive reappraisal may act as a moderator between work stress and depressive symptoms in fishermen.

MATERIALS AND METHODS

Participants

This study was approved by the Ethics Committee of Hainan Medical University. Commercial fishermen were recruited from Mandarin Chinese in Tanmen Town, Qionghai, China. Signed consent forms were obtained from over 95% fishermen who expressed interest in participating in the study. Interviews were conducted about a week before the participants went out for deep sea fishing. A total of 1,068 fishermen with a smoking habit which provided valid data across all study variables were employed in the current analysis. All the participants completed the questionnaires in the normal state, without hunger, fatigue, diseases and other things like that. Detailed demographic information shows in **Table 1**.

Procedures

A local project coordinator collected the signed consent forms. The consenting fishermen completed each of the following four questionnaires: Mental Stressor Investigation Questionnaire (MSIQ); Center for Epidemiological Studies Depression Scale (CES-D)-Chinese version; Russell Reason for Smoking Questionnaire (RRSQ); and Emotion Regulation Questionnaire (ERQ).

TABLE 1 | Demographic characteristics of the present study cohort of Fishermen.

Variable	Frequency
Mean age ± SD (range), years	38.05 ± 10.75 (18–67)
Level of education completed	
Elementary school or less	29.8%
Middle school	63.4%
Technical secondary school	1.9%
High school or higher	5.0%
Time employed in fishing	
<1 year	8.3%
1–3 years	11.9%
3–5 years	8.9%
>5 years	70.9%
Marital status	
Never married	27.6%
Married	70.4%
Divorced	2.0%
Religion	
None	76.9%
Christianity	2.2%
Buddhism	15.8%
Taoism	4.0%
Other	1.0%

Measures

Work Stress

Stress exposure was measured with the MSIQ (Yu et al., 2014). This scale was developed to assess work stress among naval ship crewmembers. It has a strong reliability score of 0.97 and validity of 0.75–0.96. In the present study, a short form of the scale was used, which was comprised of 36 items that addressed two factors: ship environment, and relations between work and interpersonal. The score for each item ranged from 1 (not at all) to 5 (almost all the time), with higher scores represent higher stress levels. The Cronbach's α of the total scale was 0.95.

Depressive Symptoms

Depressive symptoms were investigated with the Chinese version of the highly reliable and widely used CES-D (Radloff, 1977; Yang et al., 2004). Each item of the CES-D scale was scored 0 (rarely) to 3 (all of the time). The Chinese version of CES-D contained 20 items that reflected four observable variables: depressive, somatic, positive, and interpersonal variable (Makambi et al., 2009). The full-scale scores were scored 0–60. A score of 16 is the standard cut-off score for depression. The internal consistency of this scale was 0.91.

Nicotine Dependence

Dependence on smoking was assessed with the Russell's Smoking Motivation Questionnaire (RRSQ) (Russell et al., 1974), which was derived from the Chinese version of RRSQ (Wang et al., 1999). The questionnaire contains eight subscales and 24 items with each item being scored 0 (not at all) to 3 (very much so). Five (Psychological image, Hand-mouth, Indulgent, Sedative, and Stimulation) of the eight subscales are used independently. The Addictive, Automatic, and Auxiliary subscale can be used independently or together, such as for nicotine dependence. A score <6 was classified as no dependence, a score between 6 and 20 was classified as dependence, and a score >20 indicated heavy dependence. In the current investigation, the reduction subscale demonstrated a good internal consistency ($\alpha = 0.92$).

Expressive Suppression and Cognitive Reappraisal

The Chinese version of the ERQ consisted of 10 items that reflect two factors: expressive suppression (4 items) and cognitive reappraisal (6 items) (Wang et al., 2007). Each item of the ERQ was scored 1 (completely disagree) to 7 (completely agree). The Chinese version of the ERQ showed good validation in Chinese individuals (Wang et al., 2007) with a Cronbach's α of 0.84 and 0.90 for expressive suppression and cognitive reappraisal, respectively.

Statistical Analyses

Mean values were reported with standard deviations (SDs). Data were analyzed using SPSS 21 (IBM Corp., Armonk, NY, United States). The alpha value was set at 0.05.

Associations among work stress, nicotine dependence, expressive suppression, cognitive reappraisal, and depressive

symptoms were analyzed with structural equation modeling (SEM) in Mplus 7 (Muthén and Muthén, 1998–2010, Los Angeles, CA, United States).

The TECH13 option was used in conjunction with TYPE = MIXTURE to request two sided tests of model fit for multivariate skewness and kurtosis (Mardia's measure of multivariate kurtosis).

The comparative fit index (CFI), standardized root mean square residual (SRMR), and root mean square error of approximation (RMSEA) were used to determine goodness of fit with a cut-off value of >0.95, <0.09, and <0.08, respectively (Iacobucci, 2010). Additionally, Akaike information criterion (AIC) and Bayesian information criterion (BIC) values were calculated as indices of relative quality.

The BOOTSTRAP option was used in conjunction with both the MODEL CONSTRAINT option and the CINTERVAL (BCBOOTSTRAP) option to obtain indirect effects bootstrapped standard errors and bootstrap confidence intervals.

Latent moderated structural (LMS) equations were used in the latent moderation model.

The LOOP option was used together with the PLOT option to make plots. The variable total direct effect was on the *y*-axis and the moderating variable (i.e., expressive suppression or cognitive reappraisal) was on the *x*-axis. The lower, upper, and incremental values of the moderating variable were 4/6, 28/42, and 2/3, respectively.

RESULTS

Descriptive Analyses

Descriptive variables were assessed directly with psychometric instruments (**Table 2**). Most of the fishermen had a normal mood (mean total CES-D score, 5.51 ± 7.11; median score, 3). Specifically, a total of 91.9% of the fishermen in this study scored under 16, 7.2% of the fishermen scored between 16 and 32, and 0.9% scored higher than 32. None of the demographic factors examined were related to CES-D score, work stress, nicotine dependence, expressive suppression, or cognitive reappraisal levels, indicating that SEM could be conducted without considering the demographic factors.

The percentage of data missing for expressive suppression, cognitive reappraisal, and depressive symptoms was 0.4, 0.3, and 0.1%, respectively. For each variable with missing data, the data group and the absent group had no significant difference in the other indicators ($t = 0.3–1$, $p > 0.05$). The results of a multivariate *t*-test suggested that all missing data were missed *at random* and that the full-information maximum likelihood approach was suitable for managing the missing data.

The multivariate non-normality test showed that testing for both multivariate skewness (sample value = 1293.093, mean = 4.622, standard deviation = 0.228, $p < 0.001$) and kurtosis (sample value = 1833.143, mean = 287.715, standard deviation = 1.520, $p < 0.001$) were statistically significant, indicating violation of multivariate normality assumption. The rescaling-based maximum likelihood robust (MLR) estimator, would be proposed to deal with non-normal data.

Main Analyses

The zero-order correlations (*r*-values) among the latent (inferred) variables were presented in **Table 3**. Notably, both work stress (inferred from MSIQ scores) and nicotine dependence (inferred from RRSQ scores) had highly significant associations with depressive symptoms (inferred from CES-D scores), while expressive suppression and cognitive reappraisal (both inferred from ERQ sub-scores) were related to each other. In addition, work stress, nicotine dependence, expressive suppression, and cognitive reappraisal were all positively related to each other.

The SEM consisted of two parts: a measurement model and a structural model. We first tested the relationships between observable and latent variables in a measurement model. The model fit information of each latent variable in the measurement model was presented in **Table 4**. All indicators were accepted.

Next, we employed the structural model component of SEM to test whether work stress can predict depressive symptoms (section "*Hypothesis 1*") and whether nicotine dependence level can act as a mediator in the relationship between work stress and depressive symptoms (section "*Hypothesis 2*"). All indices showed excellent model fitness (CFI = 0.981, RMSEA = 0.048, SRMR = 0.033, AIC = 40919.940, and BIC = 41069.034). All factor loadings for work stress, nicotine dependence, and depressive symptoms were significant ($p < 0.001$), suggesting that the measurement model was acceptable. A visual depiction of the model was presented in **Figure 1**. A significant indirect path from work stress to level of depressive symptoms was observed via nicotine dependence (β = 0.054, 95% CI 0.032–0.089; $p < 0.001$), which accounted for 8.56% of the total effect.

TABLE 2 | Descriptive statistics for all observable variables.

Instrument **observable variable**	**Mean**	***SD***
MSIQ		
Ship environment	43.85	17.40
Work and interpersonal relations	13.79	4.94
RRSQ		
Addictive	1.45	2.05
Automatic	1.22	1.51
Auxiliary	2.14	2.10
CES-D		
Depressed	1.82	2.32
Somatic	2.22	2.77
Positive	1.09	1.67
Interpersonal	0.37	0.66
ERQ		
Expressive suppression	15.02	6.55
Cognitive reappraisal	24.04	9.97

MSIQ, Mental Stressor Investigation Questionnaire; RRSQ, Russell Reason for Smoking Questionnaire; CES-D, Center for Epidemiological Studies Depression Scale; ERQ, Emotion Regulation Questionnaire.

TABLE 3 | Zero-order correlations among latent variables.

Latent variable (inferred from)	1	2	3	4	5
(1) Work stress (MSIQ)	1	0.257***	0.124***	0.137***	0.580***
(2) Nicotine dependence (RRSQ)	–	1	0.166***	0.182***	0.316***
(3) Expressive suppression (ERQ)	–	–	1	0.770***	0.056
(4) Cognitive reappraisal (ERQ)	–	–	–	1	0.027
(5) Depressive symptoms (CES-D)	–	–	–	–	1

****p* < 0.001; *MSIQ, Mental Stressor Investigation Questionnaire; RRSQ, Russell Reason for Smoking Questionnaire; CES-D, Center for Epidemiological Studies Depression Scale; ERQ, Emotion Regulation Questionnaire.*

TABLE 4 | Model fitting information for the measurement model.

Latent variable (inferred from)	X^2	*df*	TLI	CFI	AIC	BIC	SRMR	RMSEA (90% CI)
Work stress (MSIQ)	0	0	1	1	19587.885	19632.647	0	0
Nicotine dependence (RRSQ)	0	0	1	1	12495.807	12540.535	0	0
Depressive symptoms (CES-D)	4.480	2	0.999	0.997	14648.174	14707.811	0.007	0.034 (0.000, 0.078)
Expressive suppression (ERQ)	3.606	1	0.990	0.998	16456.824	16521.443	0.006	0.049 (0.000, 0.109)
Cognitive reappraisal (ERQ)	0	0	1	1	15476.987	15521.723	0	0

CFI, comparative fit index; AIC, Akaike information criterion; BIC, Bayesian information criterion; SRMR, standardized root mean square residual; RMSEA, root mean square error of approximation; MSIQ, Mental Stressor Investigation Questionnaire; RRSQ, Russell Reason for Smoking Questionnaire; CES-D, Center for Epidemiological Studies Depression Scale; ERQ, Emotion Regulation Questionnaire.

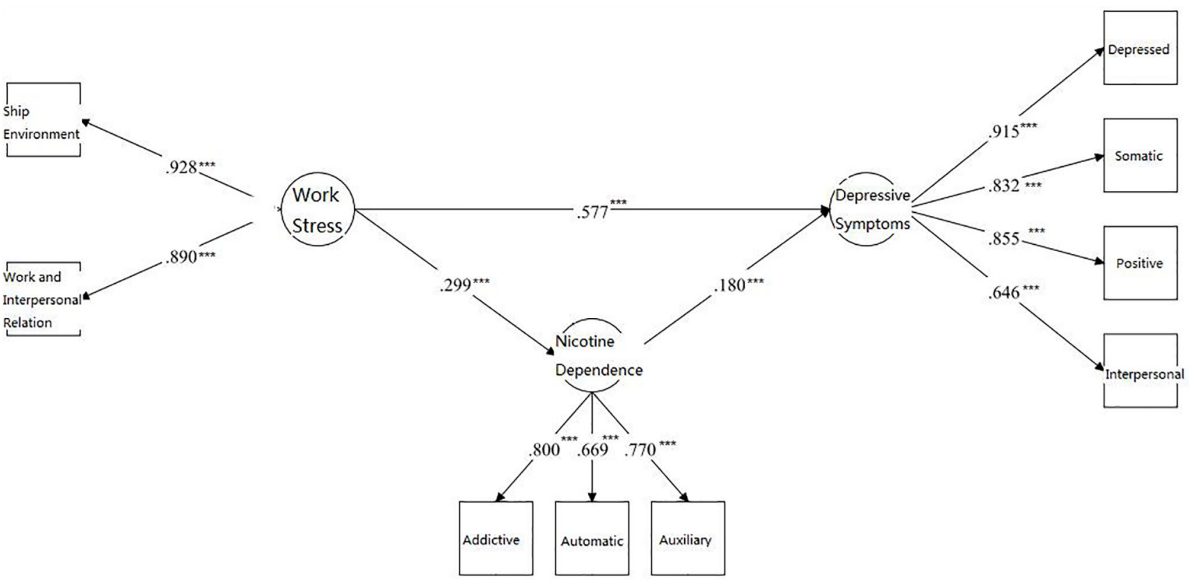

FIGURE 1 | Path analysis describing the associations between work stress, depressive symptoms, and nicotine dependence among fishermen with a smoking habit. ****p* < 0.001.

Based on our findings from the above, we tested whether the expressive suppression served as a moderator between work stress and depressive symptoms (section "*Hypothesis 3*") by using LMS. The original model estimation did not terminate normally due to a change in the log likelihood during the last step with LMS equations. Therefore, we employed the product indicator approach and obtained model fit indices indicating that the model estimation terminated normally and could not be accepted (only providing SRMR = 0.097, AIC = 57406.964, BIC = 57764.789). The regression coefficient from expressive suppression to depressive symptoms was −0.116 (p = 0.110). Work stress × expressive suppression interaction was not predictive for depressive symptoms (β = −0.117, p = 0.069).

Finally, SEM was conducted to re-test the hypotheses that work stress can predict depressive symptoms (section "*Hypothesis 1*") and that nicotine dependence serves as a mediator in the relationship between the work stress and depressive symptom (section "*Hypothesis 2*"). Whether cognitive reappraisal may serve as a moderator (section "*Hypothesis 4*") was

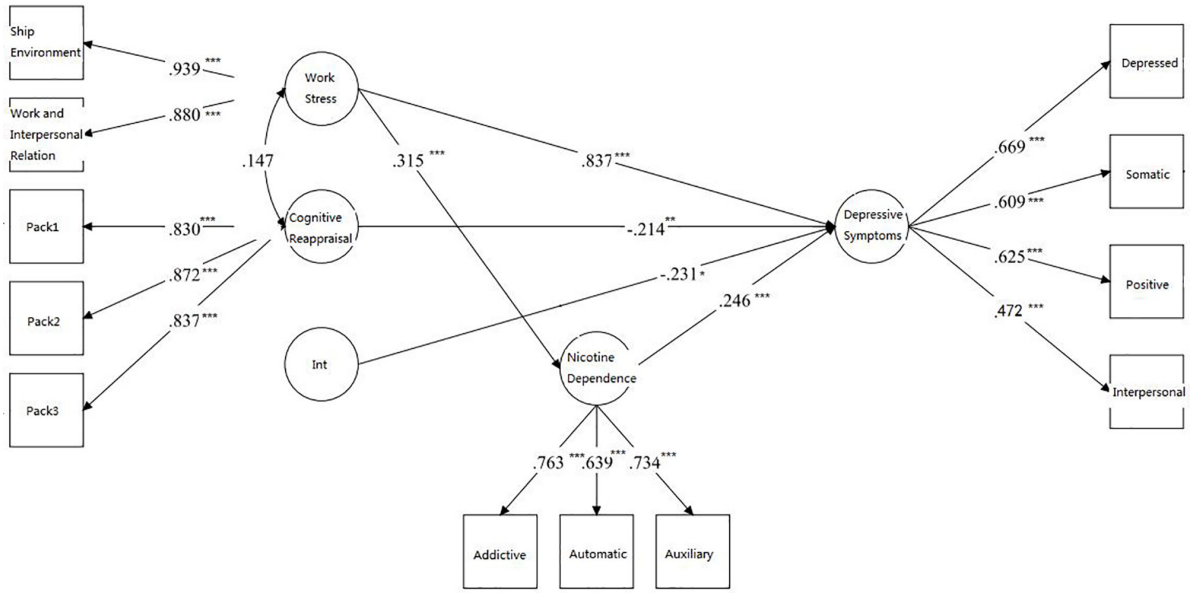

FIGURE 2 | Path analysis describing the associations between work stress, depressive symptoms, nicotine dependence, and cognitive reappraisal among fishermen with a smoking habit. The item parceling (dividing by item content) and cognitive reappraisal variable had three packs. Int = Work Stress * Cognitive Reappraisal. Parameters are standardized. $^{**}p < 0.01$, $^{***}p < 0.001$.

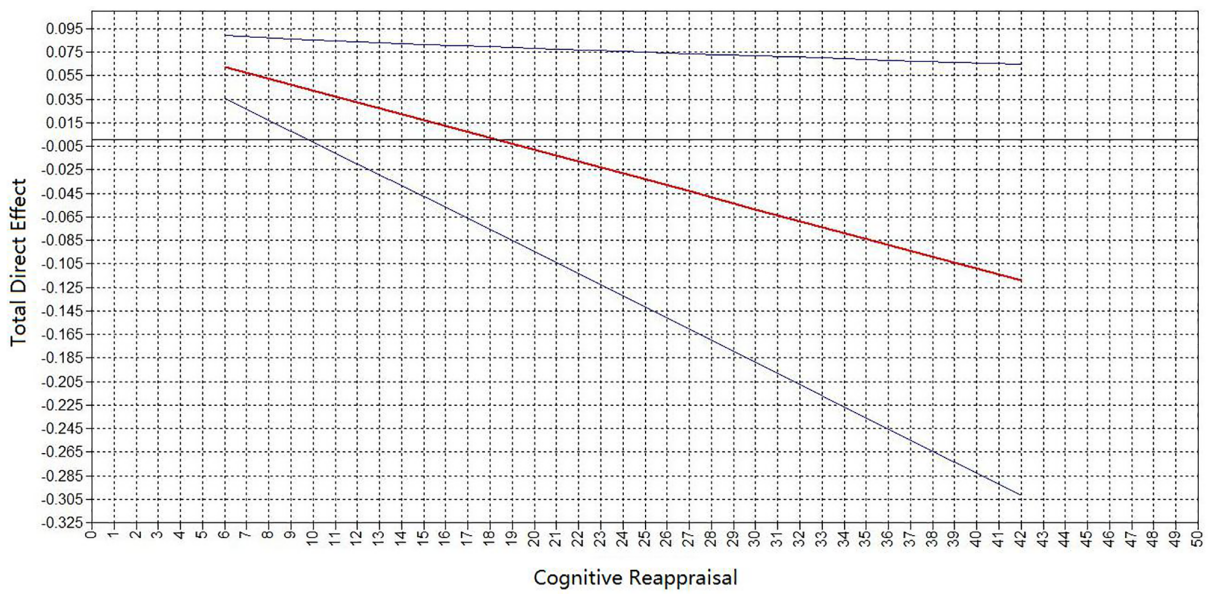

FIGURE 3 | Graphical representation of cognitive reappraisal moderation of a total direct effect between work stress and depressive symptoms. Predicted slopes for the relationship between work stress and depressive symptoms in relation to cognitive reappraisal (score range, 6–42) for Chinese fishermen with a smoking habit. The middle red line represents the total direct effect between work stress and depressive symptoms; such that the steepness of the slope reflects the strength of the moderating influence (a slope of 0 would indicate no moderating effect). Note that the higher the emotion regulation score for cognitive reappraisal (*x* axis value), the weaker the total direct effect is (*y* axis value). The area between the upper and lower (blue) lines represents the CI of the total direct effect.

investigated using LMS. The model fit indices were as follows: AIC = 29267.766 and BIC = 29476.497. All factor loadings for the latent variable indicators were significant ($p < 0.001$) (**Figure 2**). The moderating effect was −0.231 ($p = 0.025$). Work stress, the level of nicotine dependence, and cognitive reappraisal significantly predicted depressive symptoms (β = 0.837, β = 0.246, and β = −0.214, respectively; all $p < 0.01$). There was also a significantly direct association between work stress and level of nicotine dependence (β = 0.315, $p < 0.001$). A significantly indirect path from work stress to the level of depressive

symptoms was observed via nicotine dependence (β = 0.077, $p < 0.001$), accounting for 11.27% of the total effect. The total effect of work pressure on depression was reduced from β = 0.683 to a direct effect of β = 0.606. The work stress × cognitive reappraisal interaction was a significant predictor of depressive symptoms (β = −0.231, $p = 0.025$), indicating that cognitive reappraisal moderated the direct association between work stress and depressive symptoms. The moderating influence of cognitive reappraisal on the direct association between work stress and depressive symptoms is summarized in **Figure 3**. Note that the strength of the work stress-depressive symptoms direct effect was lessened with increasing levels of cognitive reappraisal.

DISCUSSION

In the present study, we examined the relationships between work stress, nicotine dependence, expressive suppression, cognitive reappraisal, and depressive symptoms in 1068 Chinese fishermen with smoking habits. Path analysis modeling indicated that work stress affects depressive symptoms directly and also affects depressive symptoms indirectly via nicotine dependence. The connection between work stress and depressive symptoms was moderated by cognitive reappraisal. Our findings suggest that interventions to reduce work stress have the potential to improve mental health in fishermen. In addition, improvements in work stress that may help reduce nicotine dependence may also, in turn, decrease depressive mood. Moreover, the adaptive cognitive reappraisal strategies may help fishermen endure the stresses associated with their job.

Depressive Symptoms in Smoking Fishermen

It has been proposed that psychological problems often occur in fishermen, who work in an environment that presents risks associated with nature and boat travel, as well as stresses related to peer relationships (Jaremin et al., 1997b; Casson et al., 1998; Thomas et al., 2001; Garrone Neto et al., 2005). Hence, we hypothesized that our study population (smoking fishermen) may have serious depressive symptoms. Unexpectedly, in the present study, the prevalence of depressive symptoms (8.1%) in fishermen with a smoking habit is lower than that in previous reports (Zeigelboim et al., 2014, 2015). More surprisingly, it is even lower than that in the general population, as the literature suggests that approximately 18% of middle-aged Chinese men in Hong Kong are affected by depressive symptoms (Wong et al., 2006); the reported prevalence of depression in male freshmen is 24.8% in Peking and 36.1% in Hong Kong (Song et al., 2008). It seems that the fishermen with a smoking habit in Hainan Province in China were not that serious in depressive symptoms. It is possible that the policies encouraging and supporting the development of fishing in China benefit the living and working conditions of fishermen, including subsides for diesel fuel, the renewal and remolding of fishing boat, and so on. Also, the longevity and well-being of the Hainan province population were counteracting factors that protected the fisherman from depression. Prospective studies are required to assess whether this finding is an accidental phenomenon.

Work Stress and Depressive Symptoms

In this study, work stress in fishermen is related to their work environments and interpersonal relationships, which have been related to the development of depressive symptoms. Our findings were in line with our hypothesis that high scores on work stress may lead to increased levels of depressive symptoms and consistent with prior studies (Lee et al., 2013; Magnavita and Fileni, 2014; Lin et al., 2016). As deep sea fishermen are particularly susceptible to risk from the prolonged hours of continuous work and constant vigilance, such as increased risk of falling, machinery entanglements, and being hit by objects (Gander et al., 2008), it suggests that the improvement in living and working conditions might be the first choice to ensure safety in sea. Moreover, as fishermen often face uncertainty regarding unpredictable aquatic animals and the possibility of their vessel capsizing or sinking (Garrone Neto et al., 2005), it is necessary to enhance their interpersonal skills so as to improve their cooperation capability. Further research should focus on potential moderators/mediators between work stress and depressive symptoms.

Work Stress, Nicotine Dependence, and Depressive Symptoms

Unlike the results of Schmidt et al. (2010) and Priyanka et al. (2016), who found that work stress had no connection or negative connection with nicotine dependence, this study was consistent with most of the research showing that work stress positively impacted nicotine dependence (John et al., 2006; Chopra et al., 2015; Sandhu et al., 2016). With respect to the relationship between nicotine dependence and depressive symptoms, the former directly predicted the later, which is consistent with prior studies (Edwards et al., 2011; Edwards and Kendler, 2012; Dierker et al., 2015). As a whole, the present findings demonstrated that nicotine dependence plays a role in linking work stress to depressive symptoms. Commonly, people who are stressed in work are prone to serious nicotine dependence (Chopra et al., 2015), and this phenomenon is especially prominent in high-risk occupations (John et al., 2006). Many fishermen, like workers in other occupations, regard smoking as an effective mean to relieve work stress, especially when their work extends into the night (Priyanka et al., 2016). Smokers with mild to moderate nicotine dependence have also been reported to exhibit an increased risk of depressive symptoms (Manley et al., 2009; Boden et al., 2010; Ashor, 2013). In the present study, nicotine dependence was found to partially mediate the association between work stress and depressive symptoms. However, this indirect effect was weaker than the direct interaction between work stress and depressive symptoms. These findings suggested that the effective work stress management could not only decrease depressive symptoms directly but could also indirectly relieve it through nicotine dependence. In future, longitudinal design

should be employed to examine whether depressive symptoms could predict nicotine dependence (Lerman et al., 1996; Currie et al., 2001; Ong and Walsh, 2001; Dierker et al., 2015; Wang et al., 2016), and even more, whether nicotine dependence link the relationship between depressive symptoms and work stress.

Work Stress, Expressive Suppression, and Depressive Symptoms

Expressive suppression, wherein behavioral expression regarding an emotional experience is inhibited, can contribute to or exacerbate stress-related symptoms (Gross, 1998; Moore et al., 2008; Richmond et al., 2017). However, in this study, expressive suppression not only did not predict depressive symptoms but also did not moderate the relationship between work stress and depressive symptoms. This suggests that the translation of work stress to depressive symptoms appears to be equally robust for those with and without expressive suppression. Firstly, it is possible that the effects of expressive suppression may not be as strong as once thought. For example, Masumoto et al. (2016) study of Japanese participants (age range, 20–70 years old) found that expressive suppression has a smaller impact on mood than cognitive reappraisal. Similarly, Barrault et al. (2017) study of regular online poker players found that expressive suppression was not linked with depression. Secondly, these negative findings could be related to culture; the correlation between expressive suppression and health problems in Asian subjects is not as strong as in Western subjects (Hu et al., 2014). Thirdly, previous studies in Chinese adolescents showed that expressive suppression had a positive relationship with depressive symptoms (Zhao and Zhao, 2015; Sai et al., 2016), but study in Chinese adults shows no relationship between them (Yuan et al., 2014). Although the present study did not confirm our hypothesis, it helps to expand our knowledge about expressive suppression, especially its relationship with work stress and depressive symptoms. We also provide new information about the different roles of expressive suppression and cognitive reappraisal in the same context. In future, if possible, more research needs to discover the relationship between expressive suppression and depressive symptoms in Chinese adults, with the focus on exploring the indirect effect or intermediate variable between them.

Work Stress, Cognitive Reappraisal, and Depressive Symptoms

Finally, we observed that the relation between work stress and depressive symptoms was weakened in those subjects who reported higher (at least average) levels of cognitive reappraisal. This means that the fishermen with a smoking habit tended not engage in cognitive reappraisal and were more inclined to depressive symptoms than those who did cognitive reappraisal. This was consistent with prior studies, persons who struggle with regulating their emotions have been reported to have more negative responses to stressors, and the adoption of effective emotion-adjusting strategies has been shown to be related to lesser reporting of depressive symptoms (Betts et al., 2009; Ford et al., 2014). The present findings suggest the possibility that cognitive reappraisal training might have a direct positive impact on the relationship between work stress and depressive symptoms in fishermen. Prior research have proved the efficiency of intervention on cognitive reappraisal, for example, the cognitive behavioral therapy (enhancing cognitive reappraisal) could reduce the negative emotion problem by modifying cognitive reappraisal-related prefrontal cortex neural signal magnitude (Goldin et al., 2013); the body-mind relaxation meditation induction could help depression patients construct reappraisal strategies (Chen et al., 2015); and the brief mindful emotion awareness and cognitive reappraisal interventions could lead to large reductions in self-reported levels of negative emotion problems (Bentley et al., 2017). Thus, improvements in cognitive reappraisal can be an effective way to mitigate the impact of work stress on depressive symptoms.

Limitations

There were several limitations associated with the current study. Firstly, this study used cross-sectional data in relation validation analyses. The causal attributions or determinations of the directionality of relationships between the variables could not be established. Studies with a longitudinal or intervention-based design are needed to reveal causes of depressive symptoms. Second, the fishermen that participated in this study all lived in the same locality. Therefore, the sample may not represent other populations accurately. Finally, our response rate was 97%. The omission of the remaining 3% may cause biases. For example, participants who completed the survey might have better interpersonal skills, better outlooks, and more positive emotional experiences than those who did not participate in the study. Notwithstanding, the sample size in this study is sufficiently large enough to extend our understanding of the relationships between work stress, nicotine dependence, expressive suppression, cognitive reappraisal, and depressive symptoms in a population of fishermen who smoke. By studying a large sample of fishermen with highly valid self-rating questionnaires, including an assessment developed for crews of naval ships, the results obtained provide valuable insights into a high-risk, high mortality rate occupation.

AUTHOR CONTRIBUTIONS

SL collected the data and wrote the manuscript. HJ analyzed the data and wrote the manuscript. JY revised the writing, supervised the study, and got fund for the project.

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Decision-Making Competence, Social Orientation, Time Style, and Perceived Stress

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Peoples' decision-making competence, defined as tendency to follow normative rational principles in their decision making, is important as it may influence the extent that requirements are met and levels of perceived stress. In addition, perceived stress could be influenced by social orientation and time style; for example, decisions need to comply with given deadlines and the expectations of others. In two studies, with students (n = 118) and professionals (police investigators, n = 90), we examined how the three individual difference features: decision-making competence, social orientation, and time approach relate to perceived stress. Results showed that social orientation and time approach were related to levels of perceived stress, but decision-making competence was not. These results indicate that social orientation and time approach are important to consider in relation to perceived stress, but the role of decision-making competence may be less important for perceived stress. However, the role of decision-making competence for perceived stress needs to be further researched.

Keywords: decision making, decision-making competence, perceived stress, social orientation, time approach

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INTRODUCTION

Stress is an increasing problem for individuals' health and for society. In work life contexts, including educational settings, a number of factors contribute to perceived stress, for example lack of control over work tasks, time-pressure on performance, and poor feedback and perceived stress appear to be a mediator for negative health outcomes (Mark and Smith, 2008). In addition, various individual difference features, such as decision-making competence, social orientation, and time approach, may contribute to perceived stress. Our definition of decision-making competence follows the prevailing definition in the literature. Thus, decision-making competence is defined as an individual's tendency to follow normative rational principles in their decision making (e.g., Parker et al., 2017). Decision-making competence is a construct that can be assumed to be related to performance and exhaustion in work life settings (see Ceschi et al., 2017). For example, in a female university sample, Santos-Ruiz et al. (2012) reported that individuals with higher decision-making ability (as measured by the Iowa Gambling Task) had significantly lower levels of cortisol before, as well as after, they were confronted with a stressful situation. In the present study, we investigated how decision-making competence, social orientation, and time approach relate to perceived stress.

In general, decision making does not only include choice but also the processes associated with making a decision, that is, the decision-making process. Various aspects of the decision-making process, not just the final decision, influence decision outcomes (e.g., Keys and Schwartz, 2007). This approach to decision making and decision outcomes is crucial in work life contexts,

since many decisions at work are socially embedded (Sanfey, 2007) and have social functions (Tetlock, 2002). At work, people need to be adaptively tuned in to the social environment so that their decision making (process) is responsive to expectations and demands in the social environment (Tetlock, 1985). People who possess this ability are more likely to be efficient at work and therefore less likely to experience that demands will exceed their available resources (Ceschi et al., 2017). Based on this assumption, the present study approaches decision making in a broad way. This is done by including *decision-making competence* as well as *social orientation* and *time approach* (Geisler and Allwood, 2015) among the factors that may influence decision making. In brief, social orientation designates how a person is aware of, relates, and adapts to other people, whereas time approach designates how a person perceives, approaches, and manages time. The rationale for this approach to decision making is that it captures more features of importance for decision making (processes) in applied and complex social settings such as work life and education.

Stress responses can occur when the perceived environmental demands exceed an individual's regulatory capacity (Koolhaas et al., 2011; see also Karasek, 1979). Stress can come to arise quickly, or evolve over time because of cognitive evaluations of situations and potential consequences (Ursin and Eriksen, 2010). That is, depending on how individuals appraise the balance between perceived resources and perceived demands, stress can be evaluated as challenging or threatening – which in turn have different effects on affect and cognition (Crum et al., 2017). In this regard, ability to make successful decisions is likely to constitute an important aspect of a person's regulatory capacity essential for such evaluations to be apt and constructive. Research has also found that individuals' perceived stress can be related to negative health status (e.g., Levenstein et al., 1993; Fliege et al., 2005; Kocalevent et al., 2007; Öhman et al., 2007). Measures of perceived stress assess the level of (threatening or "negative") stress experienced by an individual and can be assessed in general (e.g., in the last year) or more restricted (e.g., the last month) time periods (Levenstein et al., 1993). As the present research focuses on state aspects of perceived stress, perceived stress was assessed in a recent time period (the last month). We next discuss the three individual difference features suggested to influence perceived stress: decision-making competence, social orientation, and time approach.

Decision-Making Competence and Perceived Stress

Decision-making research has generally assumed that successful decision making depends on cognitive abilities to perform systematic and normatively rational decision processes. On this basis, Bruine de Bruin et al. (2007; see also Parker and Fischhoff, 2005) developed the *Adult-Decision-Making Competence* battery (A-DMC), collecting tasks that measure the extent that an individuals' decision making is affected by biases, for example, by the use of heuristics. The initial research showed that A-DMC performance relates to real-life decision-making outcomes (Bruine de Bruin et al., 2007). During the last decade, research has reported that A-DMC performance relates to decision-making styles (Parker et al., 2007; Dewberry et al., 2013), cognitive abilities (Del Missier et al., 2012), risk taking and risk behavior (Weller et al., 2015), school performance (Jacobsson et al., 2012), and financial planning (Parker et al., 2012).

However, research investigating the importance of A-DMC performance in work-life settings is lacking. In fact, only Carnevale et al. (2011) and Geisler and Allwood (2015) have attended to this issue. Carnevale et al. (2011) showed that A-DMC performance in a sample of U.S. high-level leaders outperformed the overall performance reported for Bruine de Bruin et al.'s (2007) U.S. community sample. Furthermore, Geisler and Allwood (2015) found that A-DMC performance in two different professional samples did not contribute to the explanation of reported levels of well-being, experiences of daily hassles, or negative outcomes associated with real-world decision making. Moreover, with regard to the relation between A-DMC and stress, Shields et al. (2016) found that experimentally manipulating acute stress enhanced A-DMC performance. However, the relation between A-DMC and perceived stress has not been studied. The present study contributes by exploring the extent to which A-DMC performance holds predictive validity for perceived stress levels.

Social Orientation and Perceived Stress

Decision-makers frequently depend on information or contributions from others at various stages of decision processes (Rilling and Sanfey, 2011). Furthermore, decisions often need to be accepted by others in order to achieve successful implementation and reception (Lerner and Tetlock, 1999; Allwood and Hedelin, 2005). Successful decision-makers anticipate these requirements by being attentive to social necessities, tuned in to other people's reactions, and effectively regulate and adjust decision-making processes accordingly (Ceschi et al., 2017). Indeed, research has shown that social orientation (e.g., self-monitoring, empathy, and emotional intelligence) has an effect on decision-making performance (see e.g., Telle et al., 2011; Geisler and Allwood, 2015; Ramsøy et al., 2015).

As indicators of social orientation contributing to decision making, we measured individual differences in *self-monitoring, Machiavellian personality*, and *trait-emotional intelligence* (TEI). Self-monitoring reflects self-reported sensitivity to recognize subtle hints in social interactions, and to be able to modify one's behavior accordingly (Gangestad and Snyder, 2000). Self-monitoring has been reported to be related to successful and adaptive functioning in working life, for example, positively related to job performance and promotion (Day et al., 2002). Machiavellian personality refers to tendencies of an insidious, deceitful, and manipulative approach to other people. Machiavellianism is related to, yet differentiated from, offensive personality constructs as sub-clinical narcissism and psychopathy (Paulhus and Williams, 2002). Research has shown that Machiavellian tendencies are negative in social and working-life settings since individuals high in Machiavellianism are more prone to make egoistic and amoral decisions (Dahling et al., 2009). Finally, TEI refers to the disposition to be tuned in

to, and able to regulate emotional reactions in self and others (Petrides and Furnham, 2001). TEI relates to decision-making success in work-life settings (Mikolajczak et al., 2012), and coping with stress in the form of needed "emotional labor," that is, the need to handle the clash between one's "real" subjective feelings and socially required feelings (Mikolajczak and Luminet, 2008).

Time Approach and Perceived Stress

How people perceive and approach time affect their decision making (Wittman and Paulus, 2007). As time approach guides people's judgments and decisions, it is an important feature to consider in working life (Gupta et al., 2012). One way to define and measure individual differences in the approach and management of time and time-related activities is to attend to time-styles (Usunier and Valette-Florence, 2007), which basically reflect aspects of engagement in the decision process. Time-styles relate to decision making hands on; for example, the extent to which one values and structures time or the extent to which one succumbs to given time restrictions. Moreover, differences in time styles can be seen to reflect essential aspects of the extent to which people are committed to and engaged in their decision-making processes. Previous research have reported that individual differences in how time is perceived and managed is related to various aspects of well-being (Drake et al., 2008) and self-reported stress (Claessens et al., 2007). Therefore, differences in time-styles are likely related to levels of perceived stress. Furthermore, the present research also included differences in procrastination. Procrastination is the tendency to postpone the commencement or completion of intended tasks (Lay, 1986). With regard to self-reported stress, procrastinators have been found to experience short-term benefits but long-term costs (Tice and Baumeister, 1997). Hence, the present study measured *time-styles* (Usunier and Valette-Florence, 2007) and *procrastination tendencies* (Lay, 1986) as features of individual differences in time approach.

The Present Study

The present study investigated how three individual difference features assumed to be important for successful decision making: *decision-making competence*, *social orientation*, and *time approach*, contribute to the explanation of *perceived stress*. Based on the research reviewed above (e.g., Bruine de Bruin et al., 2007; Santos-Ruiz et al., 2012), *Hypothesis 1* expected that higher A-DMC performance would be associated with lower levels of perceived stress. Furthermore, *Hypothesis 2* expected that social orientation would provide a unique amount of explained variance for perceived stress. Specifically, higher reports of self-monitoring and TEI were expected to be associated with less perceived stress, whereas higher reports of Machiavellian tendencies were expected to be associated with more perceived stress. Finally, *Hypothesis 3* expected that time approach would provide unique explained variance in perceived stress. Reports of time styles characteristic for an engaged time approach were expected to be related to less perceived stress, whereas reports of time styles reflecting a non-engaged time approach, and higher reports of procrastination, were expected to be related to more perceived stress.

The present study included two samples: university students (study 1) and police investigators (study 2). These specific samples were targeted since decision making and perceived stress are characteristic features in the daily work of both students and police investigators (Kop et al., 1999; Abdollahi, 2002; Deniz, 2006).

MATERIALS AND METHODS – STUDY 1

Procedure

This research was approved by the Regional Ethical Review Board, Gothenburg secretariat (Sweden), 2011-02-21, dnr: 071-11. In sum, 118 Swedish university students participated (85% women, mean age = 25.8 years, *SD* = 4.8). Participants were recruited at lectures or by e-mail invitations and compensated with a movie-ticket and a lottery-ticket (approx. total value of 15 USD). Written informed consent was obtained from all participants (studies 1 and 2). The data were collected in sessions of 1–15 participants in a large computer room. Participants completed the web-based questionnaire individually. The time for participation was 40–60 min.

Materials

Tests and scales unavailable in Swedish were translated by conventional back-translation procedures: A-*DMC*, *Self-Monitoring Scale* (SMS), *Machiavellian Personality Scale*, *Procrastination scale*, and *Time-Style Scale* (TSS). A-DMC was used to measure decision-making competence, whereas the SMS and the Machiavellian personality scale were used to measure social orientation, and the procrastination scale and the TSS were used to measure time approach.

Adult-Decision-Making Competence Battery (A-DMC)

The A-DMC (Bruine de Bruin et al., 2007) includes six components. Scores are calculated in terms of internal consistency and/or accuracy for the components: *Resistance to Framing* (RF), *Applying Decision Rules* (ADR), *Consistency in Risk Perception* (CRP), *Under/Overconfidence* (UOC), *Resistance to Sunk Costs* (RSC), and *Recognizing Social Norms* (RSN). The component RF measures consistency as observed over two different sets of framing tasks; attribute framing tasks and risky-choice framing tasks. The ADR measures the extent to which individuals are able to follow decision-rules of different complexity, whereas CRP concerns ability to correctly judge probability. Next, the component UOC measures the ability to recognize the correctness of one's own knowledge. RSC deals with the ability to ignore prior investments (costs or efforts). Finally, RSN measure the ability to assess social norms. An individual's overall performance is indicated by the A-DMC index, calculated as the unweighted average of the individual's standardized scores for each of the six components (for a detailed description of the A-DMC, see Bruine de Bruin et al., 2007).

Two A-DMC components were adjusted due to cultural differences between the United States and Sweden

(Weller et al., 2015). For RSN, 6 of 16 items were excluded as they were considered inappropriate in a Swedish setting. The adjusted A-DMC was pilot-tested (N = 15, 66% women, mean age = 24.4 years), and demonstrated good reliability for the amended RSN (α = 0.73, cf. α = 0.64 in Bruine de Bruin et al., 2007). One item in the component RSN showed no variation in the pilot study and was therefore excluded. Moreover, because of concerns raised by pilot-study participants that certain UOC items were inappropriate in Swedish settings, 10 of 34 items were replaced. A full list of amendments in A-DMC questions is reported in the Supplementary Material.

Self-Monitoring Scale (SMS)

We used the revised SMS with 13 items (Lennox and Wolfe, 1984), which has been found reliable (Day et al., 2002). Items are rated on 6-point Likert-type scales, with scores calculated for the total scale or divided into the two subscales: *ability to modify self-presentation* and *sensitivity to expressive behavior of others*. An example item from the *ability to modify self-presentation* subscale is "*Once I know what a situation calls for, it's easy for me to regulate my actions accordingly.*" Cronbach's alpha was α = 0.84 for *ability to modify self-presentation* and α = 0.73 for *sensitivity to expressive behavior of others.*

Machiavellian Personality Scale (MPS)

The MPS has 16 items rated on 5-point Likert-type scales (Dahling et al., 2009). Ratings are calculated for total score or divided into the four subscales: *amoral manipulation*, *desire for control*, *desire for status*, and *distrust of others*. An example item from the *distrust of others* subscale is "*I dislike committing to groups because I don't trust others*" (α = 0.90).

Procrastination Scale (PS)

The PS (Lay, 1986) has 20 items rated on 5-point Likert-type scales. An example item is "*I generally return phone calls promptly*" (reversed scoring, α = 0.87).

Time-Style Scale (TSS)

The 29 items of the TSS (Usunier and Valette-Florence, 2007) are rated on 7-point Likert-type scales and make up four time-style dichotomies: *preference for economic time* (e.g., schedule and structure time and attend to one task at a time) – *preference for non-organized time* (e.g., to not schedule one's time and to attend to multiple tasks simultaneously), *orientation toward the future* (e.g., to focus on the future) – *orientation toward the past* (e.g., focus on the past and be nostalgic), *time submissiveness* (e.g., a dutiful and conforming approach to time) – *time anxiety* (e.g., being uncomfortable and experiencing adjustment problems when faced with time-related activities), and *tenacity* (e.g., delay of gratification) – *preference for quick return* (e.g., be impulsive). Based on the four style dichotomies and to reduce complexity, two time-style indexes were calculated: an engaged time-style index and a non-engaged time-style index. The engaged time-style index collected the time-styles: economic, orientation toward the future, time submissiveness, and tenacity. The non-engaged time-style index collected the time styles: non-organized, orientation toward the past, time anxiety, and preference for quick return. Analyses of Cronbach's alpha supported the internal consistency among items for the respective index (engaged time style, α = 0.81; non-engaged time style, α = 0.78). The two indexes were then calculated by the same basic procedure used for the A-DMC index; individuals' scores are calculated by the unweighted average of standardized scores for each of the respective four time styles. Example item from the time-style *tenacity*: "*When I am interrupted doing a task, I almost always go back to it as soon as I can.*"

Perceived Stress Questionnaire (PSQ)

The PSQ assesses stress-related symptoms (Levenstein et al., 1993). We used a validated Swedish version of the PSQ (Bergdahl and Bergdahl, 2002). Building on previous research (Salo and Allwood, 2011; Allwood and Salo, 2012), we used a shortened PSQ-version shown to be reliable (α = 0.90) including 17 of the original 30 items. The respondents rated each item with respect to the degree of occurrence during the last month on a four-point rating scale with the alternatives "*Almost never*," "*Sometimes*," "*Often*," and "*Usually*." An example item is "*You have trouble relaxing.*"

Previous research has consistently showed PSQ to have Cronbach's alpha around 0.90. With respect to validity, Kocalevent et al. (2007) in a large sample, population-based, study reported that PSQ shows discriminant validity in that it correlates moderately with neuroticism (r = 0.48) and that results from previous studies show that PSQ correlates between 0.75 and 0.54 for trait anxiety and between 0.18 and 0.40 for state anxiety, depending on the form of PSQ and study. Research by Fliege et al. (2005), Kocalevent et al. (2007), and Öhman et al. (2007) demonstrate that PSQ also shows other forms of validity such as predictive and convergent validity.

RESULTS

Table 1 presents the descriptive statistics. Scales and subscales showed appropriate levels of reliability and variance. As the A-DMC index is defined by separate components that measure relatively distinct decision-making processes, and an individual may excel in performance on one component but not in others (Bruine de Bruin et al., 2007), level of alpha reliability is not relevant to consider for this index.

Correlations

Table 2 shows the correlations. Age was positively related to A-DMC index, but A-DMC index was not significantly correlated to *perceived stress* (PSQ). The correlation between A-DMC index and PSQ was $r = -0.154$, $p = 0.086$. We also controlled for the correlation when the A-DMC index only included the unmodified A-DMC components (i.e., RF, ADR, CRP, and RSC), the correlation between A-DMC index and PSQ was then: $r = -0.171$, $p = 0.064$. The two time-style indexes were negatively related. Furthermore, Machiavellianism

TABLE 1 | Descriptive statistics for study 1 (N = 118) and study 2 (N = 90).

	Study 1	Study 2	Study 1	Study 2	Possible range	Study 1	Study 2
Component	***M* (*SD*)**	***M* (*SD*)**	**Skewness**	**Skewness**		**Observed range**	**Observed range**
Decision-making competence							
A-DMC index[b]	0.0 (0.51)	0.0 (0.52)	−0.744	−0.200	–	−2.00 to 0.92	−1.19 to 1.17
Social orientation							
SMS ability to modify self-presentation	30.25 (5.57)	27.66 (4.43)	−0.153	−0.523	7–42	17–42	17–35
SMS sensitivity to expressive behavior of others	25.61 (4.19)	25.20 (4.07)	0.008	−0.165	6–36	15–36	14–35
Machiavellian Personality Scale	38.43 (11.01)	–	0.656	–	16–80	21–71	–
Trait-emotional intelligence (Global)	–	156.58 (18.76)	–	−0.010	30–210	–	115–204
Time approach							
Procrastination	60.45 (12.77)	43.36 (10.68)	−0.387	0.144	20–100	29–88	25–74
Engaged time-style index[b]	0.00 (0.65)	0.00 (0.65)	−0.301	−0.725	–	−1.65 to 1.45	−2.63 to 1.56
Non-engaged time-style index[b]	0.00 (0.61)	0.00 (0.54)	0.374	0.224	–	−1.23 to 1.69	−1.26 to 1.67
Outcome							
Perceived Stress Questionnaire[c]	2.21 (0.61)	1.89 (0.49)	0.350	0.599	1–4	1.12–3.71	1.03–3.63

A-DMC index, Adult-Decision-Making Competence index; SMS, Self-Monitoring Scale; TSI, Time-Style Index. [a]Cronbach's alpha. [b]Mean score is zero as the A-DMC index is calculated by the unweighted average of the individual's standardized scores for each of the six components. [c]Perceived Stress Questionnaire: Study 1 used a 17-item version (Salo and Allwood, 2011).

TABLE 2 | Correlations for study 1.

	1	2	3	4	5	6	7	8	9
1. Age	–								
2. A-DMC	0.221*	–							
3. SMS ability	−0.135	−0.109	–						
4. SMS sensitivity	0.250**	0.058	0.349**	–					
5. MPS score	−0.107	−0.318**	0.179	0.184*	–				
6. Engaged TSI	−0.119	−0.174	0.127	−0.063	0.114	–			
7. Non-engaged TSI	−0.053	0.024	−0.225*	0.027	0.189*	−0.249**	–		
8. Procrastination	−0.033	−0.023	−0.163	−0.039	0.082	−0.372**	0.419**	–	
9. Perceived stress	−0.029	−0.159	−0.077	0.099	0.228*	0.309**	0.256**	0.155	–

*The presented significances are for Pearson's correlation and two-tailed tests of significance. A-DMC, Adult-Decision-Making Competence index; SMS, Self-Monitoring Scale; MPS, Machiavellian Personality Scale; TSI, time-style index. *$p < 0.05$. **$p < 0.01$.*

and both time styles indexes were found to be positively related to PSQ.

Regression Analyses

To test the hypotheses, hierarchical multiple regression analyses were performed (**Table 3**). *Step 1* controlled for the effect of gender and age. The consecutive regression blocks were built by A-DMC index (*Hypothesis 1*) in *Step 2* and social orientation and time approach measures (*Hypothesis 2* and *Hypothesis 3*) tested in two separate versions of *step 3* and *step 4*. Altering the order of social orientation and time approach in step 3 and step 4 controlled for the unique contribution provided by these two features of decision-making skills.

Gender and age were not found to have an effect on PSQ. *Hypothesis 1* was not confirmed. A-DMC index was not significantly related to PSQ. However, when social orientation (*Hypothesis 2*) was inserted in step 3 of the model the contribution of this block was significant (p = 0.048, R^2 change = 7%). However, none of the single social orientation facets were found to be significant single predictors. Moreover, when social orientation was inserted in step 4 of the model, this step was not close to significant.

Time approach clearly contributed to PSQ, confirming *Hypothesis 3*. When measures of time approach were inserted in step 3, a significant 23% variance in PSQ was explained. Here, all three facets of time approach, that is, engaged time-style index (β = 0.446, $p < 0.001$), non-engaged time-style index (β = 0.238, p = 0.014), and procrastination (β = 0.199, p = 0.039) were found to be related to perceived stress. Moreover, when time approach was inserted in step 4, it provided a significant 20% explained variance in PSQ. Again, all three facets of time approach were significant predictors: Engaged time-style index (β = 0.446, $p < 0.001$), non-engaged time-style index (β = 0.238, p = 0.014), and procrastination (β = 0.199, p = 0.039).

MATERIALS AND METHODS – STUDY 2

Procedure

After initial contact with management officials, police investigators were randomly selected over different areas of operations (e.g., driving offenses and violent crimes) and geographic stations (e.g., urban/rural) by collecting email addresses for 165 police investigators. The web-based questionnaires were answered by 66 participants (participation rate = 40%), but 21 questionnaires were incomplete and therefore excluded, leaving 45 participants. However, it turned out that the electronic invitations had failed to reach all presumptive participants, as some email addresses were not activated for external communication. To facilitate participation, additional police investigators were invited to participate by paper-and-pen questionnaires. Hence, based on the same criteria and procedure as before, an additional randomized selection of police investigators was performed. A total of 195 invitations were sent out by paper-and-pen questionnaires and 50 participants answered (participation rate = 26%, total participation rate = 32%). For the paper-and-pen questionnaire, five questionnaires were incomplete and excluded. Moreover, for the paper-and-pen questionnaires, there was a limited concern of missing data (37 cases of missing data for 36 items). Missing data analysis showed no pattern; thus, data were considered to be missing at random and replaced by computations using the Expectation–Maximization method (Kline, 2005). Accordingly, in the final sample of 90 participants (37% women, mean age 46 years, *SD* = 11.21), 45 participants had answered the web-based questionnaire and 45 participants the paper-and-pen questionnaire. There were no obvious differences between the two sub-samples and all participants were instructed to answer the questionnaire-battery individually by their own desk. The time for participation was 30–50 min.

Materials

In study 2, the A-DMC component UOC was excluded. This was because, first, the time available for participation was limited for the professional sample of study 2. The A-DMC is a time-consuming measure and the UOC is especially time-consuming (see e.g., Weller et al., 2015). Second, previous research has questioned the importance of the UOC (e.g., Carnevale et al., 2011). Moreover, three of the nine items on the A-DMC component RSN were replaced. The reason for this was based on the consideration that the three items would be considered odd for the police sample since they asks, "if it is sometimes OK" to break the law (i.e., to steal, to commit a crime which could put you in jail, to experiment with marijuana). A full list of amendments in A-DMC questions is reported in the Supplementary Material. Previous research has used shortened versions of the A-DMC or only attended to certain components (e.g., Carnevale et al., 2011).

Study 2 used the adult version of the procrastination scale (Lay, 1986; $\alpha = 0.82$). Furthermore, the full-length version of the PSQ (Levenstein et al., 1993; Bergdahl and Bergdahl, 2002) was used, since the focus on perceived stress was of specific interest for the police organization ($\alpha = 0.94$). Moreover, measuring Machiavellian tendencies among police investigators could have evoked suspicion and resistance, but study 1 demonstrated that Machiavellian tendencies were associated with perceived stress (**Table 2**). Therefore, study 2 instead investigated if a relation also could be found for individual differences in the reverse tendencies. As dispositions measured by the TEI Questionnaire (TEIQue) and Machiavellianism (i.e., egoistic, amoral, and distrustful) have been found to be essentially opposite (Jones and Paulhus, 2009; Petrides et al., 2011), we used the TEIQue. Moreover, as in study 1, the SMS was used (ability to modify self-presentation, $\alpha = 0.74$, sensitivity to expressive behavior of others, $\alpha = 0.80$). Finally, with respect to the TSS analyses of Cronbach's alpha again supported the internal consistency among items for the respective index (engaged time style, $\alpha = 0.83$, non-engaged time style, $\alpha = 0.75$).

Trait-Emotional Intelligence Questionnaire – Short-Form (TEIQue-SF)

The TEIQue comprehends important aspects of decision making in social contexts, such as the ability to adequately recognize emotions and exhibit emotional adaptability (Telle et al., 2011; Mikolajczak et al., 2012). Due to work-load considerations, we used the short-form (the TEIQue-SF) that provides a global TEI score (Petrides and Furnham, 2006). The short-form comprises 30 of the 153 items from the full-version

TABLE 3 | Hierarchical Regression of Perceived Stress – Study 1.

	Total R^2	Adjusted R^2	ΔR^2	Test of ΔR^2
Model A				
Step 1: Gender and age	0.001	−0.017	0.001	$F(2, 115) = 0.048$, $p = 0.953$
Step 2: A-DMC	0.025	0.000	0.024	$F(1, 114) = 2.85$, $p = 0.094$
Step 3: Social orientation	0.092	0.043	0.067	$F(3, 111) = 2.72$, $p = 0.048$
Step 4: Time approach	0.287	0.227	0.195	$F(3, 108) = 9.84$, $p < 0.001$
Model B				
Step 3: Time approach	0.257	0.217	0.232	$F(3, 111) = 11.54$, $p < 0.001$
Step 4: Social orientation	0.287	0.227	0.030	$F(3, 108) = 1.51$, $p = 0.216$

Models A and B differ with respect to the order in which social orientation and time approach were entered into the model in steps 3 and 4. A-DMC, Adult-Decision-Making Competence index; social orientation, Self-monitoring scale; Machiavellian Personality Scale; time approach, engaged time-style index; non-engaged time-style index, procrastination scale.

(Petrides and Furnham, 2001). As a Swedish translation of the TEIQue-SF was unavailable (nor of the TEIQue), the TEIQue-SF was back-translated (α = 0.80). An example item is: "*Many times, I can't figure out what emotion I'm feeling.*"

RESULTS

Table 1 presents the descriptive statistics. The A-DMC index, the engaged and the non-engaged time-style indexes were computed by the use of *z*-transformations for the respective components or scales. For the social orientation measures, the present sample showed overall lower self-reports of *Self-Monitoring*, compared to the student sample in study 1. Specifically, the samples differed on the *ability to modify self-presentation* as students reported overall higher levels of this ability (M = 30.25, SD = 5.57), compared to police investigators (M = 27.67, SD = 4.43), $t(206) = -3.72$, $p < 0.001$. For time approach, *procrastination* tendencies were lower (M = 43.36, SD = 10.68) compared to study 1 (M = 60.45, SD = 12.77), $t(206) = -8.37$, $p < 0.001$. In addition, the present sample's level of perceived stress (M = 1.89, SD = 0.49) was lower compared to study 1 (M = 2.21, SD = 0.61), $t(206) = -4.16$, $p < 0.001$.

Correlations

Correlations are presented in **Table 4**. The A-DMC index was not related to PSQ or any other measure. The correlation between A-DMC index and PSQ was $r = -0.146$, $p = 0.171$. As in study 1, we also controlled for the correlation if the A-DMC index only included the unmodified A-DMC components (i.e., RF, ADR, CRP, and RSC), the correlation between A-DMC index and PSQ was then: $r = -0.049$, $p = 0.647$. Reports of TEI showed a high, negative correlation with PSQ as well as with reports of procrastination and the non-engaged time-style index. Moreover, both procrastination and the non-engaged time-style index were positively related to PSQ.

Regression Analyses

Hierarchical multiple regression analyses were performed to test the hypotheses (**Table 5**). *Step 1* controlled for gender and age and *step 2* controlled for type of survey (dummy-coded as, online = 0; paper-and-pen = 1). The succeeding regression blocks were built as in study 1, inserting the A-DMC index in *step 3* (*Hypothesis 1*). In order to test *Hypothesis 2* (the added and unique contribution of social orientation) and *Hypothesis 3* (the added and unique contribution of time approach), separate analyses were performed in which these measures were used in *step 4* and *step 5*, respectively.

Gender and age (*step 1*) or type of survey (*step 2*) was not found to have a significant effect on PSQ. In step 3, A-DMC index was not significantly related to perceived stress, not providing support for *Hypothesis 1*. However, when social orientation was inserted in step 4 of the model, 24% of the variance in perceived stress was explained. Reports of TEI ($\beta = -0.514$, $p < 0.001$) were the significant predictor. When social orientation was inserted in step 3, the contribution of this block was lower, 7%, but significant ($p = 0.047$) – and reports of TEI ($\beta = -0.322$, $p = 0.014$) were still a significant predictor.

The regression analyses also confirmed *Hypothesis 3*. When time approach was inserted in step 4, a significant 22% of the variance in perceived stress was explained. Two of the three facets of time approach were significant predictors: non-engaged time-style index ($\beta = 0.363$, $p = 0.001$) and procrastination ($\beta = 0.300$, $p = 0.020$). When time approach was inserted in step 5, the contributed explanation of this block was not significant. However, in step 5, the non-engaged time-style index ($\beta = 0.222$, $p = 0.048$) was still found to be a significant predictor.

DISCUSSION

This study investigated the extent that three individual difference variables assumed to contribute to decision making: decision-making competence, social orientation, and time approach, predict levels of perceived stress in a student sample and in a sample of professionals (police investigators).

Decision-Making Competence

The results from study 1 and study 2 did not render support for *Hypothesis 1*, stating that individual differences in decision-making competence (i.e., A-DMC performance) would be associated with levels of perceived stress. No association between A-DMC performance and perceived stress was found. Thus, the general benefits associated with A-DMC performance previously reported (e.g., Bruine de Bruin et al., 2007) did not generalize to the stress domain in the present study. This may be explained by the more homogeneous samples targeted in the present research (students and professionals, cf. the community sample in Bruine de Bruin et al., 2007). A further reason why A-DMC did not relate to perceived stress is that evaluations of demands and resources (Koolhaas et al., 2011) and the cognitive activation of stress responses (Ursin and Eriksen, 2010) are processes that are based on subjectively perceived levels and considerations, whereas A-DMC is a performance measure. That is, it is not known, and should be explored in future research, to what extent individuals are aware of their own decision-making competence level and if such awareness relates to perceived stress.

Moreover, although acute stress has been reported to enhance A-DMC performance (Shields et al., 2016), as noted, a relation between A-DMC and perceived stress was not observed in the present research. A difference between the studies is that the present research attended to (subjective) perception of negative stress, whereas Shields et al. (2016) experimentally manipulated acute stress. In addition, although we measured perceived stress in a recent and restricted time period (i.e., the last month), this indication of stress may be considered as more reflective of chronic stress compared to measures of acute stress. In brief, the present results do not provide support for the suggestion that decision-making competence constitutes a coping resource for perceived stress (Santos-Ruiz et al., 2012). It is possible that further research might show a relationship between decision-making competence and perceived stress under certain conditions (e.g., in larger and

TABLE 4 | Correlations for study 2.

	1	2	3	4	5	6	7	8	9
1. Age	–								
2. A-DMC	−0.057	–							
3. SMS ability	−0.311**	−0.063	–						
4. SMS sensitivity	−0.186	−0.182	0.326**	–					
5. TEIQue	−0.127	−0.001	0.274**	0.114	–				
6. Engaged TSI	−0.102	−0.152	0.117	0.125	0.144	–			
7. Non-engaged TSI	0.095	−0.193	−0.001	0.057	−0.455**	−0.103	–		
8. Procrastination	−0.179	−0.108	−0.102	0.022	−0.423**	−0.536**	0.268*	–	
9. Perceived stress	−0.252*	−0.146	0.189	0.188	−0.405**	0.039	0.397**	0.341**	–

*The presented significances are for Pearson's correlation and two-tailed tests of significance. A-DMC, Adult-Decision-Making Competence index; SMS, Self-Monitoring Scale; TEIQue, Trait-Emotional Intelligence Questionnaire; TSI, time-style index. *$p < 0.05$. **$p < 0.01$.*

TABLE 5 | Hierarchical Regression of Perceived Stress – Study 2.

	Total R^2	Adjusted R^2	ΔR^2	Test of ΔR^2
Model A				
Step 1: Gender and Age	0.064	0.040	0.064	$F(2, 79) = 2.69$, $p = 0.074$
Step 2: Survey	0.103	0.069	0.040	$F(1, 78) = 3.45$, $p = 0.067$
Step 3: A-DMC	0.117	0.072	0.014	$F(1, 77) = 1.23$, $p = 0.271$
Step 4: Social orientation	0.357	0.296	0.239	$F(3, 74) = 9.18$, $p < 0.001$
Step 5: Time approach	0.409	0.326	0.053	$F(3, 82) = 2.11$, $p = 0.107$
Model B				
Step 2: Time approach	0.340	0.277	0.222	$F(3, 74) = 8.31$, $p < 0.001$
Step 3: Social orientation	0.409	0.326	0.069	$F(3, 71) = 2.78$, $p = 0.047$

Models A and B differ with respect to the order in which social orientation and time approach were entered into the model in steps 2 and 3. A-DMC, Adult-Decision-Making Competence index; social orientation, Self-Monitoring Scale; Trait-Emotional Intelligence Questionnaire; time approach, engaged time-style index, non-engaged time-style index, procrastination scale.

more heterogeneous samples) – but our results suggest that a general relation should not necessarily be expected in work-life settings.

Social Orientation

The results supported the assumption that individual differences in social orientation influence perceived stress (*Hypothesis 2*). The contribution of social orientation did reach significance in study 1, but the contribution was more substantial in study 2. A possible reason for this difference is that study 1 included a measure of Machiavellianism, whereas this measure was replaced by a measure of TEI in study 2. Although Machiavellian tendencies were found to be significantly related with reports of perceived stress (**Table 2**), the contribution did not reach significance in the regression analyses. In contrast, the contribution provided by trait-emotional intelligence was observed to be substantial. An alternative explanation is that social orientation is more important and has greater effect for decision making in regular work-life settings (i.e., police investigators), compared to academic education (students).

Our specific expectation that higher reports of self-monitoring (SMS) would relate to less perceived stress was not supported. These results stand in contrast to findings that relate SMS to constructive performance and work-life success (e.g., Day et al., 2002). Future research should try to better understand *how* self-monitoring tendencies affect the outcome of decision making in different domains.

Furthermore, Machiavellian tendencies were found to be positively correlated with perceived stress in study 1. Previous research has reported that stress (experimentally induced acute stress and/or naturally occurring stress in everyday life) can make people more inclined to make egoistic decisions (Dahling et al., 2009; Starcke et al., 2011). Speculatively, persons who are distrustful of others might be more inclined to experience social feedback concerning decision making as negative and threatening and negative social feedback has been found to evoke stress and impair decision making (Kassam et al., 2009). However, in the present study, Machiavellian tendencies did not provide a significant contribution in the regression analyses. Conversely, higher reports of TEI were found to be strongly associated with lower levels of perceived stress in study 2. Given that our results found support for a relation between some aspects of social orientation and perceived stress, and that social orientation can have different effects depending on the sample and the specific demands in the context targeted, further research should explore the relation between other aspects of social orientation and perceived stress.

Time Approach

Both studies clearly supported *Hypothesis 3* stating that time approach is associated with perceived stress. Time approach was the feature of decision-making skill most prominently associated with perceived stress. In study 1, all three facets of time approach provided significant contribution to the explanation of perceived stress, in both step 3 and step 4 of the model (i.e., controlling for the contribution provided by social orientation). In study 2, the amount of variance explained by time approach in step 4 was comparable to that observed in study 1. However, when time approach was inserted in step 5 the contribution of time approach was not significant but the non-engaged time style was still a significant predictor. The negative relation between trait-emotional intelligence and the non-engaged time-style index may explain why the contribution of time approach was not significant (in step 5) when social orientation was controlled for (in step 4).

The specific expectation that reports of a non-engaged time approach would be associated with more perceived stress was supported. But the expectation that reports of an engaged time approach would be associated with less perceived stress was not. The results showed that reports of an engaged time approach (i.e., a preference for structuring one's time, focus on the future, succumb to time restrictions, and be persistent) were related to more perceived stress. This positive relation could be explained by a possible relation between an engaged time approach and tendencies to contemplate on possible future consequences and outcomes (Ursin and Eriksen, 2010). Thus, an engaged time approach may indicate a risk for over-commitment that may lead to perceived stress.

As expected, reports of procrastination were related to perceived levels of stress in both samples. This result confirms previous research in that, in terms of self-reported stress, procrastinators may experience short-term benefits but long-term costs (Tice and Baumeister, 1997). In sum, the results clearly demonstrate that individual differences in time approach are important to consider for understanding perceived stress in work-life settings.

Levels of Perceived Stress as an Effect of Decision-Making Skill

In the present research, levels of perceived stress were seen as a decision-making outcome. The rationale for this is that it is reasonable to see a high level of perceived stress as negative for people's well-being and physiological health and therefore an outcome of decision making that successful decision makers should be more likely to avoid. Moreover, negative stress is per definition a response that occurs when (perceived) demands exceed (perceived) regulatory resources (e.g., Koolhaas et al., 2011). Hence, when faced with high demands to make decisions, successful decision makers should possess resources necessary in order to meet the decision-related requirements. Given that successful decision-makers are likely to be more efficient in their work (Ceschi et al., 2017), it is noteworthy that previous research has paid so little attention to how decision-making relates to stress (Santos-Ruiz et al., 2012; Starcke and Brand, 2012).

Limitations

The present study has various limitations. For instance, we measured three individual difference variables relating to decision making taken in a broad sense and investigated their association with perceived stress. Thus, our study is correlational and the approach is limited by the fact that it does not have any process measures. However, this approach is the same as taken in previous research on decision-making competence (e.g., Bruine de Bruin et al., 2007). It would be beneficial for future research to include process measures in order to follow events between the participants' decisions and outcomes (see e.g., Ceschi et al., 2017).

In study 1, most participants were women. This is a limitation, as it is possible that sex can have an interaction effect. Furthermore, a potential limitation of the present study is the low response rate in study 2. The response rate might indicate that the present sample could be unduly influenced by participants with an overall low level of perceived stress. Yet, rigorous information preceded the implementation of the study and explicitly highlighted the focus on perceived stress in the police–investigator profession. Therefore, it is possible that the sample consists of employees with stress-related concerns. Consequently, although the response rate is a limitation, it is not clear if, or how, this may have affected the results.

Moreover, the data collection of study 2 was performed by the use of both web-based and paper-and-pen questionnaires which could be considered a limitation. However, previous research has found that the format of web-based questionnaires does not affect the content of people's responses and that its effects are consistent with those from studies using traditional methods (see e.g., Gosling et al., 2004; Gosling and Mason, 2015).

A further limitation of the present study is its cross-sectional design. Additionally, the measure of decision-making competence was performance/ability based whereas measures of social orientation and time approach – as well as outcome measures – were self-reports. Hence, the risk for common method bias should be acknowledged. An improvement in future research would be to use a longitudinal design. For example, initial measures of perceived stress, e.g., at the beginning of a semester (students) or after summer vacations/before reorganization (professionals) could be collected. These measures could then function as base-rates to which subsequent measures can be compared. Finally, future research should target different samples and include other types of measures than self-reports.

CONCLUSION

In this study we have used a broad definition of decision making by including features that often influence the

decision-making process. In work-life settings we argue that successful decision-makers need to attend to social and temporal aspects in order to meet decision-making requirements. In sum, our results suggest that the general benefits associated with decision-making competence reported by previous research (A-DMC performance, e.g., Bruine de Bruin et al., 2007) may not hold predictive validity for perceived stress in work-related contexts. In contrast, our results showed that social orientation and time approach, proposed to contribute to decision making, are associated with levels of perceived stress in work-life settings.

ETHICS STATEMENT

This research was approved by the Regional Ethical Review Board, Gothenburg secretariat (Sweden), 2011-02-21, dnr: 071-11. Written informed consent was obtained from all participants (studies 1 and 2).

AUTHOR CONTRIBUTIONS

All listed authors (MG and CMA) have made substantial, direct and intellectual contribution to the work and also approved it for publication.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2018.00440/full#supplementary-material

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SYSTEMATIC REVIEW
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Parenting Stress and Resilience in Parents of Children With Autism Spectrum Disorder (ASD) in Southeast Asia: A Systematic Review

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Background: This paper aimed to review the literature on the factors associated with parenting stress and resilience among parents of children with autism spectrum disorder (ASD) in the South East Asia (SEA) region.

Methods: An extensive search of articles in multiple online databases (PsycNET, ProQuest, PudMed, EMBASE, CINAHL, Web of Science, and Google Scholar) resulted in 28 papers that met the inclusion criteria (i.e., conducted in the SEA region, specific to ASD only, published in a peer-reviewed journal, full text in English). Studies found were conducted in the following countries: Brunei, $n = 1$; Indonesia, $n = 2$; Malaysia, $n = 12$; Philippines, $n = 5$; Singapore, $n = 5$, Thailand, $n = 2$; and Vietnam, $n = 1$, but none from Cambodia, East Timor, Laos, and Myanmar were identified.

Results: Across the studies, six main factors were found to be associated with parenting stress: social support, severity of autism symptoms, financial difficulty, parents' perception and understanding toward ASD, parents' anxiety and worries about their child's future, and religious beliefs. These six factors could also be categorized as either a source of parenting stress or a coping strategy/resilience mechanism that may attenuate parenting stress.

Conclusion: The findings suggest that greater support services in Western countries may underlie the cultural differences observed in the SEA region. Limitations in the current review were identified. The limited number of studies yielded from the search suggests a need for expanded research on ASD and parenting stress, coping, and resilience in the SEA region especially in Cambodia, East Timor, Laos, and Myanmar. The identified stress and resilience factors may serve as sociocultural markers for clinicians, psychologists, and other professionals to consider when supporting parents of children with ASD.

Keywords: parenting stress, coping, ASD, Autism spectrum disorder, South East Asia, culture, parent, social support

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INTRODUCTION

Parenting children with autism spectrum disorder (ASD) can be more stressful and challenging than parenting children with typical development, especially in countries where there is a dearth of various support resources. Across the literature, parents of children with ASD frequently reported higher levels of anxiety (e.g., Stein et al., 2011; Kuusikko-Gauffin et al., 2013; Falk et al., 2014), higher levels of depression (e.g., Stein et al., 2011; Hayes and Watson, 2013; Zablotsky et al., 2013; Falk et al., 2014; Weitlauf et al., 2014), and more health-related problems (e.g., Stein et al., 2011; Dykens and Lambert, 2013; Giallo et al., 2013; Fairthorne et al., 2015). Group comparison research further found parents of children with ASD to have higher levels of stress and lower level of well-being than parents of typically developing children (e.g., Dabrowska and Pisula, 2010; Estes et al., 2013; Hayes and Watson, 2013) and/or parents of children with other developmental disabilities, such as Down syndrome (e.g., Dabrowska and Pisula, 2010; Wang et al., 2011; Dykens and Lambert, 2013; Estes et al., 2013).

Commonly, the sources of stress in parents of children with ASD include the child's inappropriate and unpredictable behaviors/emotional problems (e.g., Tomanik et al., 2004; Herring et al., 2006; Lecavalier et al., 2006; Osborne and Reed, 2009; Estes et al., 2013), severity of the autism symptoms (e.g., Osborne and Reed, 2009; Ingersoll and Hambrick, 2011; Rivard et al., 2014), as well as financial worries secondary to the need to spend for treatment intervention and education (e.g., Sharpe and Baker, 2011; Vohra et al., 2014; Zablotsky et al., 2014; Thomas et al., 2016). Studies have additionally documented the critical role that social support plays in aiding parents of children with ASD to successfully cope with their higher levels of stress (e.g., Tehee et al., 2009; Ekas et al., 2010; Lovell et al., 2012; Weiss et al., 2013); including the importance to gain easy access to and support from mental health professionals (e.g., Mackintosh et al., 2012; Vohra et al., 2014).

When distinguishing between the relative importance of factors that may contribute to parenting stress, research found that the child's emotional and behavioral problems contributed significantly more to mothers' stress, perceived family dysfunction, and parent mental health problems, than the child's dignosis, presence of a development delay, or child's gender (Herring et al., 2006). These findings highlights the importance of examining the underlying sources and predictors that may lead to parenting stress and warn us against simply assuming that the mere diagnosis of ASD in a child is sufficient as a driving factor in increasing parenting stress (Herring et al., 2006). Similarly, findings from another study suggested that regardless of child's age or gender or autism symptom severity, behavioral problems (i.e., higher levels of child hyperactivity) predicted higher parenting levels of distress (McStay et al., 2014).

There have also been mixed findings in regards to the differences in stress levels experienced by mothers and fathers. Whilst some studies have found increased stress levels to be experienced by mothers and fathers as a couple (e.g., Dabrowska and Pisula, 2010; Ingersoll and Hambrick, 2011; Harper et al., 2013), others have instead determined stress levels among mothers and fathers as separate individuals and have found parental differences in the levels of stress experienced. For example, a study found mothers' stress levels to be more greatly affected (Herring et al., 2006), whereas the findings from another study found fathers to report higher levels of stress (Rivard et al., 2014).

When examining families who have a child with ASD, cultural factors are also very important to consider (e.g., Daley et al., 2013; Freeth et al., 2014). In many cases, there is a lack of information about ASD in the society, which may lead to parents of children with ASD to face stigmas, and be influenced by cultural beliefs and/or experience self-blame for their child's diagnosis (e.g., Gray, 2002; Mak and Kwok, 2010; Neely-Barnes et al., 2011; Ravindran and Myers, 2012; Sarrett, 2015; Riany et al., 2016). With the lack of support and adequte knowledge available at the societal level, these families may also struggle to make sense of their child's behavior, which may in turn increase the level of stress experienced and delay diagnosis and treatment planning for the family (Karst and Van Hecke, 2012).

The majority of studies that have investigated parenting stress in parents of children with ASD are conducted in Western or European contexts (e.g., Hayes and Watson, 2013; Ooi et al., 2016). The relatively broader research in the Western and/or European context denotes the greater awareness and support for the autism community in those countries. In contrast, the awareness of mental health and specifically ASD is still growing in the Asian region, and therefore, is still in the early stages of receiving the necessary support (Ilias et al., 2008, 2016; Sun and Allison, 2010; Neik et al., 2014). Hence, it is imperative to determine how support may be catered toward the autism community in the under-investigated Asian countries.

To achieve this, the current paper aimed to review peer-reviewed published studies conducted in Asia (limited to the South East Asian [SEA] region) in regards to parenting stress among parents with children with ASD, and therefore provide a discussion on the sources of stress among this sample, and the variables/ factors that may attentuate the levels of stress experienced by them. It is believed that findings from this review paper will be able to provide insights on the factors related to parenting stress, specific to the SEA region, an under-researched area. Furthermore, it is hoped that the findings will be able to provide a culture-specific understanding of the stress experienced by parents of chidren with ASD in the SEA region and that, the identified stress and resilience factors may serve as sociocultural markers for clinicians, psychologists, and other professionals to consider when supporting and treating parents and families of children with ASD.

METHODS

Selection of the Studies

The systematic review conducted on parenting stress and resilience in parents of children with ASD began with a search of literature using multiple electronic databases (PsycNET, ProQuest, PubMed, EMBASE, CINAHL, Web of Science, and Google Scholar; see **Figure 1**). **Figure 1** was adapted from the PRISMA flow diagram (Moher et al., 2009) and the PRISMA

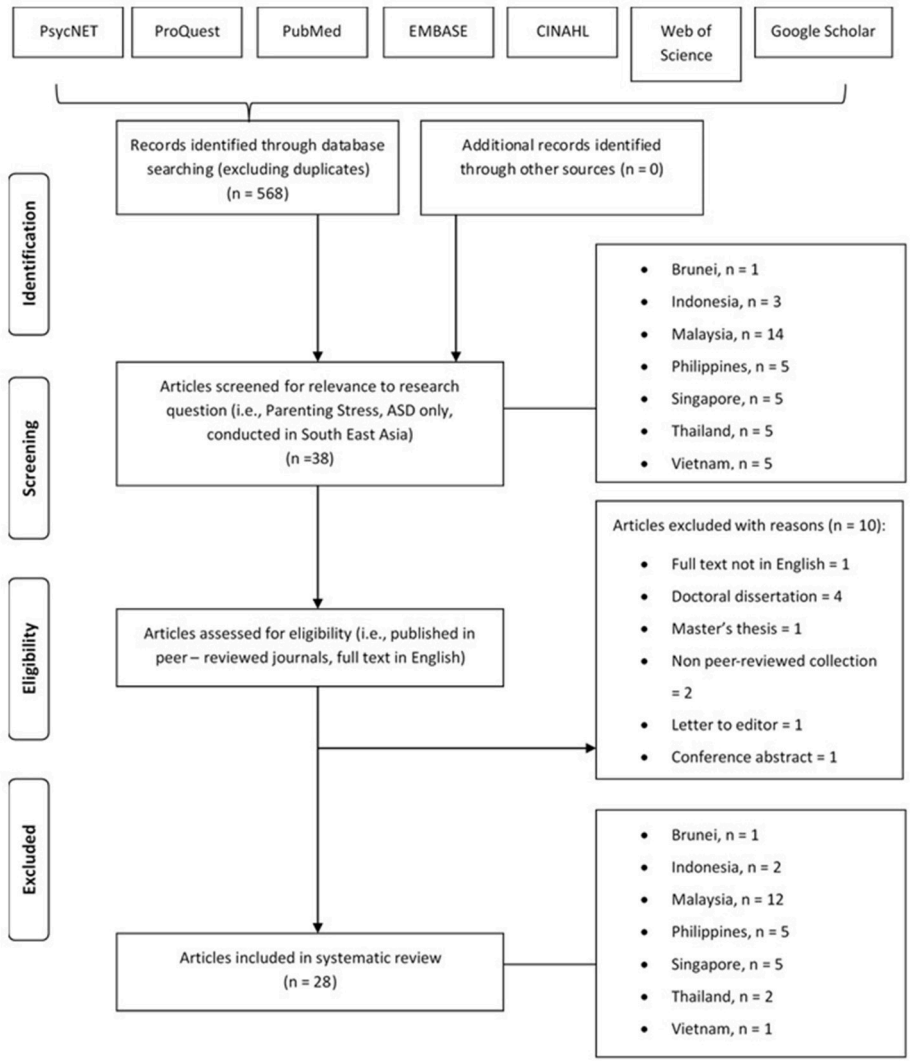

FIGURE 1 | PRISMA flowchart illustrating article selection process.

guidelines were followed. Study authors and an external auditor, a researcher with a high level of experience with systematic reviews, reviewed the process to check the adherence with PRISMA guidelines. With an emphasis on studies conducted in SEA countries, search terms used in this initial search entailed the names of SEA countries together with the search term, "ASD" or its derivatives (e.g., autism, autistic, Asperger, pervasive development disorder). In other words, several search terms on the key concept of ASD were conducted repeatedly for each SEA country. Taking into account that some countries are referred to with other names, a second search was conducted for countries with their alternative names (e.g., Indon for Indonesia, Burma for Myanmar, Filipino for Philippines). A search for the key concept of ASD was also conducted with the search term, "South East Asia" to locate studies that might have been missed out. As a cautionary step, a final search on the key concept of parenting stress (using search terms such as "parent," "mother," "father," "stress," "resilience," "coping") was conducted for each SEA country to ensure no relevant studies were overlooked. Together, a total of 568 studies on ASD in respect to the SEA region were identified.

The first screening process was then conducted to exclude ASD studies in SEA countries that were unrelated to parenting stress and resilience. The chronological order of this particular step was intentional to demonstrate the comparatively smaller ratio of ASD studies in SEA countries that are specifically targeted toward studying parenting stress and resilience. Studies that additionally sampled parent(s) of children with other forms of cognitive delay(s) and/or disability(ies) other than ASD (i.e., ADHD, dyslexia, etc.) were also excluded (e.g., Shin et al., 2006; Shin and Nhan, 2009). Additionally, studies that sampled South East Asian parents, but were not conducted in South East Asian countries were also excluded (e.g., Luong et al., 2009). This ensured that the studies reviewed in this paper were specific to the

cultural context of SEA countries. Therefore, this refined search led to a new total of 38 articles.

At the second and last screening process, those that did not meet the other inclusion criteria (i.e., not published in peer-reviewed journals; full text not in English; doctoral dissertation; Master's thesis) were excluded. Finally, a total of 28 studies were deemed eligible to be reviewed.

A conscious decision was made not to limit the range of years of published studies, in order not to further reduce an already narrow yield of results in this under-researched region. However, it was planned to exclude studies published before 1980, in accordance with the initial inclusion of autism in the Diagnostic and Statistical Manual, 3rd edition (American Psychiatric Association, 1980). Only one study was identified as published in the 1980s or 1990s (Liwag, 1989) and this study was retained; themes were consistent with findings in later writings. Articles published after July 2016 were not included in this review. An intentional decision was made to focus on peer-reviewed articles and the search was not inclusive for theses/dissertations. It was judged that including theses/dissertations would introduce bias through the identification of some theses/dissertations over others, depending on their language of writing and online availability.

Before the search commenced, study authors agreed on the search strategy in consultation with a senior librarian advisor. A senior librarian advisor was also consulted throughout the search process. Moreover, an external auditor reviewed the process involved in the selection of studies before and after the study.

A-Priori Features of Interest Among Reviewed Studies

Studies included in this review are presented in Supplementary Table 1. Features of the studies as summarized in the header of Supplementary Table 1 include: location, design/method, sample, outcome measure, aim, findings, and control variable. The descriptor, "location" was included to allow face-value comparisons of the studies amongst SEA countries. The "design/method" of the study enables a quick evaluation of the methodology in which the study was conducted (i.e., quantitative, qualitative, or mixed-method), and thus, how that would relate to its findings. The header, "sample" specifies the number of participants in the study, if a particular study used a comparison group (i.e., parents of children with typical development), and if both mothers and fathers, or only single parents were sampled. The "outcome measure" looks at the utilization of differential measures across the reviewed studies in measuring common variables such as parenting stress, coping strategies, depression and anxiety symptoms, severity of autism symptoms and so forth. The "aim" describes the purpose of a particular reviewed study, while "findings" outlines key results from that study.

Analysis Procedures

Studies yielded from the search were analyzed through a careful and strategic process. Synthesis of literature findings was conducted by reading full-text articles of included studies, identifying parenting stress factors. Each study was read multiple times by four of the study authors to prevent bias. Identified factor(s) affecting parenting stress were noted and recorded for each study. Characteristics of each study, as listed in Supplementary Tables 1, 2 and **Table 1** (e.g., location, design, parents' characteristics, child characteristics) were also noted and recorded. The use of objective measures, such as questionnaires were also noted to determine how parenting stress was differentially measured across studies.

Similarities and differences between studies were highlighted as well as pooling together similar reporting measures and outcomes across studies. All relevant influential factors were thematically categorized and presented in a descriptive approach. All authors agreed on the data analysis findings and factor categorization. To minimize bias and promote trustworthiness of the findings, three experienced researchers with knowledge in the topic area also reviewed the data analysis findings and agreed with our factor categorization and discussion of the results.

RESULTS

Description of Studies Reviewed in This Article

A total of 28 studies were finally chosen for review in this paper (see Supplementary Table 1). Out of these 28 studies, 14 had quantitative designs, 11 were qualitative, and three were mixed-method. Out of the 14 quantitative studies however, only one (Lai et al., 2015) used an active control group (i.e., parents of children with typical development) for mean comparison.

The resulting search found relevant studies to be investigated in only seven of the total, 12 SEA countries (Brunei, $n = 1$; Indonesia, $n = 2$; Malaysia, $n = 12$; Philippines, $n = 5$; Singapore, $n = 5$, Thailand, $n = 2$; Vietnam, $n = 1$). It would however be inaccurate to infer that SEA countries that were not yielded in this search have a lower awareness of ASD. This lack of identified articles in five SEA countries may be mainly due to the possibility that factors such as funding may have played a role in the lack of/absence of published research in those countries.

Across the studies, the total sample amounted to 1, 639 participants, whereby 1, 288 were mothers and 253 were fathers. Note that two studies (Vetrayan et al., 2013; Roffeei et al., 2015) did not report the sampled number of fathers and mothers in their study. Parents in the reviewed studies had at least one child who was diagnosed with ASD. The cumulative age range of these children across all studies was 0–20 years, though it should be noted that several studies failed to report the age of the child who was diagnosed with ASD in their study. The majority of the studies specified the diagnosis of the children under the broader term, "ASD" (Diagnostic and Statistical Manual of Mental Disorders 5th ed.; DSM-5; American Psychiatric Association, 2013) whilst others followed the categorization listed under Pervasive Developmental Disorders (PDD) in the fourth edition, text revision of the DSM (DSM-IV-TR; American Psychiatric Association, 2000). Supplementary Table 2 and **Table 1** display the characteristics/demographics of parents and children, respectively.

Although "autism" more accurately refers to autistic disorder as listed under PDD in the DSM-IV-TR (American Psychiatric Association, 2000), it has been used interchangeably with ASD in several of the reviewed articles to inclusively refer to other

TABLE 1 | Characteristics of children diagnosed with ASD of parents sampled in this article review.

Study	*N*	Age of children	Age diagnosed	Diagnosis
Athari et al., 2013	Not stated.	Age range = 6–8 years.	Not stated.	Autistic Disorder
Callos, 2012	Not stated.	Not stated.	Not stated.	ASD
Charnsil and Bathia, 2010	Not stated.	Not stated.	Not stated.	Autistic Disorder
Chong and Kua, 2016	10	Age range: 6–9 years.	*M* = 2+ years.	Autistic Disorder
Foo et al., 2014	6 (4 males, 2 females).	Age range = 10–18 years (*M* = 12 years 10 months).	Not stated.	Five diagnosed with Autistic Disorder; One diagnosed with Asperger's syndrome.
Foronda, 2000	16	Not stated.	Not stated.	ASD
Ilias et al., 2016	10	Age range = 5–23 years (*M* = 11 years).	*M* = 2 years 11 months.	Autistic Disorder
Ha et al., 2014	24	Age range = 2–10 years old (*n* = 15), above 10 (*n* = 12).	Not stated.	ASD
Lai et al., 2015	136. (73 with ASD, 63 with typical development). 77 males (56.6%), 59 females (43.4%).	*M* = 12.35 years, *SD* = 3.67 years.	Not stated.	Autistic Disorder (*n* = 43), Asperger's syndrome (*n* = 15), PDD – NOS (*n* = 15), typical development (*n* = 63).
Liwag, 1989	13	Age range = 4–9 years.	At the time of the study, it was 3–4 years since the child was diagnosed with autism.	Early infantile autism as according to DSM-III.
Moh and Magiati, 2012	102. Out of the 98 children who reported gender, 82 were males, and 16 were females.	Age range = 2–17 years, 3months (*M* = 7 years, 3 months; *SD* = 2 years, 9months).	Out of the 93 responses received, age range: 16–96 months (*M* = 40.7 months, *SD* = 14.4 months).	Out of the 99 children who reported diagnosis: Autistic Disorder (*n* = 25), ASD (*n* = 65), Asperger's Syndrome (*n* = 2), PDD-NOS (*n* = 7).
Nikmat et al., 2008	Not stated.	Not stated.	Not stated.	ASD
Quilendrino et al., 2015	Phase 1 (Focus group discussion): 10 children (7 males, 3 females). Phase 2 (survey): 41 children (36 males, 5 females).	Phase 1 (*M* = 75.43 months, *SD* = 33.74 months). Phase 2 (*M* = 60.73 months, *SD* = 17.45 months).	Quantitative analysis from survey (*M* = 39.39 months).	Autism
Rahman et al., 2012	2 (one daughter, one son)	Daughter: 7 years. Son: 9 years.	Not stated.	Daughter: Autistic Disorder. Son: PDD-NOS, comorbid with Attention Deficit Hyperactive Disorder (ADHD).
Rejani and Ting, 2015	Not stated.	Not stated.	Not stated.	Autism
Resurreccion, 2013	10	Age range = 6–20 years; *M* = 11.9 years	Not stated.	Autistic Disorder
Roffeei et al., 2015	Not stated.	Not stated.	Not stated.	ASD
Santoso et al., 2015	14	*M* = 7.9 years	Not stated.	ASD
Siah and Tan, 2015	Male (72%), female (21%).	7 years or below (56.63%), 7 – 14 years (19.28%), above 14 years (24.09%).	Not stated.	ASD
Siah and Tan, 2016	Not stated.	Not stated.	Not stated.	ASD
Sian and Tan, 2012	Not stated.	Not stated.	Not stated.	ASD
Tait and Mundia, 2012	30	*M* = 7.4 years	Not stated.	ASD
Ting and Chuah, 2010	12	Not stated.	2 years (*n* = 2); 4–5 years (*n* = 10).	ASD
Vetrayan et al., 2013	33	Age range = 0–6 years (39.4%), 7–12 years (48.5%), 13–18 years (12.1%).	Not stated.	"Moderately autistic" (*n* = 10), "Severely autistic" (*n* = 23).
Wahyuni, 2013	2	Case study 1 = 12 years. Case study 2 = Not stated.	Case study 1 = 2 years. Case study 2 = 3 years/	Autistic Disorder
Wisessathorn et al., 2013	333 (*n* = 255, 76.6% were males).	Age range = 2–17 years; *M* = 7.83 years; *SD* = 3.46 years.	*M* = 3.59 years; *SD* = 3.46 years.	ASD
Xue et al., 2014	65 (*n* = 60, 92.3% were males).	Age range = 3.2–11.8 years (*M* = 6.9 years, *SD* = 2.1 years). One child's age was not reported.	*M* = 35.3 months (*n* = 64).	ASD (*n* = 46; 73%), Autistic Disorder (*n* = 12; 19%), Asperger's syndrome (*n* = 3; 4.8%), PDD-NOS (*n* = 2; 3.2%). The diagnoses of two children were not reported.
Yeo and Lu, 2012	Not stated.	Not stated.	Not stated.	Autistic Disorder

M, Mean; SD, Standard Deviation.

autism-related disorders besides autistic disorder. Therefore, to ensure clarity in this paper, the term "autism" was replaced with "ASD" or "autistic disorder" when its intended meaning was obvious to the authors.

Parenting Stress and Other Related Variables

During the search process of the reviewed articles, it was noted that parenting stress among parents of children with ASD was not always examined using the term "parenting stress" per se. Rather, other related variables were also investigated, which provided an idea for different mechanisms that interact with the manifestations of stress among parents of children with ASD (e.g., resilience, psychological distress, etc.). Several of the studies investigated parenting stress as the main variable in their study (e.g., Liwag, 1989; Foronda, 2000; Nikmat et al., 2008; Moh and Magiati, 2012; Yeo and Lu, 2012; Athari et al., 2013; Xue et al., 2014; Lai et al., 2015). Some studies (Nikmat et al., 2008; Yeo and Lu, 2012; Xue et al., 2014; Lai et al., 2015) assessed "stress" through the use of objective measures (e.g., Parenting Stress Index, Abidin, 1992; Parental Stress Scale, Berry and Jones, 1995; The Questionnaire on Resources and Stress– Friedrich Short Form, Friedrich et al., 1983); whereas, other studies determined levels of parenting stress via interviews, in line with the qualitative nature of their study (Liwag, 1989; Foronda, 2000), or by calculating an index using a scale they developed (Moh and Magiati, 2012).

One of the related variables of parenting stress that was explored was level of psychological well-being/distress among parents of children with ASD (e.g., Nikmat et al., 2008; Yeo and Lu, 2012; Lai et al., 2015; Rejani and Ting, 2015). For this, measures such as the Depression, Anxiety and Stress Scale (DASS; Lovibond and Lovibond, 1995), and the General Health Questionnaire (GHQ-28; Goldberg, 1978) were utilized. The use of these scales have, therefore, highlighted the need to understand and study "stress" among parents of children with ASD, as a component of psychological distress that is compounded with other related factors such as depression and anxiety. Accordingly, other studies (Charnsil and Bathia, 2010; Rejani and Ting, 2015) were included in this systematic review, as their findings on depressive and/or anxiety symptom levels among parents of children with ASD could highlight several factors that might also be associated with parenting stress.

Other variables that were also determined in relation to parenting stress included parental satisfaction (Moh and Magiati, 2012), resilience (Santoso et al., 2015), quality of life (Sian and Tan, 2012; Wisessathorn et al., 2013; Siah and Tan, 2015, 2016), family functioning (Tait and Mundia, 2012; Xue et al., 2014), and hopelessness (Vetrayan et al., 2013). Although these variables were not identical to the concept of parenting stress, they were included in the current review to provide a holistic understanding of the stress experienced by parents of children with ASD.

Remarkably, more than half of the total reviewed studies were found to also investigate coping strategies/mechanism among parents of children with ASD (Liwag, 1989; Foronda, 2000; Ting and Chuah, 2010; Callos, 2012; Sian and Tan, 2012; Resurreccion, 2013; Wahyuni, 2013; Wisessathorn et al., 2013; Foo et al., 2014; Xue et al., 2014; Lai et al., 2015; Quilendrino et al., 2015; Roffeei et al., 2015; Santoso et al., 2015; Siah and Tan, 2015, 2016; Chong and Kua, 2016; Ilias et al., 2016). This focus area suggests that even within the SEA region, there is awareness for the need to inclusively discuss coping strategies for parents of children with ASD as opposed to merely focusing on intervention strategies for the child diagnosed with ASD. Furthermore, the current review of the coping strategies employed amongst parents of children with ASD highlights the factors that may attenuate levels of parenting stress in this population.

Factors/Variables Affecting Parenting Stress

As a result of the review, several factors were found to have played a prominent role in the levels of parenting stress experienced by parents of children with ASD in the SEA region. Particularly, these factors included: (i) social support, (ii) severity of autism symptoms, (iii) financial difficulty, (iv) parents' understanding and perception toward ASD, (v) parents' anxiety and worries about their child's future, and (vi) religious belief.

(i) **Social support.** Across the studies, social support was found to be a coping mechanism that was frequently reported in easing parenting stress (Liwag, 1989; Foronda, 2000; Ting and Chuah, 2010; Callos, 2012; Moh and Magiati, 2012; Yeo and Lu, 2012; Wahyuni, 2013; Foo et al., 2014; Ha et al., 2014; Xue et al., 2014; Roffeei et al., 2015; Santoso et al., 2015; Chong and Kua, 2016). Specifically, social support was attained from numerous sources, which included support from the immediate family, schools, families of other children with ASD, professionals, and/or extended family members (e.g.,Foronda, 2000; Xue et al., 2014; Santoso et al., 2015; Chong and Kua, 2016). However, in respect to the support drawn from external family members, contradictory results were found. In particular, unlike the research by Xue et al. (2014), the research by Foronda (2000) reported that parents drew less social support from extended family members, specifically, spouses' relatives (in-laws). On the other hand, spousal relationship itself was found to be an important source of social support (Foronda, 2000; Foo et al., 2014; Santoso et al., 2015; Chong and Kua, 2016), and was found to be a cross-cultural factor that significantly predicted parenting stress and psychological distress among parents of children with ASD in Malaysia as well as in China (Yeo and Lu, 2012).

Another noteworthy finding points to the critical role professionals were suggested to play in providing social support to these parents (Liwag, 1989; Foronda, 2000; Moh and Magiati, 2012; Rahman et al., 2012; Resurreccion, 2013; Xue et al., 2014; Santoso et al., 2015; Chong and Kua, 2016). Particularly, in Singapore, a research study found that higher parental stress was associated with a higher number of professionals consulted, and a lower perceived collaboration between parent and professionals; though, only the number of professionals consulted was found to significantly predict parenting stress (Moh and Magiati,

2012). They also found that collaboration with professionals, the perceived helpfulness of the information provided, and parental stress significantly predicted parental satisfaction (Moh and Magiati, 2012).

Overall, these findings on social support are similar to that found by a research study in Malaysia, which identified that the two types of support that parents and caregivers most frequently engaged in were informational support (i.e., professionals) and emotional support (i.e., family, friends, etc.) (Roffeei et al., 2015). Findings from this study also demonstrated that sources of social support in today's technologically advanced society now include online communities, such as Facebook (Sian and Tan, 2012). It is also likely that parents with a higher level of intrinsic motivation to participate in supportive groups and/or programs might experience enhanced social relationships, as found in the study (Sian and Tan, 2012).

(ii) **Severity of autism symptoms**. Besides social support, severity of autism symptoms was also found to affect parenting stress among parents of children with ASD (Liwag, 1989; Foronda, 2000; Nikmat et al., 2008; Charnsil and Bathia, 2010; Yeo and Lu, 2012; Athari et al., 2013; Wisessathorn et al., 2013; Lai et al., 2015; Ilias et al., 2016). Using a comparison group (parents of children with typical development) in a Singaporean sample, a study was able to show that parents of children with ASD (who were found to have a greater experience of difficult child behavior) had higher levels of parenting stress (Lai et al., 2015). Moreover, the perception of autism severity (specifically, mother's perception) was found to be a cross-cultural factor (in Malaysia and China) that significantly predicted parenting stress. However, another study did not find ASD symptom severity to be associated with a retrospective rating of parenting stress in relation to the diagnostic process (Moh and Magiati, 2012).

Autism severity was found to be negatively associated with related variables of parenting stress, such as parental quality of life (Wisessathorn et al., 2013) and parental satisfaction during the diagnostic process (Moh and Magiati, 2012). Similarly, a study found that severity of autism symptoms in a Thai sample was higher among children with caregivers who were clinically depressed, although autism symptoms did not predict depressive disorders among the caregivers (Charnsil and Bathia, 2010). The authors commented that the non-significant finding may be impacted by the small sample size (27 participants) (Charnsil and Bathia, 2010).

Uniquely, in the study by Xue et al. (2014), parents reported that although they were occasionally challenged with aggressive and self-injurious behaviors that are typically stereotyped with children with ASD, they found these behaviors to have only little interference with their lives. In fact, this group of parents reported low levels of stress, contradictory to the typical findings on parenting stress among parents of children with ASD.

On another note, the reverse of this ASD severity–parenting stress relationship was also found to be true, whereby further analyses (Athari et al., 2013) revealed that levels of stress (and depression) among mothers of children with ASD predicted the severity of autism in their child. These findings together, therefore, suggest the complexity of this relationship.

(iii) **Financial difficulty.** Financial difficulty was a factor that was frequently reported to influence the level of stress experienced among parents of children with ASD (Liwag, 1989; Foronda, 2000; Rahman et al., 2012; Tait and Mundia, 2012; Yeo and Lu, 2012; Athari et al., 2013; Vetrayan et al., 2013; Wahyuni, 2013; Ha et al., 2014; Quilendrino et al., 2015). Financial income (the inverse of financial difficulty) was found to negatively correlate with levels of parenting stress and depression (Athari et al., 2013) as well as levels of hopelessness (Vetrayan et al., 2013) among parents of children with ASD. Financial income was also found to negatively correlate with severity of autism symptoms, and even mediated the positive relationship between parenting stress and severity of autism symptoms (Athari et al., 2013).

From a cross-cultural perspective examining maternal parenting stress and maternal psychological distress, Yeo and Lu (2012) found treatment costs/father's income to have some differing impacts in Malaysia and China. For example, father's income/treatment costs contributed 15% of the variance in psychological distress for Malaysian mothers compared to only 3% for Chinese mothers. Treatment cost was considered to be an important factor that contributed to the difficulties and distress especially among Malaysian mothers, as it was speculated that Malaysian families are further challenged by having to support schooling needs for multiple children, in comparison to the Chinese, single-child families. Furthermore, Yeo and Lu's (2012) findings also highlight the cross-cultural experience of stress as a component of psychological distress.

(iv) **Parents' perception and understanding toward ASD.** Besides the aforementioned factors, parents' perception and/or understanding of having a child diagnosed with ASD was also found to play an important role in regards to the parenting stress experienced. More specifically, positive beliefs/optimism (Foronda, 2000; Callos, 2012; Wisessathorn et al., 2013; Chong and Kua, 2016), emotional acceptance and understanding (Liwag, 1989; Wahyuni, 2013; Xue et al., 2014; Chong and Kua, 2016; Ilias et al., 2016), sense of coherence (Siah and Tan, 2015, 2016), cognitive reframing (Siah and Tan, 2016), and adaptability (Wahyuni, 2013; Ilias et al., 2016) toward having a child with ASD served as coping strategies for parents of children with ASD.

On the contrary, negative perceptions of their child's diagnosis have also been reported. For example, in the case study (Rahman et al., 2012), the father, who was diagnosed with depression and was reported to engage in substance abuse (i.e., alcoholism), perceived the autism diagnoses in his children as a result of him being "cursed" for his previous bad behavior. This is in contrast to the findings of a research study by Quilendrino et al. (2015), which found parents to disagree with cultural myths and beliefs about ASD (e.g., not

a result of a curse and/or parental sin). Similarly, a study found that mothers were commonly exposed to culturally transmitted fears and concerns that they may have done something wrong in the past to cause the disorder (e.g., karma or spirit possession). Even though, the mothers did not believe these traditional lay beliefs themselves, they still described these societal perspectives as stigmatizing and impacting their well-being (Ilias et al., 2016).

(v) **Parents' anxiety and worries about their child's future.** Several studies (via qualitative interviews or an open-ended sentence completion task), found parents' anxiety in regards to the future of their child (who is diagnosed with ASD) to be one of their sources of stress (Liwag, 1989; Foronda, 2000; Tait and Mundia, 2012; Ha et al., 2014; Quilendrino et al., 2015; Ilias et al., 2016). The parents' anxieties included the child's schooling and future secondary and/or higher education (Tait and Mundia, 2012; Ilias et al., 2016), job and career prospects (Ilias et al., 2016), and worries over finding care for their children in their older age (Quilendrino et al., 2015). Conversely, thoughts of their child's future motivated mothers to be resilient when they were optimistic about their child's future (Santoso et al., 2015).

(vi) **Religious belief.** Several parents additionally reported religious beliefs as a coping strategy and as a support, helping them to accept and raise a child with ASD (e.g., Ting and Chuah, 2010; Tait and Mundia, 2012; Resurreccion, 2013; Wahyuni, 2013; Santoso et al., 2015; Chong and Kua, 2016; Ilias et al., 2016). For example, parents accepted their child as a gift from God, in spite of his or her ASD diagnosis (e.g., Ting and Chuah, 2010; Tait and Mundia, 2012), found comfort through prayer (e.g., Wahyuni, 2013; Santoso et al., 2015; Ilias et al., 2016), and/or by reading holy books (e.g., Resurreccion, 2013; Ilias et al., 2016) and/or through church involvement (e.g., Ilias et al.).

DISCUSSION

The present article aimed to review studies conducted in the SEA region, identifying the factors that influence or are associated with parenting stress among parents of children with ASD. Across the 28 studies that were included in this systematic review, four factors associated with parenting stress, were frequently reported: social support, severity of autism symptoms, financial difficulty, and parents' perception and understanding toward ASD. Two other factors were also found to relate to parenting stress, though to a lesser extent; these included parents' anxiety and worries about their child's future, and religious belief. The finding of these six factors could also be categorized in this review as either a source of parenting stress (i.e., severity of autism symptoms, financial difficulty and parents' anxiety and worries about their child's future) or as a coping strategy/mechanism that may attenuate levels of parenting stress (i.e., social support, parents' perception and understanding toward ASD and religious belief).

To a certain extent, findings from this review are comparable to that yielded from the Western context (e.g., Herring et al., 2006; Ekas et al., 2010; Ingersoll and Hambrick, 2011; Lovell et al., 2012; Mackintosh et al., 2012; Estes et al., 2013; Weiss et al., 2013; Rivard et al., 2014; Vohra et al., 2014; Zablotsky et al., 2014; Thomas et al., 2016), particularly in regards to social support, severity of autism symptoms, and financial difficulties. However, cultural variations and/or economic differences were found to underlie the differences in how these factors were uniquely manifested and/or experienced in SEA. For instance, poorer policy and economic support for mental health and special needs in the Asian region (e.g.,Foronda, 2000; Ting and Chuah, 2010; Tait and Mundia, 2012; Foo et al., 2014; Ha et al., 2014; Ilias et al., 2016) may have exacerbated the difficulties and challenges faced by parents of children with ASD in these countries in comparison to those in a Western context. Moreover, stigma and discrimination toward ASD, that is relatively more prevalent in an Asian context, might influence how parents of children with ASD are further challenged (e.g., Ting and Chuah, 2010; Rahman et al., 2012; Ha et al., 2014; Ilias et al., 2016).

Furthermore, in the region, parents with lower educational and socioeconomic statuses may be further disadvantaged, identifying later the symptoms of ASD (e.g., Moh and Magiati, 2012) and facing greater risk of stress (e.g., Athari et al., 2013), depression (e.g., Charnsil and Bathia, 2010; Athari et al., 2013), and hopelessness (Vetrayan et al., 2013). As researches suggested, parents from lower socio-educational backgrounds may be a particular group to target and support in terms of education on the early warning signs of ASD and child development in general (Moh and Magiati, 2012).

In regards to the identified factors, this systematic review was able to highlight the beneficial role of social support among parents of children with ASD, and that this social support could be drawn from various sources (e.g., spouse, immediate family, external family, other families of children with ASD, schools, professionals, online). However, it was noteworthy to find contradictory results in regards to the support received by external family members (Foronda, 2000; Yeo and Lu, 2012). This difference may be due to the quality of the already existing relationship between the parent and external family members, whereby a close relationship to a member of the family, regardless if he/she is an external or immediate part of the family, could result in greater social support from him/her. In turn, this observation highlights the equally important need for the social support received to be of high quality. For instance, the findings of the spousal relationship as an important source of social support (e.g., Foronda, 2000; Yeo and Lu, 2012) might have an opposite effect if the spousal relationship was unhealthy and/or violent.

Also noteworthy is that findings on the social support received from extended family members and/or community, seem to imply it as a cultural factor that is typical of the collective and supportive culture in an Asian context (e.g., (Foronda, 2000; Charnsil and Bathia, 2010; Ilias et al., 2016). As such, future studies are recommended to explore the impact of collectivist and individualistic values in relation to the types of social support valued.

It should also be noted that despite finding social support to be a coping strategy for parents in the majority of the reviewed

studies, a study found a lack of positive association between social support and parenting stress (Nikmat et al., 2008). This finding may be attributable to the difference in the measure of social support used in their study in comparison to other studies. Whilst the Provision Social Relation (PSR; Turner et al., 1983) measure as used in a study (Nikmat et al., 2008) specifically looks at the overall perception of social support received, other quantitative studies determined the sources of social support and/or their relative importance (Moh and Magiati, 2012; Yeo and Lu, 2012; Xue et al., 2014); as did qualitative studies (Liwag, 1989; Foronda, 2000; Wahyuni, 2013; Foo et al., 2014; Santoso et al., 2015; Chong and Kua, 2016). Together, this evidence might suggest that while social support may play a role in attenuating parenting stress experienced by parents of children with ASD, this finding is specific to the sources it is drawn from, rather than acting as a general perception of feeling supported. This offered interpretation, is merely preliminary based on the findings of this systematic review and would require a thorough mixed-method study (Ilias et al., 2015) to support its accuracy.

The importance of *quality* social support was also seen from an informational perspective (Roffeei et al., 2015) and was seen to include support received by professionals. Particularly, lower perceived collaboration with a professional was associated with greater stress (Moh and Magiati, 2012), whereas contact with professional help was found to subside the suicide ideation within a family who was isolated from their own family members and community whilst caring for their children with ASD (Rahman et al., 2012). As a cross-cultural observation, it is worth noting that the importance of support from professionals and/or policy makers has also been reported in other regions (mainly in the Western/European context; Ooi et al., 2016) in either creating a positive or negative experience for parents of children with ASD. However, in the SEA region, where support services are only beginning to phase into conception and early-development, there may be a greater challenge as to how these support services are attained and experienced. As a result, this lack of quality support services, might increase the stress experienced by parents of children with ASD, which is likely to be more evident in developing countries that are limited in assessment, diagnosis, intervention services, and government provisions (e.g., Ting and Chuah, 2010; Tait and Mundia, 2012; Ha et al., 2014).

As suggested earlier, the finding of "severity of autism symptoms" as a source of parenting stress among parents of children with ASD, is one that is supported by similar findings in a Western/European context. In a South-East Asian context, where funding policies underequip schools and mental health care providers with sufficient personnel and resources for the intervention of challenging behaviors in children with ASD (Phua, 2012; Poon, 2013; Ha et al., 2014), the "severity of autism symptoms" might be a relatively more salient challenge for parents of children with ASD in this region. Across the 28 studies reviewed in this paper, just one study (Xue et al., 2014) found parents of children with ASD to experience relatively low levels of stress, and to only experience a mild interference with their family life when their child with ASD occasionally exhibited stereotyped, aggressive behavior. A study inferred this atypical result likely to be due to the milder symptoms of ASD among the children sampled (Xue et al., 2014). Specifically, the authors claimed that because the majority of the children had a diagnosis of ASD without intellectual disabilities, comorbid medical conditions and severe aggressive behaviors, parents might have been better able to cope with their child's autism symptoms and thus, experienced lower levels of stress (Xue et al., 2014).

In regards to financial difficulty, there is a tacit assumption that this factor may be more specific to the stress experienced by fathers in comparison to mothers (e.g., Pisula, 2011). Accordingly, in this review, Liwag (1989) found financial difficulty to be a source of stress that was more relevant to fathers in comparison to mothers of children with ASD. This finding may presumably reflect the paternal dominance as the breadwinner of the family in an Asian context. However, given the lapse of time since this finding (30 years) and hence, the sociocultural changes and shifting gender roles since then, it is uncertain if such gender differences might still exist. Moreover, the variability in design across the studies in this review makes it difficult to determine if there are indeed gender differences in respect to this factor. For example, most studies that revealed financial difficulty to be a contributing factor of parenting stress, sampled only mothers and thus, made it impossible to determine gender differences between fathers and mothers (Foronda, 2000; Yeo and Lu, 2012; Athari et al., 2013; Wahyuni, 2013). Similarly, other studies, which also found financial difficulty to positively associate with parenting stress, analyzed fathers and mothers as a dyad, and did not look for gender differences (Tait and Mundia, 2012; Vetrayan et al., 2013).

In further regards to gender differences in parenting stress among parents of children with ASD, this systematic review was able to identify some possible trends that may be specific to mothers and fathers respectively. For example, in an early study (Liwag, 1989), mothers were found to express stress in respect to the symptoms and disabilities associated with autism itself and worries about if they were not alive to care for the child; whereas, fathers emphasized fears that the child will never be "normal" and anxiety that the child will always be dependent and that the family may not be able to meet the child's needs (Liwag, 1989). In a more recent study, Resurreccion (2013) found mothers to highlight the importance of "parental involvement" and caregiver responsibilities in her child's development, whereby half of the mothers sampled in the study were found to resign from their work to become full-time mothers in assisting their child at home (p. 104); as did some of the mothers in the study by Foronda (2000). On the other hand, fathers were found to bear the responsibility of meeting the educational, health, and financial needs of the child as well as of the family (e.g., Liwag, 1989; Resurreccion, 2013). Together, these findings initially suggest that whilst a nurturing/emotional theme possibly underlies the factors that affect the stress experienced by mothers, fathers may be more likely to respond to stress based on their role as a provider in the family.

In parallel to this, findings from quantitative studies (Nikmat et al., 2008; Rejani and Ting, 2015) also provide support to the notion of possible gender differences in how parents of children with ASD experience stress. Particularly in the study, mothers' higher rates of psychological distress (i.e., stress, anxiety, and depression) were found despite an absence of gender differences in level of parenting stress (Nikmat et al., 2008). Here, it is

important to note that whilst "stress" is a sub-component of psychological distress, it is compounded with other variables such as depression and anxiety in the conceptualization of psychological distress. As such, this finding (Nikmat et al., 2008) further corroborates the idea that whilst both mothers and fathers of children with ASD experience parenting stress, there may be an "emotion-focused" theme that underlies more strongly maternal than paternal stress. However, this observation is limited to the small number of studies that compared mothers and fathers and the comparatively fewer number of fathers who were recruited as participants. Therefore, further research in respect to these observations are needed to provide better insight and understanding of how parenting stress is differentially experienced by mothers and fathers in the SEA region, and thus, how intervention methods can be tailored to meet these differences.

Additionally, several studies (Rahman et al., 2012; Ha et al., 2014; Ilias et al., 2016) have found cultural beliefs (e.g., karma, parental sins, curses) to influence how society perceives the diagnosis of ASD, which is less commonly found in studies conducted in a Western context. Parents who are persuaded by such beliefs may adopt an external locus of control, such that they feel helpless and adopt maladaptive methods (e.g., substance abuse) to cope with the stress experienced as found in the study by Rahman et al. (2012). However, as observed through the current systematic review, a greater number of studies (Liwag, 1989; Foronda, 2000; Wahyuni, 2013; Xue et al., 2014; Quilendrino et al., 2015; Siah and Tan, 2015, 2016; Chong and Kua, 2016; Ilias et al., 2016) found parents to adopt a positive perception and understanding toward ASD (e.g., adaptability, emotional acceptance, positive belief, sense of coherence) and hence, effectively cope with the obstacles of raising a child with ASD. It is therefore plausible, that the South-East Asian society is beginning to move away from cultural beliefs of parental sins, karma and/or curses in the etiological understanding of the ASD diagnosis.

Two other factors (i.e., parents' anxiety and worries about child's future, and religious belief) were also found to be associated with parenting stress among parents of children with ASD. In regards to the parents' anxiety and worries about the child's future, this factor was related to the lack of resources and support services available in the region to manage the ASD symptomologies and associated comorbidities (Neik et al., 2014). This finding suggested that parents in the SEA region face an imperative need for more resources and support services. Despite the inconsistency in the presence or absence of both these factors across the reviewed studies, these factors have also been found elsewhere (e.g., Ooi et al., 2016). However, in this paper, "religious belief" stood out as a culturally related factor as it was comparatively more salient among the reviewed studies (i.e., in the SEA region) than in studies conducted in a Western/European context (e.g., Hayes and Watson, 2013; Ooi et al., 2016). However, even in other contexts, there is evidence suggesting that the role of religion may serve as a positive source of support and aid in the initial acceptance and accommodating phase of adjustment (e.g., Tarakeshwar and Pargament, 2001; Gupta and Singhal, 2004; Benson, 2010; Willis et al., 2016).

Furthermore, although the age of a child with ASD is a variable that has typically been found to affect parenting stress among parents of children with ASD in a Western context (e.g., Duarte et al., 2005; Tehee et al., 2009; Rivard et al., 2014), it was not highlighted across the studies in this review except for one study (Yeo and Lu, 2012), which found parenting stress (and its relationship to psychological distress) to differ between mothers of preschool and elementary children with ASD in Malaysia and China. The study also investigated the age of a child with ASD as a variable, though not in respect to parenting stress (Vetrayan et al., 2013). Instead, authors found no correlation between the age of the child with parents' level of hopelessness (Vetrayan et al., 2013). The scarcity in report of this factor in this review may not be due to the lack of its implications in parenting stress. Rather, it may more accurately be attributed to the aims and designs of the studies in this review that were more interested in the analyses of other variables in relation to parenting stress. Or possibly, age was measured and analyzed but was not included in a particular study due to its non-significant findings and/or space constraints in the publication of the research.

On the whole, this systemic review is limited such that is it restricted to the findings of the studies reviewed in this article. Notwithstanding a thorough search of the literature review in multiple databases, only 28 studies related to parenting stress among parents of children with ASD in the SEA region was yielded. Whilst there is a possibility that selection bias occurred, this is less likely to be case as the authors were cautious to include studies that investigated other variables (e.g., hopelessness, parental satisfaction, quality of life) that might also provide a better understanding of the parenting stress experienced by parents of children with ASD. Hence, the limited number of studies that met the inclusion criteria despite this precautionary step might also point to the lack of research conducted in the SEA region in regards to parenting stress and resilience among parents of children with ASD.

At face value, it is noticeable that low-income countries and those with lower ratings in the Human Developmental Index (United Nations Development Programme, 2013) in the SEA region were underrepresented in this systematic review; specifically, Cambodia, East Timor, Laos, and Myanmar. It is thus possible that the findings are biased toward countries in the region with higher ratings in the Human Developmental Index. Accordingly, this necessitates the advancement and expansion of the research area on ASD in this region, especially in regards to parenting stress and resilience. It should be pointed out, that in the SEA region, where native, traditional languages (e.g., Burmese, Chinese, Cambodian, Indonesian, Lao, Malay, Tagalog, Thai, and Vietnamese) are still spoken among the people, research articles published in these languages and in relation to parenting stress could illuminate on factors that may have been overlooked in the English-only, published articles included in this review. Nevertheless, very few articles were identified in native languages, although initial attempts were made to locate them as well. The English-only search strategy could have introduced bias leading articles published in local languages to be overlooked. Future reviews are recommended to include multi-languages in the search process.

Secondly, the overrepresentation of mothers/underrepresentation of fathers in this paper might lead to a gender bias in the reported findings. The large difference in the number of mothers and fathers sampled across studies in this review paper may reflect the easier nature to recruit mothers in comparison to fathers as they, in general, remain to be the primary caregiver in an Asian context (Phetrasuwan and Shandor Miles, 2009; Rejani and Ting, 2015; Siah and Tan, 2015). On the other hand, this could also be attributed to the sampling methods that aim to recruit only one parent of a child with ASD (usually the mother) rather than both parents. As elaborated above, this makes it difficult to thoroughly determine how parenting stress is experienced differently for mothers and fathers. This overrepresentation of mothers has also been a commonly observed bias in Western samples (e.g., Bitsika et al., 2013; Braunstein et al., 2013; Hayes and Watson, 2013; Ooi et al., 2016).

Moreover, majority of the studies in this review did not also report the age at which the children were diagnosed with ASD. Whilst the children of some parents would have received an earlier diagnosis, other children might have only just been diagnosed relative to the time at which the respective study was conducted. This difference might lead to parents of children with an earlier diagnosis, to over time, be more equipped and resilient in caring for their child with ASD in comparison to parents who are only beginning to seek for clarity and support. As such, if this factor was instead maintained as a control variable, it would have allowed for a clearer and more accurate examination of parenting stress among parents of children with ASD.

Further limiting the conclusions made in this review, the common use of purposeful and convenience sampling may have led to a biased sample of more resilient parents who are more likely to volunteer and participate (e.g., Tait and Mundia, 2012; Wisessathorn et al., 2013; Xue et al., 2014; Chong and Kua, 2016; Ilias et al., 2016). Even, in one article (Foronda, 2000), the author was transparent reporting she included herself as one of the 16 participants. No other conflicts of interest were specifically reported, although it is possible they may have been present in some studies. Other than that, the sampling could have also led to a biased sample of more parents from middle to higher socioeconomic backgrounds who have access to intervention services (e.g., Liwag, 1989; Sian and Tan, 2012; Ha et al., 2014; Xue et al., 2014; Santoso et al., 2015; Siah and Tan, 2016). Additionally, studies included in the review were cross-sectional and therefore inferred an association rather than a causal relationship. Longitudinal investigations are recommended for future research.

Besides that, variation in designs, factors analyzed, methods, and outcome measures, made direct comparison between the findings of the studies, problematic. As illustrated in Supplementary Table 1, significant variation was observed for the outcome measures of parenting stress, and conceptual ambiguity of the construct remains an area for future investigation to tackle. Furthermore, the use of an active control group in only one of the reviewed studies (Lai et al., 2015) elucidates the need for more experimental/quasi-experimental design components in the research area of ASD in the SEA region. The 28 studies had a reasonable balance between quantitative and qualitative studies (14 quantitative, 11 qualitative, and three mixed-method) that were found to corroborate the findings among them. Therefore, as a seminal article (at least, to our knowledge) that has reviewed articles in the SEA region in regards to parenting stress among parents of children with ASD, this paper provides a helpful and informative starting point for future researchers, parents, as well as professionals in the field.

To conclude, this systematic review observed four main factors to be associated with parenting stress among parents of children with ASD in the SEA region: social support, severity of autism symptoms, financial difficulty and parents' perception and understanding toward autism. Other factors that were also found to be associated with parenting stress in this sample (though, to a lesser extent) included, parents' anxiety and worries about their child's future, and religious belief. Whilst several of these factors may have similarly been reported in a Western context, findings from the current systematic review lean to suggest that the greater advanced development and implementation of policy, economical and professional support services in Western countries than in South-East Asian countries might impart cultural differences in regards to how these factors are manifested. Therefore, further research is imperative to more clearly identify cultural specificities that differentiate how parenting stress and its associated factors are uniquely experienced across countries in the SEA region in comparison to Western countries. Additionally, as majority of the studies identified in this review were not published in high-impact journals with large readerships, funding and research bodies are recommended to increasingly support the methodological rigor in the design, conduct, and publication of studies in the SEA region, especially in the lower-income countries.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2018.00280/full#supplementary-material

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Effect of Mindfulness Based Stress Reduction (MBSR) in Increasing Pain Tolerance and Improving the Mental Health of Injured Athletes

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Literature indicates that injured athletes face both physical and psychological distress after they have been injured. In this study, a Mindfulness Based Stress Reduction (MBSR) was utilised as an intervention for use during the period of recovery with injured athletes and, to the best of our knowledge, this is the first study using MBSR as an intervention for this purpose.

Objective: The aim of this research was to investigate the role of MBSR practise in reducing the perception of pain and decreasing anxiety/stress, as well as increasing pain tolerance and mindfulness. An additional aim was to increase positive mood and decrease negative mood in injured athletes.

Methods: The participants comprised of twenty athletes (male = 14; female = 6; age range = 21–36 years) who had severe injuries, preventing their participation in sport for more than 3 months. Prior to their injury, the participants had trained regularly with their University teams and participated in official university championships. Both groups followed their normal physiotherapy treatment, but in addition, the intervention group practised mindfulness meditation for 8 weeks (one 90-min session/week). A Cold Pressor Test (CPT) was used to assess pain tolerance. In contrast, the perception of pain was measured using a Visual Analogue Scale. Other measurements used were the Mindful Attention Awareness Scale (MAAS), Depression Anxiety and Stress Scale (DASS), and Profile of Mood States (POMS).

Results: Our results demonstrated an increase in pain tolerance for the intervention group and an increase in mindful awareness for injured athletes. Moreover, our findings observed a promising change in positive mood for both groups. Regarding the Stress/Anxiety scores, our findings showed a notable decrease across sessions; however, no significant changes were observed in other main and interaction effects in both groups.

Conclusion: Injured athletes can benefit from using mindfulness as part of the sport rehabilitation process to increase their pain tolerance and awareness. Further research is required to assess whether increasing pain tolerance could help in the therapeutic process.

Keywords: injured athletes, mindfulness meditation, pain tolerance, stress, mental health

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INTRODUCTION

Sport injuries are a considerable public health concern. The impact of the injured athlete extends beyond the individual. Although it may impact on their seasonal and potential career performance, it additionally impacts upon the clubs and organisations for whom they perform. Furthermore, it leads to a greater general burden on the health service. Every year, in the United Kingdom, there are 29.7 million injuries among athletes (Nicholl et al., 1995). This is in line with studies by Nicholl et al. (1995) and Leppänen et al. (2014), who indicate that, although there are many health benefits from participating in sport activities, risks should be expected. This occurs when athletes become injured and are out of their sports for a considerable period, or when a termination of a player's career occurs because of severe re-occurring injuries. Heaney (2006) and Reese et al. (2012) report that injuries can affect athletes' mental health by triggering depression and anxiety, decreased self-esteem, loss of identity, anger, isolation, fear, and tension. It is worth noting, that sport injuries include both psychological and physiological effects on athletes (Ruddock-Hudson et al., 2014). Peterson and Renstrom (2000) clarify that sport injuries are caused by trauma. They divide sport injuries into different levels of trauma: injuries that are caused by overuse syndromes and those caused by traumatic injuries. Overuse syndromes are common among athletes because of the duration of training and highly intense exercise, whereas traumatic injuries occur because of the impact of a large force, often resulting in a high level of pain.

Furthermore, sport injuries lead to an imbalance and discomfort in life for athletes after injury and this physical inability prevents them from achieving in their sport (Reese et al., 2012). From this perspective, recent evidence discussed by Ford et al. (2000), Tracey (2003), Heaney (2006), Vergeer (2006), Reese et al. (2012), Arvinen-Barrow et al. (2014), Ruddock-Hudson et al. (2014), and Tatsumi and Takenouchi (2014) suggests that psychological interventions are important for athletes to play an effective role in the rehabilitation process after being injured. Psychological interventions can lead to a reduction in negative thoughts and moods. Heaney (2006) reveals that there are many studies that have been undertaken using psychological interventions to enhance athletes' attitudes and reduce negative thoughts as a strategy of the injury rehabilitation process (Ford and Gordon, 1998; Francis et al., 2000; Hemmings and Povey, 2002). Crossman (1997) and Dawes and Roach (1997) state that it is common, during and after injury, for athletes to have negative thoughts and experiences. Therefore, understanding the psychological response is the first step in organising rehabilitation for injured athletes, because emotions stimulate tension and worry (Crossman, 1997). In other words, both tension and worry impede athletes from achieving their optimum performance and hinder the injury rehabilitation process. In support, Ivarsson et al. (2013) also emphasise that in recent years, theoretical concepts, empirical studies, and applied knowledge in the psychology of injury are widely used as part of the rehabilitation process of injured athletes.

Sport injuries can affect injured athletes' teammates, coaches, and family members. Therefore, their social support can have a positive effect on athletes and help them to return to their sports (Crossman, 1997). Regarding the social factor in sport rehabilitation, Rees et al. (2010) emphasise that receiving support from family, medical staff, coaches, and friends can enable athletes to cope with psychological distress. In this vein, Podlog et al. (2014) stress that the duration of the sport rehabilitation process could be shorter, for injured athletes, if they continue to connect and socialise with teammates, keep their fitness level high, have a love of sports, and reach their personal goals. Calvert (2015) also stressed that utilising psychological interventions with athletes is useful during the rehabilitation process. The reason is that athletes' beliefs, emotions, and thoughts influence the way their body responds after injury. More specifically, there is an interaction between body and mind and this interaction can be utilised for two purposes. The first is to support injured athletes in the rehabilitation process. The second is that injured athletes become more confident in avoiding the risk of injuries (Calvert, 2015).

With respect to the role of mindfulness meditation in current research, Arvinen-Barrow and Walker (2013) mention that as a part of sport injury rehabilitation, mindfulness can be an effective instrument to achieve a relaxed state of body and mind. Moreover, it can enable an individual to gain more awareness and acceptance about their situation as an injured athlete (Arvinen-Barrow and Walker, 2013). Besides, it might be suitable to turn their attention to psychotherapy treatment, seeking to confirm the correct course of action for rehabilitation (Arvinen-Barrow and Walker, 2013). Venkatesh et al. (1997) report that practising meditation, in the long-term, leads to considerable changes in awareness. Furthermore, the study has investigated significant changes in self-awareness, arousal, and perceptual experience. Stahl and Goldstein (2010) emphasise being in the present moment, or living in the body, by paying attention to, and being conscious of, physical sensations. Therefore, a 'body scan' is a very convenient mode with which to connect with one's mind and body. In this way, a body scan can be an effective technique for the reduction of physical pain, anxiety and stress. More importantly, it has been reported that mindfulness meditation is beneficial for healing those suffering from pain. In addition, Ivarsson (2015) refers to elite football players who undertook psychological interventions based on attention, and they were able to diminish sports injuries. He also recommends daily mindfulness exercises to lessen the risk of injury.

In this vein, mindfulness-based intervention has also flowed into sport performance. Literature has shown beneficial consequences in improving athletes' performance. Birrer et al. (2012) emphasise that cultivating mindfulness practise with athletes can be taught via a different mechanism. For instance, mindful breathing could be introduced as a 'non-sports setting'; however, it can be also being incorporated into athletes' sport attitude by accepting and not judging those attitudes. In other words, mindfulness practise can encourage athletes to accept whatever situations they might face during involvement with their sports, and not judge them. They also demonstrate the

capability of incorporating mindfulness practise into sport training. Another example of incorporating mindfulness practise in sports, as mentioned by Birrer et al. (2012), was a body-scan, that could take place at the end of a sport training programme or during the cool-down process.

By the same token, numerous empirical trials are analysed by Sappington and Longshore (2015). They discuss promising evidence of the usefulness of mindful practise in sport performance. As such, Thompson et al. (2011) suggest applying a long-term mindfulness approach called Mindful Sport Performance Enhancement (MSPE), as a promising intervention that can enhance athletes' performance.

Therefore, this study aims to use a common meditation technique, based on Mindfulness-Based Stress Reduction (MBSR), as an intervention for utilisation during the recovery period of injured athletes. The aim of this research was to investigate the role of MBSR practise in reducing the perception of pain and anxiety/stress and increasing pain tolerance and mindfulness. Additionally, the aim was to increase positive mood and decrease negative mood in injured athletes.

Our hypothesis was that practising regular mindfulness will increase pain tolerance, and awareness, in injured athletes. Furthermore, it will reduce the perception of pain and decrease negative mood in their daily lives.

MATERIALS AND METHODS

Participants

A total of 20 injured athletes, who were all university students, were recruited; Flyers were placed in different university locations such as academic departments, clinics, student unions, and exercise facilities, emails were sent to all students through the students' support officer at the School of Sport and Exercise Sciences, and participants were recruited through word-of-mouth and by asking therapists to refer injured athletes.

Regarding the inclusion criteria, participants who were involved in this intervention were athletes who trained regularly with their teams in university. They participated in official university championships but were not elite athletes.

In addition, participants in both groups had been away from their sports due to injury for 3–6 months. The participants (injured athletes) were from various kinds of sports as well as typology of injury. Both males and females could take part in this intervention. The age of participants was between 18 and 45 years. Participants who took part in the intervention group were asked to attend all sessions of the MBSR. Similarly, they were asked to complete all assessment tools and CPT during the period of the MBSR programme. As such, the same procedure was followed in the control group prior to and after each physiotherapy session and during the MBSR programme. Furthermore, they were asked to read the participant information sheet carefully, which included all the instructions, before they signed the informed consent form to take part in the study.

In relation to the exclusion criteria, participants who self-reported having diabetes (Type I or II), haemophilia, Reynaud's syndrome, fainting, seizures, any recent cuts to the hand, or cardiovascular disorders were excluded from the study. Any absence from any mindfulness session in the intervention group or physiotherapy session for the control group, meant that the participants were excluded from the programme. Participants who withdrew from the MBSR programme were excluded from this study.

The randomisation process was designed to approach 20 injured athletes in both the intervention and control groups. The first participant who visited the sport clinic and signed the informed consent was allocated to the intervention group. Likewise, the second participant who visited the sport clinic was assigned to the control group. Pairs of participants, as they arrived at the sport clinic at the same time, were assigned randomly by a third person (blind to the aims of the study) to one of the two groups. Four participants dropped out of the study, two dropped out after signing the consent form. Another two withdrew after starting the MBSR but were replaced.

Demographic information for each participant that completed the study is presented in **Table 1**. The two groups did not differ in age, $t(18) = 0.083$, $P = 0.935$, (M intervention = 28.9 years, $SD = 6.21$; M control = 28.7, $SD = 4.47$) or gender, $\chi^2 = 0.952$, $P = 0.329$. All participants received physiotherapy treatment at a sports therapy clinic when they had been away from their sports for three to 6 months.

Procedure

Ethical approval for the study was obtained from the Ethics Committee, School of Sport and Exercise Sciences.

All the participants gave informed consent prior to starting the study. All the participants saw the participant's information sheet (PIS) and signed the consent form. The PIS contained information regarding the procedure involved in this study, such as the purpose of the study, what kind of population could take part, whether there were any benefits and risks involved in taking part, confidential issues, and contact details.

In week zero (week_0) and nine (week_9) of the study, all the participants completed the cold pressor test (CPT). During weeks one to eight, participants in the intervention group completed three questionnaires (MAAS, DASS, and POMS) before and after each formal meditation session. Injured athletes in the control group who did not receive MBSR were also asked to complete the CPT in week zero and week nine. Regarding the quantitative measurements, they completed all the questionnaires before starting their clinical session and at the end of the treatment.

The intervention in this study was based on the original version of the MBSR, which was developed by Kabat-Zinn 1979 at the University of Massachusetts Medical Centre in Worcester (Kabat-Zinn, 2013). Notably, MBSR consists of 8 weeks of coursework lasting about 2.5 h per week in a group session. In this study, the procedure was modified due to the nature of the severely injured athletes' state. Hence, carrying out meditation for 2.5 h was not medically reasonable because the physically injured athletes were not capable of practising meditation for that duration, due to suffering pain whilst maintaining a stable body posture (see **Table 2**).

TABLE 1 | Demographic details for each participant in each of the groups in terms of age, gender, clinical characteristics of the injury and sporting activities.

Age	Gender	Typology of Injury	Physical Activity	Side of Injury	Side of Body Tested for CPT
Intervention Group					
36	Male	Ankle injury	Tennis	Right Ankle	Right Hand
36	Male	Wrist injury	Kickboxing	Right Wrist	Right Hand
34	Male	Knee injury	Bodybuilding	Right Knee	Right Hand
32	Female	Hips Injury	Running	Left Side	Left Hand
32	Male	Low Back pain	Running	Low Back pain	Right Hand
31	Male	Shoulder injury	Football	Left Shoulder	Right Hand
24	Male	Shin injury	Basketball	Right Side	Right Hand
22	Male	Collateral-Ligament	Basketball	Right Knee	Right Hand
21	Male	Knee ACL	Running	Right Knee	Right Hand
21	Female	Knee ACL	Basketball	Right Knee	Right Hand
Control Group					
36	Male	Knee (ACL)	Football	Right Knee	Right Hand
33	Male	Low Back pain	Kickboxing	Low Back Pain	Right Hand
31	Male	Arm injury Knee injury	Running	Left Arm	Right Hand
31	Female		Cyclist	Right Knee	Right Hand
30	Male	Peroneal tendon subluxation	Cyclist	Left Side	Right Hand
29	Male	Shoulder injury	Bodybuilding	Left Side	Right Hand
26	Female	Elbow injury	Basketball	Left Elbow	Right Hand
26	Male	Ankle	Cyclist	Right Ankle	Right Hand
24	Female	Knee (ACL)	Running	Right Knee	Right Hand
21	Female	Big Toe/ Proximal phalanx	Running	Left Side Toe	Right Hand

ACL, Anterior cruciate ligament. The labels used in the typology of injury were labels given by the injured athlete. These injuries either occurred during participation in the sport or during training. The two groups did not differ in age, t(18) = 0.083, P = 0.935, (m intervention = 28.9 years, SD = 6.21; m control = 28.7, SD = 4.47) or gender, χ^2 = 0.952, P = 0.329.

TABLE 2 | Mindfulness-Based Stress Reduction (MBSR) that was used in this study with injured athletes in the intervention group.

Weeks	Formal meditation practise (90 min)	Informal meditation practise (20 min)
Week 0	– Participant information sheet – Consent forms – Cold Pressor Test (CPT)	Participants given the CD guide of MBSR programme to practise at home.
Week 1 - Week 8	– Participants were asked to complete three questionnaires (MAAS, DASS and POMS), approximately 15 min. – 10–15 min of mindful check-in and sharing ideas about mindfulness meditation practise. – 30 min formal meditation practise with researcher. The formal session included these meditation skills (sitting/laying down meditation, mindful breathing and body scan meditation). – Participants were asked to complete three questionnaires (MAAS, DASS, and POMS) for the second time at the end of the meditation session. – 10–15 min of mindful check-in and sharing of ideas about mindfulness meditation practise. – Participants attended the lab on the same day each week.	– 20 min daily meditation practise. The CD guide of MBSR programme includes (sitting/laying down meditation, mindful breathing, body scan meditation, mindful eating, mindful walking meditation, meditation for anxiety and stress, mindful lying yoga, mindful standing, yoga, and loving kindness meditation. – Participants were free to choose the skills they would apply or listen to.
Week 9	Participants repeated the Cold Pressor Test (CPT) at the end of the MBSR.	

Likewise, gathering all injured athletes in a group session, at the same time, was not possible because of their physiotherapy treatments and availability. Therefore, individual sessions were run with each athlete.

All participants in the study followed their normal physiotherapy treatment. Notably, for the duration of the sport therapy, each injured athlete followed therapy advice specific to their injury.

Participants were asked to come to a specific room, which was adapted to run the mindfulness practise in a noiseless and unobtrusive space at the School of Sport and Exercise Science. The participants started each session by completing three types of questionnaire that lasted approximately 15 min. They then spent 10–15 min on a mindful check-in and shared ideas about mindfulness meditation. After 30 min of meditation (mindful breathing, body scan meditation, and sitting meditation) the

same questionnaires were completed, followed by the sharing of ideas about meditation and their body sensations. Consequently, the participants spent about 90 min in each session with the first author.

In addition to 90 min of formal meditation practise with an instructor and as a part of the MBSR programme, each participant was given a CD guide of meditation practise to listen to and were asked to practise at home for between 20 and 30 min per day. The informal meditation practise in this study was based on the CD guide that was delivered to injured athletes to apply at any time during their daily activities.

In this study, the CD from the 'mindfulness-based stress reduction workbook' by Stahl and Goldstein (2010) was offered to injured athletes and at the end of the MBSR they were returned to the researchers. It is important to note that, many researchers have followed different levels of practise of MBSR in their research, such as work by Mackenzie et al. (2006) and Bergen-Cico et al. (2013). It should also be noted that injured athletes in both groups received physiotherapy treatment according to their specific injury.

Cold Pressor Test

As per previous studies, injured athletes started the CPT test by sitting down and submerging one hand (participants chose their preferred hand) in a bucket of cold water between 0 and 2°C for a maximum of 8 min (Angius et al., 2015). They were instructed to put their hand in the ice bucket and keep it in for as long as possible but for no longer than 8 min. All participants placed their hand in the ice bucket so that the whole hand was submerged up to the level of the wrist.

The pain tolerance measure was described as the time between submersion and removal of the hand from the cold water. CPT is appropriate for this research as it is safe, time efficient, and is a reliable method widely utilised to measure pain (Mitchell et al., 2004; Wirch et al., 2006; Angius et al., 2015).

Visual Analogue Scale (VAS)

Injured athletes recorded a mark on a 10 cm straight line, anchored with the labels *no pain* and *most pain* at each end, to indicate the degree of pain experienced when removing their hand from the water in the CPT. VAS is a popular and reliable assessment tool for measuring pain (Johnson, 2005). The interclass correlation between the two sessions was $r(12) = 0.807$.

Mindful Attention Awareness Scale (MAAS) (Brown and Ryan, 2003)

This is a 15-item questionnaire that measures the frequency of mindful states in everyday life, using general and situation-specific statements. Responses are given on a six-point scale, from one *(almost always)* to six *(almost never)* with higher scores representing greater mindfulness. The objective of using the MAAS scale is to obtain the level of participants' mindful awareness across the 8 weeks of the study. Across the two sessions and 8 weeks, Cronbach's α ranged between 0.946 and 0.838.

Depression Anxiety and Stress Scale (DASS) (Lovibond and Lovibond, 1995)

The DASS was used to assess the level of anxiety and stress during the 8 weeks of the study. The DASS scale contains 42 items, consisting of three subscales to evaluate depression, anxiety, and stress. Only the anxiety and stress section of the scale were administered, with participants reporting the symptoms they were currently experiencing. The anxiety scale comprises four factors: skeletal muscle effects, the subjective experience of the effect of anxiety, situational anxiety, and autonomic arousal. In contrast, the stress scale assesses nervous arousal, irritability/being over-reactive and impatient, being upset/agitated, and having difficulty relaxing. The rating scale is divided between zero *(did not apply to me at all)* to three *(applied to me very much, or most of the time)* (Lovibond and Lovibond, 1995). Across the two sessions and 8 weeks, Cronbach's α varied between 0.941 and 0.436.

Profile of Mood States (POMS) (Terry et al., 2003)

Injured athletes completed the POMS prior to and after each session during the 8-week MBSR programme. Participants answered the POMS according to how they felt at the time and they chose from a rating scale of zero *(not at all)* to four *(extremely)* (Terry et al., 2003). Across the two sessions and 8 weeks, Cronbach's α varied between 0.843 and 0.525.

Statistics Analysis

All data was calculated as means and Standard Error to assess the pre- and post-meditation practise during each week and for both the intervention and control group.

Pain perception scores from the VAS and pain tolerance were analysed using a two-way mixed analysis of variance, with Group (intervention, control) as the 'between' subject factor and Time (week_0, week_9) as the 'within' subject factor. Scores from each of the questionnaires (MAAS, DASS, and POMS) were analysed using a three-factorial mixed analysis of variance with Group (intervention, control) as the 'between' subject factor and Time (weeks 1–8) and Session (pre and post) as the 'within' subject factors (see **Tables 3**, **4**).

RESULTS

Analysis of Pain Perception and Pain Tolerance

Analysis of pain perception scores showed no significant main or interaction effects (all F's < 0.36, P's > 0.18, partial eta squared (PES) < 0.1, see **Figure 1**. Analysis of pain tolerance scores indicated a significant main effect of Time, $F(1,18) = 12.21$, $P = 0.003$, PSE = 0.4 but no main effect of Group $F(1,18) = 2.29$, $P = 0.148$. However, there was a Time × Group interaction, $F(1,18) = 13.12$, $P = 0.002$, PES = 0.422. **Figure 2** indicates that the increases were only in the intervention group. Further analysis showed no significant

TABLE 3 | Mean, standard errors, and partial eta squared (PES) for the main effect of session for the POMS, MAAS and DASS questionnaires for the intervention group and control group.

Dependent Variables		Session			
		Pre	Post	*P*	*PES*
POMS: depression-dejection	Mean	2.76	1.71	0.001	0.49
	Standard error	0.47	0.28		
POMS: tension-anxiety	Mean	3.94	2.58	<0.001	0.545
	Standard error	0.51	0.39		
POMS: anger-hostility	Mean	2.75	2.22	0.165	0.104
	Standard error	0.54	0.43		
POMS: vigour-activity	Mean	6.46	6.65	0.617	0.014
	Standard error	0.76	0.81		
POMS: fatigue-inertia	Mean	3.74	2.49	0.004	0.385
	Standard error	0.51	0.42		
POMS: confusion-bewilderment	Mean	2.74	1.75	<0.001	0.294
	Standard error	0.43	0.27		
MAAS	Mean	61.26	64.81	0.001	0.478
	Standard error	2.49	2.56		
DASS-anxiety	Mean	6.18	4.87	0.008	0.328
	Standard error	1.00	0.82		
DASS-stress	Mean	9.96	7.74	0.001	0.471
	Standard error	1.13	1.11		

TABLE 4 | Mean and standard errors and partial eta squared (PES) for the main effect of Time for the POMS, MAAS and DASS questionnaires for the intervention group and control group.

Dependent Variables		Time									
		1	2	3	4	5	6	7	8	*P*	PSE
POMS: depression-dejection	Mean	3.35	3.01	1.95	2.17	1.97	2.17	1.87	1.38	0.004	0.152
	Standard error	0.61	0.64	0.39	0.47	0.37	0.52	0.41	0.38		
POMS: tension-anxiety	Mean	4.63	4.68	2.62	2.66	2.74	3.83	2.49	2.40	<0.001	0.248
	Standard error	0.74	0.66	0.41	0.50	0.55	0.71	0.47	0.52		
POMS: anger-hostility	Mean	3.12	3.46	2.17	2.16	2.11	2.59	2.27	2.00	0.165	0.105
	Standard error	0.61	0.80	0.46	0.53	0.39	0.50	0.54	0.51		
POMS: vigour-activity	Mean	6.87	6.63	6.63	6.62	6.17	6.42	6.65	6.46	0.617	0.03
	Standard error	0.69	0.75	0.93	0.86	0.67	0.89	0.95	1.02		
POMS: fatigue-inertia	Mean	5.11	4.59	2.48	3.50	2.76	2.26	1.99	2.21	0.004	0.327
	Standard error	0.70	0.77	0.43	0.76	0.48	0.52	0.44	0.47		
POMS: confusion-bewilderment	Mean	3.56	3.15	2.08	2.00	2.46	2.03	1.48	1.22	0.001	0.262
	Standard error	0.57	0.54	0.30	0.40	0.47	0.45	0.31	0.29		
MAAS	Mean	57.90	58.15	62.70	64.48	63.40	63.00	66.20	68.48	0.001	0.264
	Standard error	2.58	2.78	2.64	2.84	2.65	2.93	3.04	3.09		
DASS-anxiety	Mean	6.20	6.58	5.35	5.90	5.35	5.15	5.10	4.55	0.611	0.041
	Standard error	0.94	0.87	1.21	1.34	1.23	1.47	1.04	0.72		
DASS-stress	Mean	9.52	10.97	10.33	8.73	9.50	8.25	7.18	6.33	0.001	0.166
	Standard error	1.26	1.47	1.38	1.46	1.04	1.28	1.45	1.26		

difference between the two groups at week_0, [$t(18) = 0.006$, $P = 0.9$], but a significant difference at week_9 [$t(18) = 2.66$, $P = 0.016$].

Mindful Attention Awareness Scale

The MAAS scores increased over the two Sessions, $F(1,18) = 16.45$, $P = 0.001$, PSE = 0.478 and over the 8 weeks, $F(7,126) = 6.45$, $P < 0.001$, PSE = 0.264. There was also a main effect of Group, $F(1,18) = 5.34$, $P = 0.033$, PSE = 0.229), indicating higher MAAS scores for the intervention group ($m = 68.79$, $s = 3.52$) than the control group ($m = 57.29$, $s = 3.52$). There was a greater change in the MAAS scores across the Session for the intervention group (pre = 66.16, post = 71.41) than for the control group (pre = 56.36, post = 58.21), the Group *x* Session interaction, $F(1,18) = 3.77$, $P = 0.034$ (one-tailed), PSE = 0.173 was significant.

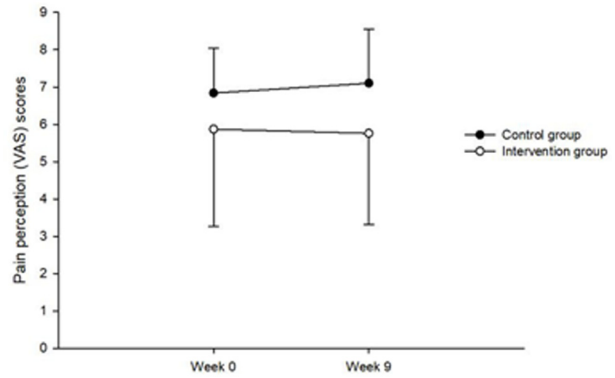

FIGURE 1 | Showing the Time × Group interaction for pain perception.

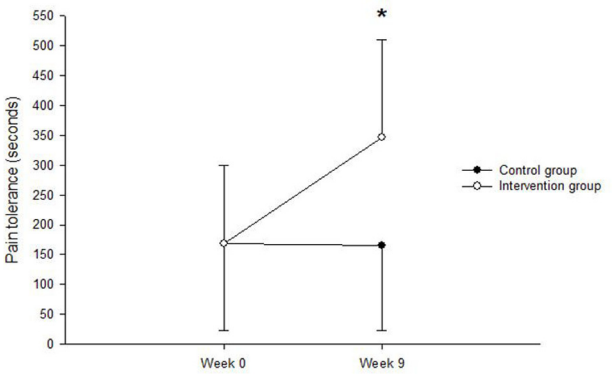

FIGURE 2 | Showing the Time × Group interaction for pain tolerance.

Profile of Mood States

These results indicated that there were general changes in mood across Session and Time for depression, tension, fatigue and confusion scores. All other main and interaction effects were not significant ($P > 0.06$). The main effects of Session and Time are illustrated in **Tables 3**, **4** respectively, for each measure of mood.

Depression Anxiety and Stress Scale

Anxiety scores indicated a notable decrease in anxiety across Sessions, $F(1,18) = 8.80$, $P = 0.008$, PSE = 0.328 see **Table 3**. All other main and interaction effects were not significant ($P > 0.2$). Stress scores indicated a decrease across Sessions, $F(1,18) = 16.04$, $P = 0.001$, PSE = 0.471 and Time $F(7,126) = 3.59$, $P = 0.001$, see **Tables 3**, **4**. All other main and interaction effects were not significant ($P > 0.06$).

DISCUSSION

The objective of this study was to investigate whether MBSR has any effect on reducing pain and the improvement of the mental health of injured athletes during an 8-week programme. Results showed that there was an increase in pain tolerance, and therefore less sensitivity to pain, in the intervention group. This study suggested that MBSR could be used by injured athletes to manage their pain. Hence, meditation practise might provide them with an ability to manage their injury. It was also observed that injured athletes who had taken part in the intervention group gained beneficially from MBSR as an additional tool during the sport rehabilitation process. Self-regulation practise could also improve pain management through attitudes that emerged from MBSR. Consequently, pain tolerance increased further in injured athletes, who received MBSR, compared to their peers in the control group. To support this view, Kabat-Zinn (2013) states that 'keeping particular attitudes in mind is actually part of the training itself, a way of directing and channelling your energies so that practitioners can be most effectively brought to bear in the work of growing and healing' (p. 21).

This supports previous research, which found that people who participated in 8 weeks of a Mindfulness Based Stress Reduction experience a significant reduction in their pain, compared to the control group that followed a health education protocol (Morone et al., 2009). Additionally, Lykins and Baer (2009) and Nehra et al. (2012) indicate the self-regulation benefits of MBSR on pain management and well-being. Essentially, Baer (2003) refers to the research that has been conducted on the influence of MBSR on patients with pain disorders. It included four studies that were the same as those of Kabat-Zinn et al. (1985, 1987), and Radolph et al. (1999). All this research collected data about chronic pain with patients who applied MBSR. In addition, the results of these studies showed that there was a significant enhancement in pain grades for patients. Furthermore, Zeidan et al. (2010) mention that 3 days of a brief mindfulness intervention is effective in diminishing pain and increasing psychological status. Our results highlight that MBSR can be used in a group of injured athletes to increase pain tolerance.

However, the VAS scores in perception of pain showed that there was no difference in the intervention or control groups pre- and post-programme. Based on the instructions of CPT, injured athletes in both groups could take their hands out of the water when they experienced pain. This might predicate their similar levels of perception of pain.

The MAAS results showed that mindful awareness was higher immediately after 90 min of MBSR. This change was more significant in the intervention group than in the control group. In other words, participants in the intervention group understood how to pay attention, live in the present moment, and increase their level of body awareness, without criticising themselves through specific instructions, which they received from MBSR. That could be the main reason for the higher scores of MAAS in the intervention group.

It was also observed that mindful awareness increased across the 8 weeks. As this was true of both groups, this is probably due to both groups receiving physiotherapy treatment. Physiotherapy relies on touch to treat patients; therefore, our expectation was that it would lead to an improvement in their mindful awareness, possibly due to the focus of attention on a specific part of the body, after 8 weeks of treatment. The MAAS results in this study support previous research, which has shown an increase in mindfulness skills over time with cancer patients (Brown

and Ryan, 2003). Correspondingly, athletes who contributed to research by Goodman et al. (2014), were taken from 26 colleges and several experimental groups comprising of eight athletes, whereas, the control group consisted of 13 male athletes from sport teams. As a result, there were significant results in the experimental group, with greater attention to their goals regarding mindful exercise than student athletes from the control group. Another possible explanation for our findings is that by practising mindfulness meditation on a regular basis, injured athletes improve the regulation of their emotions. To support this interpretation, Siegel (2008) stated that mindfulness application leads to combatting emotional dysfunction, a reduction in negative attitudes, a capability to regulate emotion, and an improvement in patterns of thinking. Moreover, a study by Azulay and Mott (2016) found encouraging results in relation to mindfulness meditation practise with a mixed brain injury. They also observed that awareness had increased in patients with a stroke condition, as they were more mindful about their disability at the end of the treatment. They explained their findings were a consequence of regular meditation, providing patients with the ability to manage their pain from physical injuries.

A control group that did not receive physiotherapy treatment would be distinguished from any natural increase in mindfulness with time. In the control group, athletes could have directed their attention to their injury, which might have been sustained throughout the 8 weeks. Alternatively, it could be that the injury increases worry or rumination of the consequences of the injury. Then, as the injury heals over time, these decrease, subsequently improving mindfulness awareness.

Regarding mood changes, a consistent pattern emerged over Time and over Sessions. We found a general decrease in mood for depression-dejection, tension-anxiety, fatigue-inertia, and confusion-bewilderment. There were no significant changes for anger-hostility or vigour-activity. As these main effects did not interact with the group, this suggests no additional benefit was gained from the MBSR. It is important to note that there was mood decrease in the control group. This could be due to the physiotherapy though, again, a control group (without physiotherapy) would be needed to answer this question. It could be that as the injury improves over time (either due to physiotherapy or not) mood decreases. The lack of any change in tension-anxiety and vigour-activity may be because injured athletes were not engaged with their physical activities and therefore, they did not feel active enough during those 8 weeks.

In relation to stress and anxiety scores, the results showed a notable decrease across sessions, however; no significant changes were observed in the other main interaction effects, although, a sizable body of literature found a positive influence of MBSR in reducing anxiety and stress (Ott et al., 2006; Pradhan et al., 2007; Keng et al., 2011). A potential explanation for this might be the injured athlete's state of mind at the time of completing the DASS questionnaires. Furthermore, the last therapeutic process might also have an effect on injured athletes' scores.

According to the results of this study, injured athletes can benefit from using mindfulness meditation as a part of the sport rehabilitation process to increase their pain tolerance and the level of mindful awareness.

Implications

The main aim of this study was to explore the usefulness of MBSR in a sport injury rehabilitation context. Based on the results of this study, incorporating the MBSR programme into sport therapy helped injured athletes to increase their pain tolerance as well as mindfulness, and had a positive effect on their recovery from an injury. This study suggests that there is considerable scope for including some formal mindfulness components into the professional training of sports injury rehabilitation professionals. More specifically, regarding the significant mental nature of pain, mindfulness can become an essential part in the therapeutic toolkit of sport therapy.

This is consistent with Pen and Fisher (1994), who suggest that the ability of an injured athlete to support pain is related to how quickly the athlete recovers from an injury. However, regarding therapeutic duration, further research is needed to understand whether MBSR could support injured athletes during the recovery period.

Limitations of This Study

- The effectiveness of MBSR on the participants' injury-related pain was not measured. In this study there were different types and extents of sport injuries, making it difficult to compare different categories of injury.
- In this study the procedure was modified due to the nature of the injured athletes' state after suffering severe injuries. Therefore, individual sessions were run with each athlete. As such, the time of the formal meditation sessions was one 90-min session per week.
- The sample size was a limitation for the study; only 20 injured athletes completed the study. This was partially due to the difficulty in recruiting injured athletes. Further research is therefore required to substantiate and generalise the findings of this study.
- The gender and the typology of sports injuries were other limitations of this study that should be taken into the consideration for future research.
- An additional active control group could be beneficial in future research.
- Another potential limitation to this study was the assessment of informal meditation practise. Injured athletes were asked to complete numerous requirements during the MBSR programme, thus affecting their participation in this study.

AUTHOR CONTRIBUTIONS

WM collected the data, conducted the preliminary statistical analyses, and wrote the first draught of the manuscript. AP generated the original idea for the study and was responsible for interpreting the data. DS led the design of the methodology and

contributed to the data processing. All authors contributed to the interpretation of the data, reviewed/edited the manuscript, and approved the final version.

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Effectiveness of Online Mindfulness-Based Interventions on Psychological Distress and the Mediating Role of Emotion Regulation

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Online mindfulness-based intervention as a feasible and acceptable approach has received mounting attention in recent years, yet more evidence is needed to demonstrate its effectiveness. The primary objective of this study was to examine the effects of online mindfulness-based programs on psychological distress (depression and anxiety). The randomized controlled intervention design consisted of four conditions: group mindfulness-based intervention (GMBI), self-direct mindfulness-based intervention (SDMBI), discussion group (DG) and blank control group (BCG). The program lasted 8 weeks and a total of 76 participants completed the pre- and post-test. Results showed that participants in GMBI and SDMBI had significant pre- and post-test differences on mindfulness, emotion regulation difficulties, and psychological distress, with medium to large effect sizes. In addition, ANCOVA results indicated significant effects of group membership on post-test scores of mindfulness, depression and anxiety when controlling the pretest scores, with medium to large effect sizes. The GMBI appeared to exert the greatest effects on outcome variables in comparison with other groups. In addition, changes in emotion regulation difficulties across groups could mediate the relationship between changes in mindfulness dimensions (Observing and Describing) and changes in psychological distress across groups. These results provided encouraging evidence for the effectiveness of online mindfulness-based interventions in reducing psychological distress, and the possible mediating role of emotion regulation, while also underlining the importance of group discussion in online mindfulness-based interventions.

Keywords: online mindfulness-based intervention, psychological distress, emotion regulation, randomized control trial, mediating effect

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INTRODUCTION

Mindfulness was defined as "the awareness that emerges through paying attention, on purpose, in the present moment, and non-judgmental to the unfolding of experience moment by moment" (Kabat-Zinn, 2003, p. 145). Since late 1970s, mindfulness-based interventions (MBIs) such as Mindfulness-Based Stress Reduction (MBSR) program (Kabat-Zinn, 1990) and Mindfulness-Based

Cognitive Therapy (MBCT) (Segal et al., 2002) have been widely used to enhance psychological wellbeing in both clinical and non-clinical samples (e.g., Hofmann et al., 2010; Spijkerman et al., 2016). Both MBSR and MBCT are 8-session group-based therapies which incorporate mindfulness practices with other therapy approaches of stress reduction and cognitive reappraisals. Many previous studies have proven the effectiveness of MBIs in helping to improve life satisfaction and positive emotions (Sears and Kraus, 2009; Grossman et al., 2010), and to reduce psychological distress such as depression and anxiety (Goldin and Gross, 2010; Boettcher et al., 2014; Khoury et al., 2015).

In recent years, there is a growing number of online interventions targeting many different symptoms and conditions for various population groups (Andersson and Cuijpers, 2008; Currie et al., 2010; Boettcher et al., 2014). For example, the study of Currie et al. (2010) found that an Internet-based cognitive behavioral therapy-based program could help reduce emotional distress of college students. Research also indicated that online MBIs could provide a more accessible and easily disseminated approach to deliver mindfulness-based programs to large groups (Kvillemo et al., 2016; Wahbeh and Oken, 2016). The first review and meta-analysis study on the effectiveness of online MBIs in improving mental health found that online MBIs had small but significant beneficial impact on mindfulness and psychological distress including stress, anxiety and depression (Spijkerman et al., 2016). To contribute to a better understanding of the effectiveness of online MBIs, more random control design studies are still needed.

The existing studies on online mindfulness programs are mostly group-based MBIs, and a few studies of self-direct MBIs also showed early promise (Cavanagh et al., 2013, 2014). Compared with self-direct MBIs, group-based MBIs not only include content and practice focusing on the cultivation of mindfulness, but also provide an environment where participants could share an enhanced sense of community and feel supported by each other (Lewis et al., 2012), since social support can play a critical role in traditional group-based MBIs (Malpass et al., 2012). The study of Schellekens et al. (2017) confirmed that increased social support played an important mediating role in the effects of mindfulness intervention on mood disturbance and stress symptoms. Thus, the combination of mindfulness practice with group support may have greater efficacy in helping to reduce psychological distress than self-direct MBIs. Given the rapid expansion of online mental program and easy accessibility, online self-direct MBIs in recent years begin attracting more attention and showing early promising effectiveness (Cavanagh et al., 2014). Significant benefits of self-direct MBIs for mindfulness skills and for symptoms of anxiety and depression were found in some previous studies (Lewis et al., 2012; Cavanagh et al., 2013). Some reviews and meta-analyses have indicated that self-direct intervention may be beneficial to people experiencing common problems such as anxiety and depression (Coull and Morris, 2011; Lewis et al., 2012). However, the comparison of self-direct interventions with therapist-administered interventions showed the latter with a larger effect size (Lewis et al., 2012). Although self-direct MBIs could help reduce psychological distress and allow time flexibility for the arrangement of weekly sessions, participants still reported the experience of lack of support (Kvillemo et al., 2016). The removal of the group context may be a disadvantage to self-direct MBIs (Cavanagh et al., 2014). As self-guided MBI might provide greater reach and cost effectiveness but also with some limits, thus, more evidence is needed to extend this small, but promising research field.

To compare the effectiveness of MBIs with other therapies, random control design is necessary to help identify the special contribution of MBI. Some previous studies have compared the effectiveness of MBIs with other active control groups. For example, Carlson et al. (2015) conducted a research to examine the effectiveness of mindfulness-based cancer recovery and supportive-expressive group therapy to help cancer survivors relieve distress. Their results suggested that both mindfulness group and supportive-expressive group could help participants reduce distress. Schellekens et al. (2017) also found that MBSR participants showed significant improvements on mood disturbance, stress symptoms and social support compared with the supportive-expressive group. To our knowledge, the online mindfulness programs are still in an early pilot phase and require more random control design studies. Therefore, it's important to examine the different levels of effectiveness of online group mindfulness-based intervention (GMBI) and self-direct mindfulness-based intervention (SDMBI), when compared with other active control groups such as discussion group (DG).

Previous studies have provided initial evidence of emotional regulation ability as an underlying mechanism of MBIs (Goldin and Gross, 2010; Gratz and Tull, 2010). Whether emotion regulation could serve as a special mechanism underlying MBIs compared with other conditions still calls for more investigation. Emotion regulation refers to the ability to manage affective states effectively and is identified as a critical cause of many psychological problems (Gross, 1998). Poor emotional awareness, inappropriate expression of negative emotions and maladaptive coping strategies are predictive of high depressive and anxious symptoms (D'Avanzato et al., 2013). Previous studies also demonstrated that emotion regulation difficulties had a significant relationship with negative affects including depression and anxiety (Vujanovic et al., 2008; Gratz and Tull, 2010). Mindfulness was confirmed to be positively related to adaptive emotion regulation processes in both clinical and non-clinical populations (Roemer et al., 2009; Gratz and Tull, 2010; Pepping et al., 2016). The research of Goldin and Gross (2010) found that participants in the mindfulness practice such as breath focused attention task showed diminished negative emotion experience, reduced amygdala activity, and increased activity in brain regions related to attentional deployment. Mindfulness training could strengthen individuals' ability to monitor their internal reactions in emotion-eliciting situations and thereby realize when they are in the grip of emotions and need to take time to calm down before responding. The role of non-judgment in mindfulness could facilitate the capacity to view one's emotional experience from a more objective perspective. In addition, individuals who undertake mindfulness training are taught how to cultivate an attitude of kindness and compassion toward themselves, especially during moments of difficulties (Gratz and Tull, 2010). All these core components of mindfulness could

effectively help disrupt the maladaptive and automatic reactions on one's emotions (Gratz and Tull, 2010). Vujanovic et al. (2010) found that greater levels of the mindfulness skills such as observing, describing, acting with awareness, and accepting without judgment were associated with fewer emotion regulation difficulties (e.g., emotional avoidance and lack of emotional awareness). Therefore, the role of emotion regulation may serve as a mediator to explain the effectiveness of online MBIs on psychological distress compared with control groups.

In conclusion, the main objectives of the present study were to investigate the effectiveness of online MBIs on psychological distress and the possible mediating role of emotion regulation. We would like to compare the effectiveness of online GMBI and SDMBI with DG and blank control group (BCG) to evaluate the effectiveness of online MBIs and further identify the active components of this intervention approach. We proposed three hypotheses: (1) Participants in GMBI, SDMBI would have significant improvement in mindfulness, and significant reductions of emotion regulation difficulties and psychological distress compared with BCG. And GMBI would have stronger effects on outcome variables than SDMBI. (2) Participants in DG would have significant decreases in psychological distress, but no significant differences in mindfulness and emotion regulation difficulties compared with BCG. (3) Changes in emotion regulation difficulties could mediate the effects of online MBIs on psychological distress.

MATERIALS AND METHODS

Participants and Procedures

A total of 525 potential volunteers responded to the web-based advertisements. With the original selective criteria, these individuals needed to join the study on a voluntary basis with the aim of relieving stress, have access to computers and Internet and could understand instructions in Chinese. Additionally, they should not have any prior mindfulness or meditation experience. They had self-claimed to be mentally healthy without identified mental illness. At last, 192 participants enrolled in the program, completed the informed consent and pretest. All participants were randomly assigned to different online groups including GMBI, SDMBI, DG, and BCG. Each group was originally assigned 48 participants. Participants in each group were asked to complete a questionnaire before and after the program. The participant's recruitment process was shown in **Figure 1**.

In group of GMBI, nine participants withdrew after the first session, and 19 participants absent more than four sessions were excluded. At last, there were 20 participants completing the pre- and post-tests. In SDMBI, 32 participants who did not submit weekly report more than four times were excluded. One participant who did not complete the post-test was also excluded. In DG, 17 participants withdrew after the first session, and 13 participants who were absent more than four times were excluded. In BC, 25 participants who did not complete the post-test were excluded.

In all, a total 76 participants completed both pre- and post- tests after the whole program, with 44 females and 32 males. The age range was from 18 to 47 (M = 27.84, SD = 7.94). **Table 1** displays sociodemographic characteristics of different intervention conditions.

Intervention Process

The intervention implemented in the present study was a revision of MBCT. The instructor is a master majoring in Counseling Psychology and with 3 years' solid experience of mindfulness intervention. In the GMBI group, the intervention consisted of eight 2-h weekly sessions. In each session, there was 40-min mindfulness-based practice. In the remaining time, the group members discussed their experience and homework

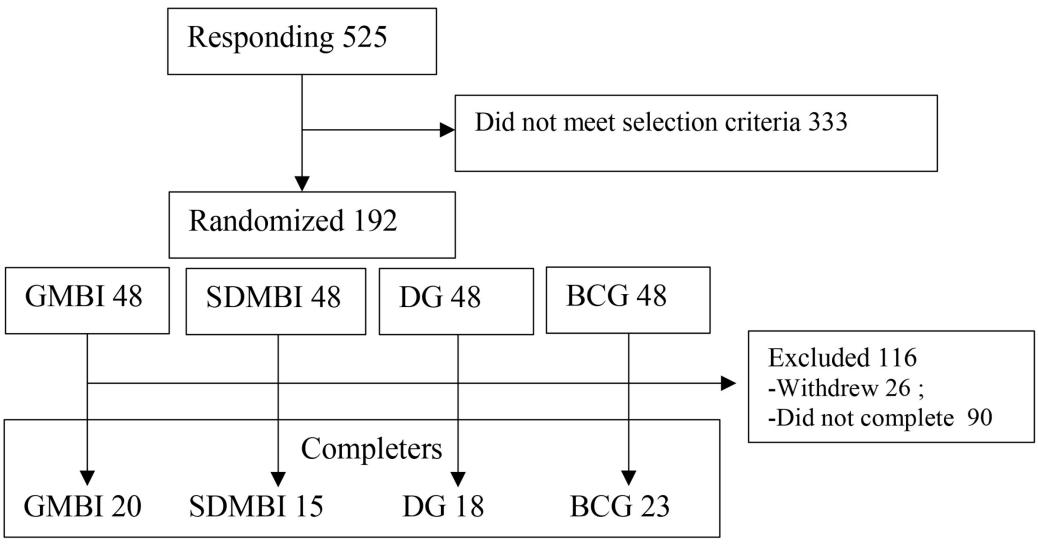

FIGURE 1 | Participants recruitment process.

TABLE 1 | Content of online mindfulness-based intervention.

Session	Content	Practice
1	***Awareness and Automatic Pilot:*** Recognize the tendency of automatic pilot, become aware of each moment	Body and breathing sensation
2	***Living in Our Heads:*** further focus on body sensation, tend to control reactions to daily events, learn about emotion	Further body scan
3	***Gathering the Scattered Mind:*** Recognize how the mind can often be busy and scattered, taking awareness to breath and movement	Breathing space; mindful stretching; mindful walking
4	***Recognizing the Territory of Aversion:*** Take a different and wider perspective to experience, know the territory of depression	Sounds and thoughts meditation; difficulties exploration
5	***Allowing/Letting Be:*** cultivate attitudes of non-judgment and acceptance	Body scan and breathing space
6	***Thoughts Are Not Facts:*** Recognize the thoughts related to our experience, and work with thoughts with curiosity and kindness	Kindness mediation
7	***How Can I Best Take Care of Myself:*** Learn how to deal with negative emotion threatens, make plans to respond to the signs	Breathing space; mindfulness bells
8	***Maintaining and Extending New Learning:*** Recognize mindfulness could help balance the life, take care of oneself	Keep mindfulness in daily life

in the previous week. The audio practices were distributed to participants after each weekly session. The intervention content mainly contained mindfulness practices and some cognitive therapy elements. Formal mindfulness practices employed included body scan, breathing space, mindful sitting, mindful stretch, etc. Cognitive therapy elements included, for example, how to recognize the thoughts related to our experience and take a different and wider perspective to experience. Compared with the traditional MBCT, this online GMBI did not include the 1-day retreat due to the limitation of the online environment. In addition to the recording of happiness and unhappiness as in the second and third weeks of the traditional MBCT, this GMBI also included an assignment of recording events of stress and communications in the fourth and fifth weeks. The content of online MBI in present study was shown in **Table 1**.

Participants in the SDMBI group only received the materials and practice guidance without group discussion sessions. The materials were the same as that of the GMBI group including mindfulness related reading material and practice audio. These self-directed materials were distributed to participants every week. Participants were asked to report their practice time and experience on a weekly basis.

Participants in DG engaged in a closed and supervised online discussion forum. The topics they discussed were associated with emotion events. For instance, topics included positive and negative events, stress, and interpersonal communications, as well as how the participants perceived their psychological distress such as stress, anxiety, and depression symptoms, and how they dealt with their emotional problems. These online dialogs were supervised by an instructor who did not play an active role in the discussions.

Participants in BCG received no intervention. They were informed that they could join the online MBI in another cohort.

Measures

Five Facet Mindfulness Questionnaire (FFMQ) (Baer et al., 2008) is a 39-item questionnaire which includes five facets of mindfulness: Observing, Describing, Acting with awareness, Non-judging of inner experience, and Non-reactivity to inner experience. Items were rated on a 5-point metric of frequency (1 = almost never and 5 = almost always). A higher total score means a higher level of mindfulness. The Chinese version of FFMQ developed by Deng et al. (2011) was used in this study. Cronbach's alphas for our sample were 0.92 (pre) and 0.93 (post).

Difficulties in Emotion Regulation Scale (DERS) (Gratz and Roemer, 2004) is a 36-item Likert-type scale. Participants indicated how often the items applied to themselves, with responses ranging from 1 (almost never) to 5 (almost always). There are six factor structure of the DERS including lack of emotional awareness (AWARENESS), lack of emotional clarity (CLARITY), difficulty in engaging in goal-direct behavior under negative emotions (GOALS), loss of control under negative emotions (IMPULSE), limited strategies for emotion regulation (STRATEGIES), and non-acceptance of emotional responses (NON-ACCEPTANCE) (Gratz and Roemer, 2004). The total score of DERS was generally suggested to be used in previous studies to present the total dysfunction in emotion regulation. The Chinese version of the DERS had demonstrated good reliability and validity (Wang et al., 2007). Cronbach's alphas for our sample were 0.96 (pre) and 0.95 (post).

The Self-Rating Anxiety Scale (SAS) (Zung, 1971) was used to assess anxiety symptoms. Each instrument includes 20 items in a four-point scale ranging from 1 (never) to 4 (always), with total scores ranging from 20 to 80. A higher total score denotes a higher level of anxiety. The Chinese version of SAS has been used in many previous studies (e.g., Liu et al., 1999). Cronbach's alphas for internal consistency reliabilities for our sample were 0.87 (pre) and 0.90 (post).

The Self-Rating Depression Scale (SDS) (Zung, 1965) was used to assess depression symptoms. This scale includes 20 items, which is rated from 1 (never) to 4 (always), with total scores ranging from 20 to 80. A higher total score denotes a higher level of depression. The Chinese version of SDS has been used in many previous studies (e.g., Liu et al., 1999; Yu et al., 2015). Cronbach's

alphas for internal consistency reliabilities for our sample were 0.88 (pre) and 0.89 (post).

Data Analyses

Preliminary analyses were conducted to determine whether the four groups differ in the pre-program period.

The main purpose of this study was to explore if the online MBIs and control groups would evolve differently throughout the program, by comparing the results of the pretest to posttest. To tackle this question, we first used paired-samples *t*-test to compare the differences between the pretest and posttest outcome variables in each group. The effect sizes were calculated through Cohen's *d* which was recommended with values of 0.20, 0.40, and 0.60, indicating effect sizes of small, medium, and large (Cohen, 1988). Then ANCOVAs, which was a general method best suited to examine between-groups differences of pretest to posttest in a randomized control design (Huck and McLean, 1975; Perez-Blasco et al., 2013), were employed to answer whether the four groups' posttest means would differ after controlling the pretest scores. The η_p^2 was included as an indicator of effect size with approximate values of 0.01, 0.06, and 0.14, indicating effect sizes of small, medium, and large (Cohen, 1988; Perez-Blasco et al., 2013).

Finally, to calculate the mediating role of emotion regulation of the intervention effect, the indirect effects were estimated using SPSS process (Preacher and Hayes, 2008) and then bootstrapping procedure was also used to examine the significance of indirect effect. The bias corrected and accelerated 95% confidence intervals were then examined, and if these intervals did not contain zero, the point estimate of the indirect effect would be considered significant. For all the analyses, the level of statistical significance was set to 0.05.

RESULTS

The results of chi-square test and one-way ANOVAs indicated that participants in the four intervention conditions were not significantly different prior to the intervention in gender or age (**Table 2**). **Table 3** shows descriptive statistics of mindfulness, difficulties of emotion regulation, depression and anxiety in pre- and post-tests. No significant differences were found in any of the outcome variables prior to the intervention, including FFMQ [$F(3,72) = 0.24$; $p = 0.87$], DERS [$F(3,72) = 0.19$; $p = 0.91$], SDS [$F(3,72) = 0.95$; $p = 0.42$], SAS [$F(3,72) = 0.42$; $p = 0.74$].

Changes in the Outcome Variables From Pre- to Post-test

Comparisons of the pre- and post-test scores of outcome variables across different groups are presented in **Table 3**. In the GMBI group, the score of FFMQ surged considerably from pre- to post-test, while scores of DERS and SDS dropped remarkably, with medium to large effect sizes in Cohen's *d*. In the SDMBI group, there were significant pre- and post-test changes in scores of FFMQ, DERS, and SDS. In DG, there were also significant increase in the score of FFMQ, and significant

TABLE 2 | Demographic characteristics of participants.

	GMBI (*n* = 20)	SDMBI (*n* = 15)	DG (*n* = 18)	BCG (*n* = 23)		*p*
Male	7	8	8	9	$\chi^2 = 1.31$	0.73
Female	13	7	10	14		
Age *M (SD)*	29.15 (8.22)	29.47 (9.17)	26.39 (6.85)	26.78 (7.78)	$F = 0.72$	0.54

GMBI, group mindfulness-based intervention; SDMBI, self-direct mindfulness-based intervention; DG, discussion group; BCG, blank control group.

TABLE 3 | Descriptive statistics, *t*-test and ANCOVA results for the studied variables.

	GMBI			SDMBI			DG			BCG			ANCOVA
	Pretest	Posttest	*t*	Pretest	Posttest	*t*	Pretest	Posttest	*t*	Pretest	Posttest	*t*	*F*(3,71)
	M (*SD*)	*M* (*SD*)	(*d*)	*M* (*SD*)	*M* (*SD*)	(*d*)	*M* (*SD*)	*M* (*SD*)	(*d*)	*M* (*SD*)	*M* (*SD*)	(*d*)	(η_p^2)
FFMQ	112.93 (24.43)	130.14 (26.00)	−3.57** (0.68)	108.15 (13.77)	121.72 (16.03)	−2.62* (0.91)	113.12 (20.53)	123.22 (14.77)	−3.57** (0.56)	113.84 (20.32)	117.02 (16.34)	−1.29 (0.17)	3.22* (0.12)
DERS	103.60 (27.50)	90.51 (25.35)	2.69* (0.49)	106.67 (20.15)	93.88 (15.83)	3.40** (0.71)	99.78 (32.39)	94.47 (17.35)	1.02 (0.21)	103.10 (23.04)	100.47 (17.82)	0.62 (0.13)	1.87 (0.07)
SDS	38.98 (10.04)	32.11 (8.24)	3.62* (0.75)	43.12 (6.71)	39.39 (8.66)	2.04* (0.48)	42.80 (10.14)	38.25 (7.73)	2.19* (0.50)	42.84 (7.45)	40.02 (7.89)	1.65 (0.37)	2.93* (0.11)
SAS	36.17 (10.91)	31.71 (9.34)	1.88 (0.44)	39.22 (5.69)	38.61 (7.23)	0.41 (0.09)	38.65 (10.05)	34.46 (6.70)	2.60* (0.49)	38.83 (8.44)	39.50 (8.44)	−0.57 (0.08)	4.83** (0.17)

*$p < 0.05$, **$p < .01$. GMBI, group mindfulness-based intervention; SDMBI, self-direct mindfulness-based intervention; DG, discussion group; BCG, blank control group; FFMQ, Five Facet Mindfulness Questionnaire; DERS, Difficulties in Emotion Regulation Scale; SDS, Self-Rating Depression Scale; SAS, Self-Rating Anxiety Scale.*

decrease in SDS and SAS, but no notable changes in DERS. In the BCG group, data analysis revealed no statistically changes in levels of all studied variables.

Differences in Posttest Scores on Outcome Variables Between Groups

The one-way analysis of covariance (ANCOVA) was used to identify if there were between-group differences on posttest levels of FFMQ, DERS, SDS, and SAS after controlling the pretest levels of these variables. Homogeneity of regression assumption was not violated for these variables. There were no interactions between any of the covariates (Pretest measures of FFMQ, DERS, SDS, and SAS) and the group membership [pretest FFMQ × group membership, $F(3,68) = 1.14$, $p(3,68) = 0.34$; pretest DERS × group membership, $F(3,68) = 0.58$, $p = 0.63$; pretest SDS × group membership, $F(3,68) = 0.43$, $p = 0.73$; pretest SAS × group membership, $F(3,68) = 0.79$, $p = 0.50$].

After controlling the pretest levels of FFMQ, DERS, SDS, SAS scores separately, there were significant effect of group membership on the posttest levels of FFMQ, SDS, and SAS, but the effect on DERS was not remarkable (**Table 3**). While the effect sizes (η^2) of all the outcome variables were from medium to large (0.07 to 0.17), which suggested potential effects of group membership on all the posttest outcome variables.

The *post hoc* tests were run to make pairwise comparisons of adjusted mean scores among all outcome variables (**Table 4**). The adjusted mean score of posttest FFMQ was significantly higher for participants in GMBI than those in BCG. And the adjusted mean scores of posttest DERS, SDS and SAS were significantly lower for participants in the GMBI compared with those in the BCG. Participants in DG showed significantly lower adjusted mean score of SAS than those in BCG. The adjusted mean scores of other outcome variables in SDMBI and DG didn't show significant differences when compared with BCG.

TABLE 4 | Pairwise comparisons of adjusted mean scores of outcome variables.

Outcome variables		GMBI *MD (SE)*	SDMBI *MD (SE)*	DG *MD (SE)*
FFMQ	SDMBI	5.52 (4.97)	–	–
	DG	7.02 (4.71)	1.51(5.08)	–
	BCG	13.66* (4.43)	8.15 (4.84)	6.64 (4.56)
DERS	SDMBI	−1.88 (5.51)	–	–
	DG	−5.81 (4.90)	−3.93 (5.29)	–
	BCG	−6.03* (4.61)	−8.32 (5.01)	−4.39 (4.75)
SDS	SDMBI	−5.26* (2.40)	–	–
	DG	−4.28 (2.28)	0.98 (2.43)	–
	BCG	−6.03** (2.15)	−0.77 (2.30)	−1.75 (2.18)
SAS	SDMBI	−5.32* (2.13)	–	–
	DG	−1.47 (2.02)	3.85 (2.17)	–
	BCG	−6.42** (1.91)	−1.09 (2.06)	−4.95* (1.95)

*$p < 0.05$, **$p < 0.01$. *MD, mean difference; SE, standard error; GMBI = group mindfulness-based intervention; SDMBI, self-direct mindfulness-based intervention; DG, discussion group; BCG, blank control group; FFMQ, Five Facet Mindfulness Questionnaire; DERS, Difficulties in Emotion Regulation Scale; SDS, Self-Rating Depression Scale; SAS, Self-Rating Anxiety Scale.*

Emotion Regulation as Mediator

As reported in the above analysis of intervention effects, there was no significant group membership effect on DERS; therefore, we did not include group membership in the mediation analysis. Correlations between changes of outcome variables across groups appear in **Table 5**. The changes in total score and subscales of FFMQ were all negatively related to the change in DERS across groups. And the score change of DERS was positively related to changes in SAS and SDS across groups. The score changes of FFMQ, DERS, SAS, and SDS in mediation analysis had also been examined. Results of mediating effects analysis through SPSS process (Preacher and Hayes, 2008) indicated that there was no significant indirect effect of change in FFMQ on changes in SAS ($B = -0.114$, SE = 0.096; 95% CI = [−0.422, 0.004]) and SDS ($B = -0.005$, SE = 0.015; 95% CI = [−0.038, 0.023]) through the mediating role of change in DERS. Then a similar analysis using the FFMQ subscales instead of the FFMQ total score was conducted. The results found that there were significant indirect effects of changes in the dimension of Describing on changes in SAS ($B = -0.099$, SE = 0.076; 95% CI = [−0.325, −0.002]), and SDS ($B = -0.118$, SE = 0.089; 95% CI = [−0.365, −0.003]). The change in the dimension of Observing in change of SAS ($B = -0.099$, SE = 0.076; 95% CI = [−0.325, −0.002]) also exerted a significant indirect effect.

DISCUSSION

With a random control design, the current study investigated the effectiveness of online MBIs on psychological distress of general population seeking stress reduction. Consistent with the hypotheses, online MBIs showed promising effectiveness on the reduction of anxiety and depression. The results also emphasized the important role of group support in online MBI as participants in online MBI within group situation seemed exerting the most significant effectiveness. Additionally, the emotion regulation difficulties could serve as a possible mediating role to help extend our knowledge of the mechanism underlying the effects of MBIs.

There were significant pretest–posttest differences of the level of mindfulness in the GMBI and SDMBI groups. Statistical examination of the group differences of the posttest outcome variables suggested that there were medium to large effect sizes of group membership effects on the posttest level of mindfulness. GMBI showed significant difference in mindfulness compared with BCG group. These results were in line with the limited previous studies suggesting that online MBIs were effective to cultivate mindfulness (Spijkerman et al., 2016). DG also had significant effect on mindfulness, which was out of our hypotheses. One previous study of Schellekens et al. (2017) also found that both MBCT and supportive-expressive group therapy could help improve participants' level of mindfulness, and MBCT did not show significant improvement on mindfulness compared with supportive-expressive group therapy. A possible reason is that the group discussion about the participants' positive and negative emotion states and emotion regulation strategies might indirectly help raise their levels of awareness and clarity of their own emotions (Schellekens et al., 2017). Increased awareness and

TABLE 5 | Descriptive statistics, correlations between changes in studied variables across groups.

	1	2	3	4	5	6	7	8	9
(1) FFMQ	–								
(2) Observing	0.30**	–							
(3) Describing	0.26*	0.52**	–						
(4) Acting with awareness	0.33**	0.29**	0.37**	–					
(5) Non-judging inner exp.	0.30**	0.14	0.23*	0.46**	–				
(6) Non-reactivity inner exp.	0.20	0.51**	0.32**	0.45**	0.26*	–			
(7) DERS	−0.35**	−0.30**	−0.25*	−0.47**	−0.29*	−0.42**	–		
(8) SAS	−0.59**	−0.23**	−0.09	−0.26**	−0.33**	−0.22	0.27*	–	
(9) SDS	−0.63**	−0.29**	−0.03	−0.27*	−0.38**	−0.19	0.25*	0.74**	–

*$p < 0.05$, **$p < 0.01$. FFMQ, Five Facet Mindfulness Questionnaire; DERS, Difficulties in Emotion Regulation Scale; SDS, Self-Rating Depression Scale; SAS, Self-Rating Anxiety Scale.*

clarity of emotions through group discussion might also enhance participants' mindfulness levels in the DG.

Examination of the group differences of the posttest outcome variables suggested that there were medium to large effect sizes of group membership effects on posttest levels of depression and anxiety. These results were consistent with previous studies which confirmed that interventions with mindfulness-based components exerted significant benefits in comparison with control conditions on levels of mindfulness, depression, and anxiety, with small to medium effect sizes (Hofmann et al., 2010; Spijkerman et al., 2016).

Results of pairwise comparisons in the present study suggested that only the GMBI group had significant effects on the outcome variables compared with BCG. Groups of SDMBI and DG did not show significant differences in the outcome variables compared with BCG. The GMBI seemed to exert the strongest effect on the outcome variables compared with other groups. These results suggested that the online MBI in a group approach might enhance the effectiveness of online MBIs. The findings were also in line with previous studies which confirmed that GMBI had greater effect on psychological distress than self-help MBIs (Cavanagh et al., 2013).

Although the SDMBI showed significant pretest and posttest differences on outcome variables, it did not show significant group differences on outcome variables compared with BCG. These results suggested that self-direct MBIs might not be the best choice due to the lack of group support which usually occurs in group-based interventions (Lewis et al., 2012). What's more, in SDMBI without direct instruction and group discussion, participants were lack of in-depth understanding about mindfulness. In the present study, the online SDMBI included self-help audio guides and reading materials, but these resources seems not enough. The effectiveness of self-guided programs is distinct in terms of varied content, delivery, and guidance (Lewis et al., 2012). More presentation of multimedia such as video guide and smart phone apps might increase the efficiency of SDMBI (Lewis et al., 2012). Another possible reason is that the 8-week time is difficult for participants to remain engagement. One previous study of Cavanagh et al. (2013) conducted a brief self-direct online MBI lasing for 2 weeks, which results supported the feasibility and effectiveness of shorter self-guided MBI. The discrepancy might also be accounted for by our outcomes referring to random control trail reporting the group and pre-post analysis, where in previous studies, one open trail only reports pre-post analysis (Krusche et al., 2012). Also, this study included general population, where previous study of Cavanagh et al. (2013) only included university students who might have better understanding about mindfulness in SDMBI.

The GMBI and SDMBI showed significant pretest-posttest decreases in the total score of emotion regulation difficulties, while the DG did not show significant pre- and post-test effect on emotion regulation difficulties. These results suggested that mindfulness intervention compared with group discussion might serve as a more adaptive approach to improve effective emotion regulation strategies. Group discussion might help cultivate a supporting environment, but experience of social support as non-specific therapeutic factors may not directly improve participants' adaptive strategies to deal with negative emotions. Mindfulness intervention emphasizes improvement of the present attention to emotions, facilitates self-control ability of emotion impulse, and helps cultivate the acceptance of emotions, all of which help reduce emotion regulation difficulties (Goldin and Gross, 2010; Gratz and Tull, 2010).

Although the result did not show significant group effect on emotion regulation difficulties, the effect size was medium. The small sample in the present study might be a possible reason for the non-significant group effect on emotion regulation difficulties. Our findings also suggested that the relationship between score changes of sub-dimensions of mindfulness (Observing and Describing) and changes in psychological distress across groups could be mediated through the changes in emotion regulation difficulties across groups. These results indicated that possible changes in mindfulness across groups were associated via changes in emotion regulation to improved psychological distress, which were in support with several previous studies showing that dispositional mindfulness was related to psychological distress through the mediating role of emotion regulation difficulties (Pepping et al., 2013, 2016). There may be overlap between conceptions of mindfulness and DER, because these two conceptions both include element of emotional awareness. More research is needed to use other different measures such as emotion regulation scale developed by Gross and John (2003) to confirm our results.

Limitations and Future Research Directions

Some limitations of the present study and implications for future research should be noted. First, the study was limited by the small sample size, and which was selected from the general population. Therefore, further work needs to be done to determine whether the results could be generalized to clinical samples. Participants in the present study did not display a notable level of psychological symptoms which might have influenced their motivation to participate in the program and to persist through the weekly home practice. This might have in turn reduced the sensitivity of changes in the outcome measures. Future studies could compare the effectiveness of clinical utility of online MBIs with non-clinical populations. Second, the follow-up data was not available in the present study, thus prevented us from investigating the lasting effect of the online MBIs. Future long-term research should examine whether the effects of online MBIs on mindfulness, emotion regulation, depression, and anxiety are maintained over time. Another limitation is that we obtained data of outcome variables by self-report questionnaires. A wider range of assessment resources such as physiological index may be used in future studies. Additionally, future online SDMBI development should explore approaches to optimize the program delivery and maximize acceptability, engagement and effectiveness of online SDMBI. Further research is also needed to identify for whom the SDMBI is likely to be most beneficial as self-interventions are not appropriate for everyone (Lewis et al., 2012), and it's necessary to explore the individual factors that influence the effectiveness of SDMBI.

ETHICS STATEMENT

This study was carried out in accordance with the recommendations of Code of Ethics for Counseling and Clinical Practice, Chinese Psychological Society. The protocol was approved by the Ethics Committee, Beijing Key Laboratory of Learning and Cognition, Capital Normal University. All subjects gave written informed consent in accordance with the Declaration of Helsinki.

AUTHOR CONTRIBUTIONS

YM and ZS contributed equally to this paper. YM mainly contributed to the design of the study and writing of the manuscript. ZS mainly contributed to the design of the study and conducted the intervention. AS, XZ, and XL critically reviewed and revised the manuscript. All authors were accountable for the final version of the manuscript.

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The Effect of Childhood Adversities and Protective Factors on the Development of Child-Psychiatric Disorders and Their Treatment

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Context: Families with high rates of childhood adversities (CAs) (multi problem families, MPF) have an increasing importance in public health-policy.

Objective: The present study addresses the relationship between risk- and protective factors and the severity and treatment-outcome of mental disorders.

Setting: Family-therapeutic home-based treatment for MPF. We examined a clinical sample (N = 1031) of children between the age of 4 to 17, and a non-clinical sample of 148 children. We hypothesized that of all children of the clinical group have a predominance of risk factors and a higher number of psychopathological symptoms. Furthermore, we hypothesized that children with a predominance of protective factors benefit stronger from psychotherapy.

Main Results: In the clinical sample, most children met the criteria of a psychopathological diagnosis (95.7%, as compared to 21.6% in the non-clinical sample) and showed significant higher rates of CAs and significant less protective factors as compared to the non-clinical sample. The clinical group showed a significant reduction of psychopathological symptoms and benefited equally well from treatment. The number of risk factors was a significant predictor for a child from the non-clinical sample to meet the criteria of a psychopathological diagnosis, while the number of protective factors significantly predicted the absence thereof.

Conclusion: Children and adolescents with high scores of CAs show significant associations with child psychiatric symptoms (d = 0.35; including all ICD-diagnosis such as, e.g., Asperger Syndrome, ADHD etc. with a higher rate of genetic etiology). Early life stressors, however, do not trigger an irreversible fate, as psychotherapy with young people with high numbers of risk factors does help to reduce psychopathological symptoms significantly (range of five outcome parameters: d = 0.31–0.72).

Keywords: protective factors, multi problem family, childhood adversities, outcome research evaluation, family therapies

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INTRODUCTION

Epidemiological data show that up to 20% of children and adolescents show mental disorders (Belfer, 2008). The prevalence of neglect, maltreatment, deprivation in childhood in Germany is estimated with about 10–15% (Reichl et al., 2014), higher rates were found in multi problem families (MPF; Belfer, 2008), which leads to an increased risk of vulnerability for children (Egle et al., 2004; Bachler et al., 2014). High-risk families not only meet many criteria of family adversity indices, but also show low treatment compliance and low relational functioning of the families (Bachler et al., 2017). MPF exhibit structural, dynamic, and social characteristics that could lead to an increased risk of vulnerability and implement and test treatment procedures that help adults and children of such multi-problem or high-risk families. Typically, families in such problematic situations exhibit disorders in parental relationship behavior, have a lower socioeconomic status (SES), and are associated with conditions of deprivation (Woolfenden et al., 2001; Witkiewitz et al., 2013). Low SES has been shown to be linked to parental behavior as a moderating and mediating terms of being less engaged, less parental monitoring and a less enriched environment, thereby exerting negative attachment-related effects to child development (Bornstein and Bradley, 2003). There is an extensive research about mediating and moderating factors in the development of psychopathological symptoms (Luo and Waite, 2005; Lund et al., 2011; Cabaj et al., 2014; Rasmussen et al., 2014).

These problems sometimes run across many generations in the families, which eventually creates a lack of trust into governmental and municipalities' services and a belief that the life's problems are an inevitable fate. Therefore, MPF form a clientele that is sometimes referred to as "hard to reach," even though it has been shown that psychotherapy is effectively possible (Curtis et al., 2004). Untreated, multi-generational psycho-social problems have an impact on and interaction with education, SES, general health, quality of life, number of children and more, and therefore have been shown to form a high economic burden to societies (Wittchen and Jacobi, 2005). Detection and treatment of MPF is thus ethically and financially of high importance to social policy and the general public, in order to not allow these networks of childhood adversities (CAs) forming it to an irreversible damage as measured by psychiatric diagnoses/symptoms.

Kessler et al. (2010) undertook the approach of relating 12 CAs – grouped into clusters of interpersonal loss, parental maladjustment, maltreatment and others – with the onset of 20 DSM IV disorders in a cross-national study. They found that in high-income as well as in low-income countries, there was an almost equal chance of 38.4% (and 39.1%) to report one or more of the CAs. The presence of one or more CAs accounted for 28.2% of all DSM-IV diagnoses over all countries, and were significantly correlated with an increased risk for DSM-IV disorder (Klasen et al., 2015). Slopen et al. (2014) examined the influence of high and chronic exposure to CAs at different developmental periods in childhood on internalizing and externalizing symptoms, as well as other health related parameters (weight, blood pressure) of adolescents or adults (Edwards and Hans, 2015). They showed that onset and continuance of cumulative childhood adversity are influencing mental and physical health risks in general. Similarly, it has been shown that children or adolescents with 4 or more CAs were 7.3 times more likely to display depression, anxiety, affect regulation problems, or substance abuse (Putnam et al., 2013). Besides forming general risk factors, CAs might also play a direct role in onset of specific disorders and specific symptoms (Bentall et al., 2014; Young and Widom, 2014), while it has also been found that severity of CAs plays a bigger role than their mere number (Schilling et al., 2008).

Research into the underlying mechanisms of cross-generational impact of CAs sketch a picture of interactions between nature and nurture. Cicchetti and Rogosch (2012) reported a different genotype between maltreated and non-maltreated children, which was associated to their individual level of resilience. The influence of bonding patterns has been demonstrated in several studies (Haushofer and Fehr, 2014; Reichl et al., 2014). The neuropathophysiology of psychosocial stress and stress responsivity has, e.g., been linked to the HPA axis, as well as neurogenesis and the development of functionality and morphology of the brain (Bick et al., 2012). Kim et al. (2013) revealed the influence of childhood poverty in low SES families and CAs on amygdala and prefrontal cortex dysregulation. This proven shift in the subcortical mode is a result of individually different susceptibility to qualities of environments through genetic factors as Bakermans-Kranenburg and van Ijzendoorn (2006) showed for the DRD4 dopaminergic system, behavior problems and parenting. Environments (e.g., parenting) are steering epigenetic processes and children's behavior is forming parenting (Hartman and Belsky, 2016). Taken together, there is empirical evidence that CAs and also protective factors are integrated into the interacting levels of behavior, environment, and gene-expression, as it is conceptualized in the model of genetic differential sensitivity to social environment (GDSE, Hengartner et al., 2013; Mitchell et al., 2013; McDonald et al., 2016; Moore and Depue, 2016).

The existing literature and research is, however, thin on the interaction between protective factors and risk-factors and especially their influence on psychotherapy in form of increased number of symptoms and effectiveness of treatment (Andershed and Andershed, 2015). The present research therefore aimed at replicating earlier results, that children and adolescents from a non-clinical sample have lower risk factors and more protective factors as compared to a clinical sample for a German-Austrian setting. Furthermore, we tested the hypothesis that the number of risk- and protective factors (and their combination) predicts the presence and absence of psychopathological diagnosis in a non-clinical sample. In addition, we addressed the respective relationship between CAs and protective factors and symptomatic burden.

MATERIALS AND METHODS

Participants

TAF-treatment in the clinical sample is initiated through the proposal of the regional youth services (Salzburg, Upper Austria

and South East of Bavaria-Germany). The indication is done after a first diagnostic and selective-indicative clearing. All 1031 families for whom the treatment began in 2008 or later but only if the index child was older than 4 years were included in the study (consecutive sample). The data on the children and adolescents in the comparative sample (n = 148) were collected at a grammar school in southern Germany. The drop out quote of the clinical group was 17% (failed compliance). The treatment length 21.6 months (mean).

The clinical sample of the present study consisted of all patients/families, entering TAF in the years between 2008 and 2017. Diagnostic clearing cases cover patients that were placed in new families, entered outpatient psychotherapy or suffered of severe psychopathology.

An overview of socio-demographic data, ICD-10 diagnoses and symptom-score (pre-post) can be seen in **Table 1**.

The Treatment Method TAF

TAF (therapeutic, outreach intervention) is a disorder-oriented, therapeutic, intervention for MPF. It constitutes an integrative form of family therapy (FT) for MPFs and integrates family-therapeutic interventions and elements of structural psychotherapy. TAF incorporates the various common principles for treatment of structural psychotherapy (for the improvement of ego-structural competencies) that were identified by the task force of the APA Division 12: strong working alliance, therapist's ability to repair alliance-ruptures, collaboration on goals, and a high level of therapist activity (Critchfield and Benjamin, 2006).

Instruments of Measurement

All instruments of measurement used in this study are part of a standardized in-house manual (TAF-DOK). Some of the instruments of TAF-DOK are only applicable to children under the age of 4 years. A total of 118 cases were therefore not considered in the clinical group because we did not have access to a kindergarten.

Mannheim Parental Interview (MPI)

The MPI (Esser et al., 1989) is a structural, standardized, clinical interview for therapists to assess the severity of the mental disorder of children, adolescents, and primary attachment figure. The interview is divided into three parts: the parents' and child's demographic and social statistics, child and adolescent psychiatric symptoms and socio-familial conditions/and important life events. The 37 questions regarding child and adolescent psychiatric symptoms are leading through clearly stipulated criteria and scores of severity to a cumulative child-psychiatric symptom-score and different ICD-10 diagnoses (non ICD-10 diagnose; ICD-10 F92-98 mood, anxiety, and attachment disorders; ICD-10 F 90 ADHD; ICD-10 60 personality disorders, ICD-10 F 91 externalizing symptoms and maladaptive behavior; and F84-89 special diagnoses ICD-10) and comorbidities. The interrater reliability is 0.71–1.0, i.e., the kappa coefficient of concurrence of the diagnoses was determined as r = 0.71 (percentage of concurrence 79% between the clinical, professional opinions).

Family Adversity Index (FAI)

The FAI was developed by Rutter and Quinton (1977). It measures five family-related CAs of chronic disharmony in the family, a low SES, small living quarters, parental criminality, and mental disorder of the mother. Reliability is given as 0.65, and validity in the range of 0.66 to 0.70 (Rutter and Quinton, 1977).

Adverse and Protective Life Events

Egle et al. (2004) presented a meta-analytic overview of empirically found protective and adverse life events. The results of this meta-analysis were used to create a screening questionnaire, which includes 22 adverse live events. CAs were assessed dichotomously.

We generated five Clusters of CAs: *Cluster 1a (SES-Resources):* low SES, poor schooling of parents, unemployment, large family and very narrow living room, single parent, contacts with institutions of social control; *Cluster 2a (violence):* crime or antisocial behavior of parents, chronic disharmony in the family, authoritarian paternal behavior; *Cluster 3a (attachment related CAs):* maternal occupational activity in the first year of life, insecure attachment behavior after 12/18 months of age, loss of parent, divorce, separation of parents, frequently changing early reference person, improper contacts with peers, age distance to the nearest siblings younger than 18 months, prolonged separation from the parents during the first 7 years of life, male sex; *Cluster 4a (physical or mental illness):* mental disorder of the father or mother, severe physical illness of the father or the mother, chronically ill sibling; *Cluster 5a (single or cumulative trauma):* sexual abuse and physical maltreatment and emotional neglect. Similarly we recorded eight protective life events: *Cluster 1p* (social resources): good relationship with at least one primary caregiver, secure attachment behavior, extended family, compensatory parents relationship, good replacement milieu after an early mother loss, social promotion (e.g., school, church, reliable support reference person); *Cluster 2p* (individual resources): above average intelligence, robust active temperament, self-efficacy.

Childhood SES (SSE-TAF)

SSE-TAF (social self-sufficiency) is a validated (interrater reliability 0.73) part of the TAF documentation (TAF-DOK) and tries to document the social self-preservation ability of the family with one item (Bachler et al., 2014). The SSE TAF measures the ability to work and is a is based on a 5-tiered Likert scale.

Global Assessment of Functioning Scale for Adults and Children (GAF, CGAS)

Global Assessment of Psychosocial Functioning is used as measurement for scaling the individual competence-related and psychosocial functional level. It includes interpersonal and employment abilities and represents a one-dimensional depiction of a patient's psychosocial functioning level (Soderberg et al., 2005). The rating ranges between 0 and 100. The interrater reliability has been reported with 0.74. A score of $\leq$50 indicates severe limitations.

TABLE 1 | Demographics, diagnostics, and pre-/post-symptom scores.

	Clinical group					Non-clinical	
	Pre		Post		ES*		
	N	M (*SD*) or %	*N*	M (*SD*) or %		*N*	*M* (*SD*) or %
Age	1028	15.7 (4.9)				148	11.8 (3.2)
Sex	1028	46.0% ♀				148	52% ♀
Treatment length (month)	1031	21.6 (15.2)					
SES	1030	3.21 (1.24)	1030	2.94 (1.2)			
Drug addiction parent(s)	902	26.9%					
Uneducated (FAI1)	1004	31.3%					
Disharmony/Single parents	1009	76.9%					
ICD-diagnosis-total	913	95.7%	897	60.2%		148	21.6%
Emotional disorder	*n* = 455	49.8%	*n* = 281	31.3%		148	13.5%
Dysregulation disorder	*n* = 136	14.9%	*n* = 55	6.1%		148	1.4%
ADHD	*n* = 207	22.7%	*n* = 130	14.5%		148	6.8%
Special diagnoses	*n* = 76	8.3%	*n* = 74	8.2%		148	0%
Severity of problems (MPI)	1009	12.5 (9.35)	1002	7.73 (7.69)	0.61	148	4.1 (3.9)
Family adversity index	1031	2.33 (1.11)	1031	2.05 (1.12)	0.34		
Caregiver (GAF)	1031	61.2 (15.6)	1031	66.3 (16.3)	0.44		
Child (CGAF)	754	57.2 (15.5)	754	67.0 (16.4)	0.72		
Relation (GARF)	805	58.2 (18.0)	805	68.2 (18.9)	0.54		

**ES, effect size Cohen's d, N = valid cases. TAF, Therapeutic Ambulant Family Care; SES, socioeconomic status; FAI, family adversity index; GAF, Global Assessment of Psychosocial Functioning; CGAF, childrens' GAF; MPI, Mannheim Parental Interview; GARF, Global Assessment of Relational Functioning.*

Global Assessment of Relational Functioning (GARF Scale)

The GARF scale was used to rate the psychosocial functioning level of the families (Stasch and Cierpka, 2006). The GARF detects three dimensions: (a) problem solving; (b) organization; and (c) emotional climate. The scaling occurs between 0 and 100. The interrater reliability is reported with 0.72, the Cronbach alpha with 0.91, and the generalizability coefficient (GC) with 0.93.

Procedure

The data of the clinical sample was collected by the respective therapist of a family during the first 3 months of treatment. The non-clinical sample was drawn from two schools in Bavaria (Elementary School and High School), using the same methods as in the clinical sample. The non-clinical sample was matched (age and gender) according to the characteristics of the clinical group. For the statistical analyses (calculating mean, standard deviations, independent samples *t*-test, logistic binary regression, *Pearson's correlation coefficient*, and linear regression analysis) IBM® SPSS® Statistics Premium GradPack 23 for Windows has been used.

There is no potential conflict of interest. This study was carried out in accordance with the recommendations of WMA Declaration of Helsinki – Ethical Principles for Medical Research Involving Human Subjects. All subjects gave written informed consent in accordance with the Declaration of Helsinki. The investigation has been approved by the Ethics Committee of our Institutions (Institute for Psychoanalysis and Family Therapy Salzburg Austria).

RESULTS

Prevalence Rate of Psychopathological Diagnosis

In the clinical sample 95.7% of the cases met the ICD-10 criteria for at least one psychopathological diagnosis, compared to 21.6% in the non-clinical sample.

Risk- and Protective Factors

The mean number of CAs was 7.81 (SD = 3.18) for the clinical sample and 1.83 (SD = 2.08) for the non-clinical sample. Therefore, the clinical sample met on average 35.49% (SD = 14.48%) of 22 CAs, while the non-clinical sample did so for 8.35% (SD = 9.47%). Tested with an independent samples *t*-test, this constitutes a significant difference [$t(1155) = 22.12$, $p < 0.001$, $d = 2.27$], meaning that kids in the clinical sample had significant more CAs.

As can be seen on the left side of **Figure 1**, children in the clinical sample (solid line) were exposed to more risk factors as compared to the non-clinical sample (dashed line). In addition – as scan be seen on the right side of **Figure 1** – persons in the clinical sample grew up with significantly less protective factors [clinical: M = 32.41%, SD = 18.1%; non-clinical: M = 69.53%, SD = 17.63%; independent samples *t*-test: $t(1155) = -23.37$, $p < 0.001$, $d = -2.08$].

The three most prevalent CAs in the non-clinical sample were divorce or separation of parents (14.2%), employment of mother during first year after childbirth (21.2%) and a low SES (10.9%).

Cluster 5a (single or cumulative trauma): sexual abuse, physical maltreatment, and emotional neglect.

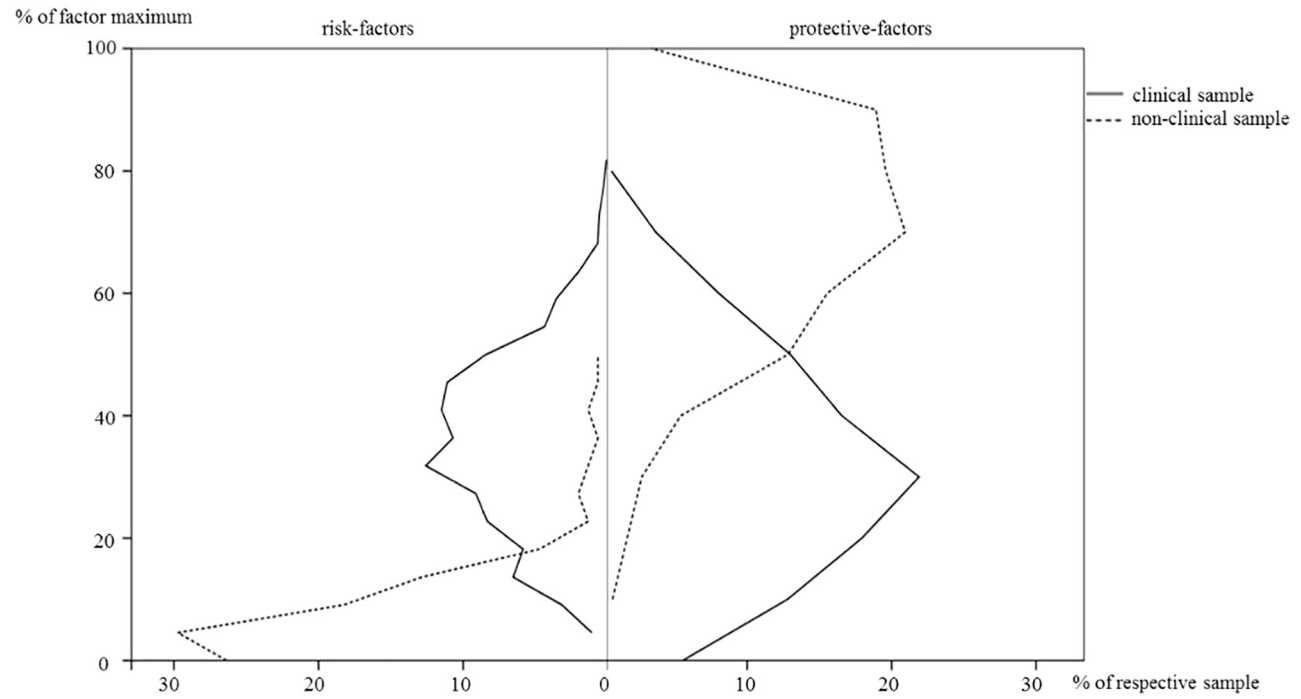

FIGURE 1 | Percentages of corrected risk- and protective-factors in the clinical and non-clinical sample.

Relationship Between Psychopathology and Risk-/Protective Factors in a Non-clinical Sample

To test the relationship between the risk-/protective factors with the presence of a psychopathological diagnosis, we conducted a logistic binary regression. Both, CAs ($B = 5.06$, $exp\ b = 158.01$, $p = 0.017$) and protective factors ($B = -0.34$, $exp\ b = 0.03$, $p = 0.006$), turn out to be significant predictors for the existence/absence of a psychopathological diagnosis in the non-clinical sample [$X^2(1) = 18.0$, $p < 0.001$; $R^2 = 0.177$ (Nagelkerke, 1991), 0.112 (Cox and Snell, 1989)]. These results suggest that in a normal population of schoolchildren, protective factors make it significantly less likely to have a psychopathological diagnosis, while risk factors increase that chance significantly. In our non-clinical sample, children with a negative ratio of protective to risk factors had a 9.4% chance of meeting criteria for an ICD-10 diagnosis, while none (0%) of the kids with a positive ratio (more protective factors) did.

Treatment Effect in the Clinical Sample

For the clinical sample, all psycho-social post treatment scores were significantly lower as compared to before treatment. The psychopathological symptoms as measured by Mannheim Parental Interview dropped from 12.57 ($SD = 9.35$) to 7.73 ($SD = 7.69$) after treatment, as can be seen in **Figure 2**. Tested with a paired samples t-test, that constitutes a significant reduction in psychopathologic symptoms [$t(1000) = 18.94$, $p < 0.001$; $d = 0.61$], even though the sample includes high rates of diagnoses like adolescent personality disorders and Asperger-syndrome with lower therapeutic variability. The family adversity index (FAI) significantly dropped from 2.33 ($SD = 1.11$) to 2.05 [$SD = 1.12$; $t(1030) = 11.19$, $p < 0.001$, $d = 0.35$]. The ability for social self-preservation (SSE-TAF) improved from 3.21 ($SD = 1.24$) to 2.94 [$SD = 1.20$; $t(1029) = 10.05$, $p < 0.001$, $d = 0.31$]. The three assessments of global functioning in terms of caregiver (GAF) [Mpre = 6.12, $SD = 1.56$, Mpost = 6.63, $SD = 1.63$; $t(1030) = -14.52$, $p < 0.001$, $d = -0.45$], index child caregiver (CGAF) [Mpre = 5.72, $SD = 1.55$, Mpost = 6.70, $SD = 1.63$; $t(753) = -19.83$, $p < 0.001$, $d = -0.72$] and relational functioning caregiver (GARF) [Mpre = 5.82, $SD = 1.80$, Mpost = 6.82, $SD = 1.89$; $t(804) = -16.01$, $p < 0.001$, $d = -0.54$] all also improved significantly.

Risk-Factors and Their Relationship to Psychopathological Symptoms

The number of risk factors was significantly correlated to all measures related to psychological problems in the clinical sample (MPI: *Pearson's* $r = 0.17$, $p < 0.001$; FAI: *Pearson's* $r = 0.46$, $p < 0.001$; GAF: *Pearson's* $r = -0.3$, $p < 0.001$; CGAF: *Pearson's* $r = -0.21$, $p < 0.001$; GARF: *Pearson's* $r = -0.25$, $p < 0.001$) and also in the non-clinical sample (MPI: *Pearson's* $r = 0.32$, $p < 0.001$). The hypothesis that the higher the number of CAs – and therefore risk-factors – coincides with a higher number of psychopathological symptoms, was confirmed by a linear regression analysis

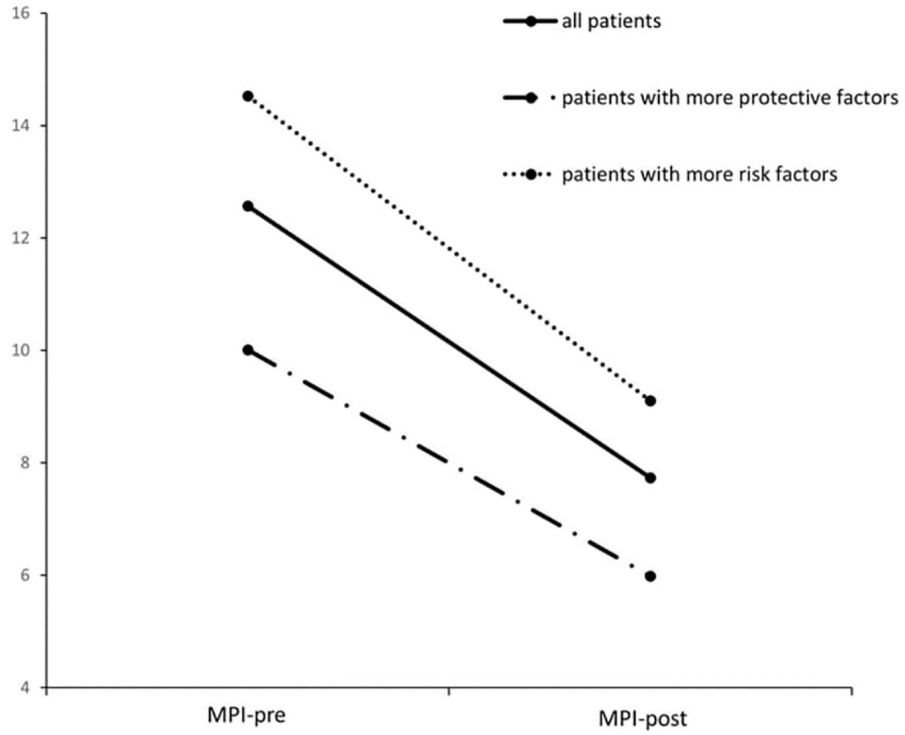

FIGURE 2 | Risk and protective factors and their relationship to child psychiatric symptoms.

[$F(1,1007) = 30.29$, $p < 0.001$]. The parameter of the risk-score significantly predicted the number of psychopathological symptoms [$t(1007) = 11.24$, $p < 0.001$]. With a $R^2 = 0.03$ and the value $b = 11.02$, these results can be interpreted in a way, that for each two additional risk-factors, we can predict an increase of one point on the psychopathological symptom-score at the beginning of treatment, as measured by the MPI.

We did not find evidence for the hypothesis that higher risk-scores have a predictive value for the treatment effect [$F(1,999) = 2.04$, $p = 0.154$], suggesting that treatment is as effective for patients with high risk as it is for patients with only a few or no risk factors.

Protective-Factors and Their Relationship to Psychopathological Symptoms

The protective-factors were significantly correlated to the number/severity of psychological problems, in the opposing direction of the risk-factors for the clinical sample (MPI: *Pearson's* $r = -0.26$, $p < 0.001$; FAI: *Pearson's* $r = -0.18$, $p < 0.001$; GAF: *Pearson's* $r = 0.23$, $p < 0.001$; CGAF: *Pearson's* $r = 0.32$, $p < 0.001$; GARF: *Pearson's* $r = 0.23$, $p < 0.001$) and also in the non-clinical sample (MPI: *Pearson's* $r = -0.26$, $p < 0.001$), constituting the exact complementary result of the risk factors. We tested the hypothesis that a higher number of protective factors predicts lower number of psychopathological symptoms. A linear regression analysis revealed that patients' number of protective factors significantly predicted the pre-treatment scores of MPI [$F(1,1007) = 73.31$, $p < 0.001$]. The parameter of protective-factors with an $R^2 = 0.07$ and $b = -13.43$ significantly predicted [$t(1007) = -8.56$, $p < 0.001$] that for each protective factor the psychopathological symptom-score can be expected to be 1.3 lower on average, constituting a buffering effect of protective-factors.

The hypothesis that the number of protective factors also predicts the number of symptoms after treatment was met in the opposite direction as previously hypothesized [$F(1,999) = 10.94$, $p < 0.001$]. With an $R^2 = 0.01$ and a $b = 4.63$, the linear regression analysis significantly predicted [$t(999) = 3.31$, $p = 0.001$] that for each additional protective factor, the treatment will reduce 0.46 less symptoms. This might be interpreted in the light of the results that patients with more protective factors had less symptoms to start with at the beginning of treatment and therefore less chance to reduce these, as can be seen in **Figure 2** and is reported in the next paragraph.

Effect of the Net-Score of Risk- vs. Protective-Factors

By subtracting the corrected risk-factors from the corrected protective factors, we separated the clinical sample into two groups of patients with predominance of risk-factors (risk-group, $n = 556$) and predominance of protective-factors (protective-group, $n = 445$), respectively.

As can be seen in **Figure 2**, the mean psychopathological symptoms of these two groups at beginning of treatment (risk-group: $M = 14.58$, $SD = 9.53$; protective-group: $M = 10.07$, $SD = 8.48$) differed significantly [$t(1007) = 7.72$, $p < 0.001$].

Even though both groups significantly reduce their psychopathology scores during treatment [risk-group: $M = 9.16$, $SD = 8.23$, $t(555) = 14.53$, $p < 0.001$; protective-group: $M = 5.96$, $SD = 6.54$, $t(444) = 12.33$, $p < 0.001$], there remains a significant difference between the two groups [$t(999) = 6.69$, $p < 0.001$] after treatment. The risk group – dotted line in **Figure 2** – did show a trend for having a bigger total reduction of their symptoms [$F(1,999) = 6.53$, $p = 0.011$]. Taken together, patients with a higher number of CAs than protective factors showed more psychopathological symptoms before and after treatment, but had a tendency to reduce more of their symptoms, as compared to children that had more protective factors.

Correlation of Clusters of CAs and PFs With SES, Symptom-Score at Begin and Reduction of Symptoms

As can be seen in **Table 2**, the different clusters of protective- and risk factors correlated differently with psychopathological symptoms at beginning of the treatment. The cluster of attachment related risk-factors show the strongest relation to the symptoms (*Pearson's* $r = 0.24$, $p < 0.001$), with the other clusters of violence (*Pearson's* $r = 0.12$, $p < 0.001$) and trauma (*Pearson's* $r = 0.13$, $p < 0.001$) to be also significantly correlated.

Both clusters of the protective factors are significantly negative correlated with the symptom-score at beginning of treatment (social resources: *Pearson's* $r = -0.25$, $p < 0.001$; individual resources: *Pearson's* $r = -0.16$, $p < 0.001$).

DISCUSSION

Multi-problem families are often faced with a cross-generational, self-sustaining network of problems, where the social, educational, occupational, physical, and psychological maladaptation of one generation increase the risk of the family's next generation. In our study, a representative sample of 148 children and adolescents from two schools were faced with an average of 1.84 (8.35% of 22) childhood-adversities, while a clinical sample of 1009 kids were exposed to a significant higher number of CAs (7.81; 35.49%). These children not only grow up under circumstances of heightened risk, they also have a significant lower number of positive, protective factors at their disposal (clinical sample: 32.41%; non-clinical: 69.53%). Children that meet the criteria of a psychopathological diagnosis will have encountered a smaller SES, more violence in the family, attachment-difficulties, more psychological and physical illness of their family members and are more likely to have gone through a traumatic experience, while they have less individual and social resources to cope with these adversities. In such an environment, psychopathology possibly has better chances to evolve and persist.

In addition, not only the presence of a diagnosis is more likely, but also the number of symptoms is significantly positive correlated with different clusters of CAs (and negatively correlated with the two protective clusters) in the clinical sample as well as in the non-clinical sample. For each two more CAs encountered in early life, the symptomatic score increases on average by one point when at the beginning of treatment. Each protective factor reduces that score by 1.3 points.

These results clearly support the notion that growing up in a family with multiple problems forms a thread to future psychological health of a child, but that fate is not irreversible. When undergoing psychotherapeutic treatment, as in the present clinical sample, the average patients – independently of their adverse or beneficial circumstances – benefit significantly from therapy. The treatment effect did not depend on the severity of disorders. To get a deeper understanding of the role, CAs and protective factors play in therapeutic processes, we divided the group of all patients into two groups that either had a predominance of adversities or protective factors. The group with more risk factors displayed a higher symptom-score before and after treatment. However, this group presented itself with an

TABLE 2 | Bivariate correlation matrix of current stressors (socio-economic status and psychopathology), childhood adversities (risk-clusters), and protective clusters.

Pre-treatment measures	1	2	3	4	5	6	7	8	9	10
Current stressors:										
(1) SES-TAF		0.012	0.037	0.658*	0.195*	0.148*	0.165*	0.09*	−0.194*	−0.154*
(2) Symptomscore_pre (MPI)			−0.619*	−0.002	0.120*	0.235*	0.021	0.125*	−0.247*	−0.157*
(3) Symptomscore-reduction (MPI)				0.026	−0.009	−0.103*	0.016	−0.049	0.079‘	0.092‘
Risk clusters:										
(4) SES-resources					0.228*	0.253*	0.180*	0.130*	−0.172*	−0.099*
(5) Violence						0.169*	0.199*	0.298*	−0.219*	0.000
(6) Attachment							0.136*	0.150*	−0.253*	−0.147*
(7) Physical or mental illness								0.101*	−0.079‘	−0.054
(8) Trauma									−0.142*	−0.015
Protective clusters:										
(9) Social resources										0.281
(10) Individual resources										

**Significant at >0.01; ‘significant at 0.05; N = 1009 (symptomscore reduction N = 1001).*

equally strong reduction of symptoms after therapy. In fact, the symptomatic drop was almost stronger for the risk-group, which, however, has to be interpreted in the light of having started out with more symptoms.

CONCLUSION

Combined, these results of therapeutic effectiveness shed a positive light on the question, whether the cross generational network of problems can be dismantled. Knowing that therapy even in severe circumstances is possible, not only demands public investment into therapy for the young person at hand, but is publicly even more beneficial, since it is likely to cut the cross-generational inheritance of adverse living conditions. That argument is supported by the comparison of a clinical sample with a non-clinical sample, where it could be shown that the chances for developing a psychopathology decreases with the decrease of CAs and increase of protective factors in early life.

The understanding of the etiology of psychological problems needs to take into account the framework of CAs and their interaction with protective factors. The individual risk of developing mental health problems is possibly caused by individual vulnerability, personal and family-related resources (PFs), as well as by the age, frequency, the duration and the accumulation of various risk factors. However, even when a kid grows up in bad circumstances and does develop psychopathological symptoms, therapy is possible and with high outcome values. Adaptive treatments can prevent disorder-related long-term effects and can decrease family related indices of CAs (FAI, $d = 0.35$). Our study showed that therapeutic home-based treatment with high structural and process quality can successfully treat groups with severe child-psychiatric disorders. But we need further research about treatment aptitude and "what works for whom" (Beutler et al., 2016).

Our data allow us to point out the importance of CAs × PFs interactions as a framework to explain individual differential susceptibility for environmental influences in G × E interaction. This will have relevance for preventive and curative interventions in child-protection, and health policy pay off, because the direct and indirect costs of CAs over the course of lifetime are very high (Masten, 2011). The costs of the developmental effects of serious child maltreatment exceeds 210.000$ per victim (Klika and Herrenkohl, 2013). Empirical research about these issues are important because the long-term effects of CAs are harmful and costly. We can summarize that the development of child psychiatric symptoms is determined by the complexity of a number of genetic, epigenetic, and different environmental influences (socio-familial, socioeconomic factors, and by CAs × PFs interactions) with non-additive influence at different stages of age.

Three important tasks can be derived from the presented results: First, families, neighbors, schools, social services and governments have to take action to prevent, screen and if necessary, act quickly on harsh conditions in and for families, for not allowing to have violence and rates of early life stressors dominate childrens' life's (Flouri et al., 2015; Bethell et al., 2016). Second, more empirical research has to be conducted, to better understand dysfunction specific resilience mechanisms and underlying gene–environment interactions. The regulating function of the HPA axis and in consequence long-term functionality of the brain is, e.g., just one mechanism, how early uninterrupted life-stressors might have a lasting influence (Bick et al., 2012). Third, generalizing research on groups has to be expanded by designs that allow a better understanding of which treatment might help whom and when the best. Therefore our empirical study is a contribution to treatment aptitude research (Beutler et al., 2016).

Limitations

Even though we had three sources of data with high reliability to the assessment of the CAs (primary care giver, adolescents, and therapists), retrospective assessment has possible biases in terms of under-reporting (memory) or over-reporting (trying to please the interviewer). Furthermore, the study has a naturalistic design, the treatments were conducted as usual, with adherence check for the interventions. Therefore, causal interpretations, are, in a strict sense, not possible.

AUTHOR CONTRIBUTIONS

All authors designed the study and proofread the literature. BA was responsible for statistics. EB and AF collected the data. EB, HB, MN, and GS wrote the paper.

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The Role of Rumination and Negative Affect in Meaning Making Following Stressful Experiences in a Japanese Sample

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Stressful experiences can lead to meaning making that is seen as central in adjustment. Although rumination and negative affect are important factors of meaning making, little is known about the mechanisms involved. This study aimed to examine the meaning making process, focusing on the role of intrusive and deliberate rumination and negative affect. The principal hypotheses were as follows: negative affect is positively related to threat evaluation and intrusive rumination, while regret and guilt are positively related to deliberate rumination; intrusive rumination is negatively related to finding meaning, whereas deliberate rumination is positively related to finding meaning. A total of 383 undergraduate students were asked to remember their most stressful life event and complete a questionnaire containing the Event Related Rumination Inventory and items about negative affect, threat evaluation, and finding meaning about the stressful life event. For 342 of the final sample, structural equation modeling based on the study hypotheses showed that both deliberate and intrusive rumination immediately after the event were positively associated with finding meaning. Intrusive rumination at present, however, was negatively related to finding meaning. This study also revealed the effects of negative affect: helplessness, sadness, and fear induced intrusive rumination; moreover, regret was positively associated with deliberate rumination.

Keywords: meaning making, intrusive rumination, deliberate rumination, threat, negative affect, regret

INTRODUCTION

Stressful Life Events and Meaning Making

Many individuals face highly stressful and traumatic experiences (e.g., bereavement, natural disaster, murder, traffic accident, divorce), which typically lead to serious posttraumatic symptoms; however, many people are able to understand and interpret their individual experience in their own way. Such cognitive coping is often referred to as meaning making (Park, 2010),

which may play a role in adaptation to such experiences. Meaning making was found to be central in recovering from stressful experiences such as bereavement, illness, and terrorist attacks (Gillies and Neimeyer, 2006; Kernan and Lepore, 2009; Park et al., 2012). It alleviates posttraumatic symptoms and brings about positive changes following the experience (Bower et al., 1998; Tolstikova et al., 2005; Updegraff et al., 2008).

Park (2010) proposed the meaning making model, which is a useful theoretical framework for understanding the processes of meaning making. This model identifies two levels of meaning: global and situational. Global meaning refers to individuals' general orienting systems, consisting of beliefs, goals, and worldview. Individuals' deeply ingrained global meaning involves the belief that the world is benevolent, predictable, and meaningful, and the self is worthy (Janoff-Bulman, 1989), and life is lived based on these upheld beliefs. On the other hand, situational meaning consists of appraisals of a specific situation. The model posits that when individuals perceive a discrepancy between their global and situational meanings, they experience distress, which leads them to meaning-making efforts to mitigate the discrepancy.

Because this model represents restrictive processes of meaning making, it is insufficient to elucidate the cognitive processes that take place after being motivated to make meaning. Furthermore, not all individuals who experience stressful and traumatic events report having any answers to questions such as "Why did this event happen?" or "Why me?" Moreover, chronic meaning-making efforts may even enhance their distress (Updegraff et al., 2008; Davis and Novoa, 2013). However, few studies have examined the factors that contribute to chronic meaning-making efforts from the viewpoint of meaning-making processes. It is thus necessary to clarify the components of meaning-making processes to resolve the problems mentioned above. Therefore, we first focused on rumination as a critical factor in meaning making.

Two Types of Rumination

According to Greenberg (1995) and Park and George (2013), rumination concerning stressful experiences is an important factor in meaning making because it promotes trauma reappraisal or schematic revision. Moreover, Tedeschi and Calhoun (2004) proposed two types of rumination identified in the cognitive processing of meaning making, which is a necessary step in adjustment and positive change. One type is intrusive rumination, which involves unintentional and unwanted thinking and images that are difficult to control, with contents related to the stressful events. The discrepancy between global and situational meanings leads to intrusive rumination (Greenberg, 1995; Park, 2008). Intrusive rumination is accompanied by substantial emotional distress and negative affect (Roberts et al., 2006; Updegraff et al., 2008; Kernan and Lepore, 2009) but decreases when individuals find some kind of meaning in their experience (Silver et al., 1983). The other type of rumination is deliberate rumination, which involves voluntarily and purposely trying to understand events and their implications (Calhoun et al., 2000), for example, answering questions such as "Have I learned anything?" or "Has the experience changed my beliefs about the world?" Deliberate rumination is more likely to be related to posttraumatic growth (PTG), in which positive psychological changes result from the struggle with a highly stressful life event, whereas intrusive rumination, which is not controlled by the individual, is more likely to be related to various kinds of posttraumatic stress. Consequently, because intrusive rumination leads individuals who experience stressful events to focus on negative aspects of their experience, they may have difficulty in finding meaning, with the time spent searching for meaning being prolonged, subsequently increasing their distress. On the other hand, because deliberate rumination may shed light on multilateral and positive aspects of their experience, this type of rumination may promote understanding and help to find meaning, value, and significance in the experience.

However, intrusive rumination is also necessary to trigger the cognitive processes toward positive change (Taku et al., 2009; Wu et al., 2015), and is a normal response that immediately follows stressful and traumatic experiences (Joseph et al., 2012). Intrusive rumination is also a coping mechanism that is important as a survival strategy to hedge from a menace quickly. Thus, intrusive rumination may be as important as deliberate rumination in order to find meaning. In previous research, the role of these ruminations types has not been studied in depth and, in fact, no previous studies on associations between the two types of rumination and meaning making exist in the literature. Furthermore, it is possible that a chronic intrusive rumination leads to post-traumatic stress disorder (PTSD) or increased stress response (Greenberg, 1995; Calhoun et al., 2000; Michael et al., 2007). Specially, intrusive rumination may have a different function according to its time of occurrence. In previous studies, intrusive rumination immediately after the stressful event was not related to poor mental health, but intrusive rumination at present (at the point of research) was positively associated with stress responses (Taku et al., 2008, 2009; Nightingale et al., 2010). In consideration of these results and the function of intrusive rumination, although such kind of rumination occurring at the time of the experience may reflect the stress response at the time, its effect on finding meaning may be very small. However, high levels of intrusive rumination after a certain time may lead individuals to focus on negative aspects of the stressful event, and it is assumed that they might continue searching for meaning unsuccessfully or generate negative meaning. Moreover, if intrusive rumination immediately after the event is a normal response and predictor of getting over the experience, intrusive rumination could promote deliberate rumination. Thus, research needs to focus on the timing of rumination and meaning making processes with the ultimate goal of clarifying the factors that promote or inhibit finding meaning.

It is assumed that a factor influencing the frequency of rumination is the subjective threat evaluation of the stressful and traumatic experience. Park (2010) proposed that subjective threat evaluation may be used as an index of the degree of discrepancy between global and situational meanings. The perception of threat to the self or worldview may motivate individuals to review and revise their values and priorities, which are part of their global meaning (Davis and Macdonald, 2004). Based on

their studies, threat evaluation of the stressful experiences is an important factor for motivation to find meaning, which involves revising one's own worldview and common sense, or changing the interpretation of the experience. Given that the discrepancy between global and situational meanings induces intrusive and deliberate rumination (Greenberg, 1995; Park, 2008; Taku et al., 2008), it is assumed that highly threatening experiences promote both intrusive and deliberate rumination in order to concurrently find meaning.

Therefore, this study examined the meaning making process to clarify the factors promoting and inhibiting finding meaning. Simultaneously, we examined the relationship between finding meaning and the frequency and timing of the two types of rumination and between these and threat evaluation.

Negative Affect in Meaning Making and Rumination

When individuals go through stressful and traumatic life events, they experience strong emotions. George and Park (2013) focused on the influence of negative affect on meaning making following stressful and traumatic experiences. Meaning making was found to mitigate not only depression and PTSD but also negative affect (Park, 2010; George and Park, 2013). Most previous studies showed that finding meaning reduced the degree of negative affect when experiencing stressful events (Park, 2010; George and Park, 2013). However, no precise has been identified relationship between the various types of negative affect immediately after a stressful event and meaning making, as researchers tend to handle negative affect as a general construct. Given that there are many different kinds of negative affect as described below, each one of them may have distinctive effects on meaning making. Hence, elucidation of the negative affect roles in the meaning-making process, in particular the relationships between negative affect and the two types of rumination may contribute to increasing our knowledge to prevent the prolongation of meaning-making efforts and derive adaptive meaning.

For example, when individuals attribute the cause of their stressful experience to themselves, they may focus on their own failures and feel regret and guilt (Roese et al., 2009; Joseph et al., 2012). These affects are associated with depression, PTSD, and intrusion (Arata and Burkhart, 1996; Roese et al., 2009). Additionally, because self-esteem and self-value are threatened when individuals fail, make a mistake, or act immorally, these behaviors are in contradiction with their global meaning, including self-worth (Janoff-Bulman, 1989). This results in a discrepancy between global and situational meanings. Hence, regret and guilt may promote threat evaluation and intrusive rumination.

However, self-blame and regret also have an adaptive function. In the case of self-blame with regards to own behavior during a stressful experience, most individuals consider whether they could have done something differently to have prevented the event. This process is known as counterfactual thinking (Davis et al., 1996). Behavioral self-blame is associated with perceived controllability of similar future events (Karl et al., 2009), as individuals are able to identify out what to do to avoid them. Thus, regret can help to improve performance. Regret also signals a need for corrective actions and leads individuals to implement them (Roese et al., 2009). Consequently, because individuals who feel regret and guilt become motivated to find meaning and actively attempt to use of their experience to improve behavior, regret and guilt may possibly promote deliberate rumination.

On the other hand, some events caused by others, such as betrayal, insult, and intentional infringement may cause anger (Nezlek et al., 2008). Anger is related to re-experience and intrusive memories of the traumatic event, which are two of the symptoms of PTSD (Kleim et al., 2013; Dewey et al., 2014). Given that these are similar concepts (Halligan et al., 2003) with some features (i.e., repetitive and difficult to control), in common with intrusive memories, thoughts, and rumination (Martin and Tesser, 1996), anger may promote intrusive rumination.

Some stressful experiences that are perceived to be caused by certain external objects; on the other hand, other experiences such as natural disasters, and unintentional injuries and accidents that are difficult to associate with specific objects. Since because these stressful events are not caused by others, individuals may find it difficult to control and deal with them to avoid reoccurrence. Furthermore, whatever the cause, individuals sometimes encounter situations that are hard to predict, control, or deal with, which seem to induce helplessness, fear (Tolstikova et al., 2005; O'Donnell et al., 2007), and sadness (Kitamura, 2006).

In summary, stressful and traumatic events that are unpredictable and uncontrollable may induce anger, helplessness, fear, and sadness. The stronger these negative affects are, the greater discrepancy there is between global and situational meanings. This could be because of the tendency of these events to disrupt individuals' global meaning, which involves the belief that the world is predictable, comprehensible, and controllable (Janoff-Bulman, 1989). Moreover, because it is difficult to interpret and understand these stressful experiences in the framework of previous global meaning (as it is disrupted by such experiences) negative affect may induce threat evaluation and intrusive rumination.

Purpose and Hypotheses of the Current Study

The purpose of current study was to examine the meaning-making processes with a focus on intrusive rumination, deliberate rumination, and negative affect. Specifically, we used structural equation modeling (SEM) to examine the relationships between threat evaluation, negative affect, two types of ruminations, and finding meaning in the stressful experience. The study hypotheses based on above discussion were as follows: (1) negative affect will be positively related to threat evaluation and intrusive rumination; (2) regret and guilt will be positively related to deliberate rumination; (3) threat evaluation will be positively related to both intrusive and deliberate rumination; (4) intrusive rumination immediately after the event will be positively related or not related to finding meaning; (5) deliberate rumination immediately after the event and at present will be positively related to finding meaning; (6) deliberate rumination immediately after the event will positively related to intrusive

rumination at present; and (7) intrusive rumination at present will be negatively related to finding meaning.

MATERIALS AND METHODS

Participants

This study carried out an investigation for undergraduate students. To prevent from being noticed the intention of this study, we recruited participants from some classes except the psychology. A total of 383 Japanese undergraduate students (200 male, 173 female, and 10 unknown) at a university in Japan in June 2015 participated in this study. The mean age of participants was 19.59 years (*SD* = 2.50, range = 18–30). They participated in this investigation during class.

Procedure

First, participants were asked to remember the most stressful life event that they faced more than 1 year ago and describe it in writing in a blank section in the questionnaire. To avoid discomfort that may be brought about by recalling the stressful event, this study set the following conditions: (1) the event must have occurred more than 1 year ago, and (2) it had to be possible for participants to deeply reflect about the event. Second, participants completed the questionnaire which was comprised of the following questions regarding the event written to the questionnaire. Prior to the investigation, they were informed about the purpose of the study, that they did not need to answer any questions that made them uncomfortable, and that their personal information and data would be treated with strict confidentiality. Completion of the questionnaire took approximately 15 min. This study was approved by the institutional review board of the university.

Measures

Demographic Information

Demographic data such as age and gender were self-reported.

Negative Affect

As for negative affect related to the stressful event, participants rated how they felt immediately after the stressful event in term of the following six negative affects: sadness, anger, regret, guilt, fear, and hopelessness, on a scale ranging from 1 (not at all) to 7 (strongly agree). These six items were selected based on the studies of Ellsworth and Smith (1988) and Scherer (2005). We used the following question: "When you experienced the event, to what extent did you feel each of the following emotions?".

Threat Evaluation

To measure the degree of subjective evaluation of threat in relation to the event, we used the following single-item measure: "When you experienced the event, how much did you feel threatened by it?" Participants answered this item on a scale ranging from 0 (the least threatened in my life) to 100 (the most threatened in my life), which was based on Kamijo and Yukawa (2014, 2016).

Event Related Rumination Inventory

The Japanese version of the Event Related Rumination Inventory (Cann et al., 2011; Taku et al., 2015) is a 20-item inventory, with 10 items assessing intrusive, unintentional, and undesired thoughts and images, (i.e., intrusive rumination; e.g., "Thoughts about the event came to my mind and I could not stop thinking about them"), and the remaining 10 items assessing deliberate, more constructive, and purposeful thinking (i.e., deliberate rumination; e.g., "I thought about whether I have learned anything as a result of my experience"). Items were rated to a scale ranging from 1 (not at all) to 4 (often). Participants were asked to rate each item on how much they ruminated about the event at two points in time (i.e., immediately after the event and at present). In this study, we used only the three items with the highest factor loadings on each scale (Kamijo et al., 2016) in order to reduce participants' burden to answer numerous items. The items of intrusive rumination were as follows: "Thoughts about the event came to mind and I could not stop thinking about them," "I could not keep images or thoughts about the event from entering my mind," and "Thoughts about the event distracted me or kept me from being able to concentrate." The items of deliberate rumination were as follows: "I thought about whether I have learned anything as a result of my experience," "I thought about whether I could find meaning from my life," and "I thought about whether changes in my life have come from dealing with my experience." The three items scores were, respectively, summed and averaged out to obtain the scores of intrusive and deliberate rumination. The internal consistencies for the scale were 0.90 (intrusive rumination immediately after the event), 0.96 (intrusive rumination at present), 0.84 (deliberate rumination immediately after the event), and 0.95 (deliberate rumination at present).

Finding Meaning

To measure whether participants found their own meaning in the stressful life event, they were asked the following question: "How much do you feel you have been able to make sense out of the event or find some kind of meaning in it?" They rated their answer on a scale from 1 (none) to 5 (a great deal). This statement was used to measure finding meaning in previous research (Davis et al., 1998; Updegraff et al., 2008; Kernan and Lepore, 2009; Park et al., 2012).

Statistical Analysis

First, we described the study variables in terms of means and standard deviations. Then, we classified the stressful life events into five categories based on Taku et al. (2007). Associations between variables were measured using bivariate Pearson correlations.

Second, to examine the meaning-making processes focusing on negative affect and the two types of rumination, we used SEM based on the study hypotheses model. SEM can be viewed as a complex path model. The full information maximum likelihood estimation was used to generate the standardized parameter estimates. Because fit indexes represent different facets of model fit, we used multiple indexes: χ^2 test, the comparative fit index (CFI), standardized root mean square residual (SRMR), and

root-mean-square error of approximation (RMSEA). According to West et al. (2012), if CFI is over 0.95, RMSEA under 0.05, and SRMR under 0.10, the model is considered to have a good fit.

RESULTS

Descriptive Statistics

Forty-one participants were excluded from the analysis due to the following reasons: they reported a stressful event that occurred within 1 year, they did not provide answers for more than half of all items, or their age was over 3 SDs from the average age (19.59 years). The final sample was 342 (183 male, 157 female, and 2 unknown; average age = 19.49 years, SD = 1.26). Descriptive data for all variables are presented in **Table 1**. We conducted an independent-samples t-test comparing all variables by gender, which showed no significant statistical difference between the genders for any variables except for fear [male average = 3.48 ± 2.09, female average = 4.40 ± 2.14, $t(338) = 4.00$, $p < 0.001$]. Hence, the following analyses did not assess gender differences.

The stressful events reported by participants in the current study were classified based on Taku et al. (2007): "self" (33.2%) included events such as a severe illness or injury, natural disaster, and any accident from club activities; "relationship" (28.5%) included events like being physically and/or verbally bullied at school, falling out with friend or teacher, and a relationship rupture; "school" (17.8%) included events such as failure on college entrance examination or any significant academic problem; "family" (9.6%) included events like parents' divorce or separation, being abused by family member, and a family member's illness; "bereavement" (6.0%) included events such as a death of a family member or loved one; "other" (4.9%) included events that did not fit into any of the five categories above. The time elapsed from the stressful event ranged from 1 to 15 years, with a mean of 3.75 (SD = 2.95) years.

Path Analysis

Table 1 presents the correlation matrix for all variables. SEM was used to evaluate the path model, based on the study's hypotheses: (a) in correspondence with Hypothesis 1, direct paths from all negative affects to threat evaluation and intrusive rumination immediately after the event; (b) in correspondence with Hypothesis 2, direct paths from regret and guilt to deliberate rumination immediately after the event; (c) in correspondence with Hypothesis 3, direct paths from threat evaluation to intrusive rumination immediately after the event and at present and deliberate rumination immediately after the event and at present; in correspondence with Hypotheses 4–7, (d) direct paths from intrusive (and deliberate) rumination immediately after the event to intrusive (and deliberate) rumination at present and finding meaning; (e) direct paths from intrusive (and deliberate) rumination at present to finding meaning; (f) correlations between intrusive rumination and deliberate rumination; (g) correlations among all negative affects. Furthermore, we aimed to examine the relationships between all negative affects and deliberate rumination: (h) direct paths from anger, sadness, hopelessness, and fear to deliberate rumination immediately after the event. Although it is possible that there is a relationship between finding meaning and threat evaluation, this link was not examined in this study. Taku et al. (2009, 2015) pointed out the importance of mental suffering, that is, rumination, for meaning making and PTG; thus, threat evaluation alone would not be sufficient to achieve this. As such, we considered the absence of a direct relationship between threat evaluation and finding meaning. Additionally, to exclude the effect of elapsed time, we included the direct paths from elapsed time to all variables.

Figure 1 presents the tested paths in the hypothesis model, which showed a good fit with the study data ($\chi^2(31) = 65.197$ ($p < 0.001$), CFI = 0.964, RMSEA = 0.057 [90%confidence interval = 0.037–0.076], SRMR = 0.034). Hopelessness and fear were positively associated with threat evaluation (hopelessness: $\beta = 0.31$, $p < 0.001$, fear: $\beta = 0.40$, $p < 0.001$). On the other hand, threat evaluation, hopelessness, sadness, and regret were positively associated with intrusive rumination immediately after the event (hopelessness: $\beta = 0.11$, $p < 0.05$, sadness: $\beta = 0.22$, $p < 0.001$, regret: $\beta = 0.11$, $p < 0.10$); however, only regret was correlated with deliberate rumination immediately after the event ($\beta = 0.20$, $p < 0.01$). Furthermore, finding meaning was positively associated with deliberate rumination, both immediately after the event and at present (immediately: $\beta = 0.30$, $p < 0.001$, present: $\beta = 0.28$, $p < 0.001$), as well as with intrusive rumination immediately after the event ($\beta = -0.15$, $p < 0.01$). Only intrusive rumination, however, was negatively associated with finding meaning ($\beta = 0.16$, $p < 0.01$). Additionally, intrusive rumination immediately after the event and deliberate rumination at present ($\beta = 0.15$, $p < 0.05$), as well as deliberate rumination immediately after the event and intrusive rumination at present ($\beta = 0.13$, $p < 0.01$) had positive correlations, respectively.

DISCUSSION

This is the first study to examine the relationships between the two types of rumination and meaning making, and the characteristics of negative affect in meaning making in a Japanese sample. In path analysis via SEM, Hypotheses 1, 2, and 4 were partially supported and Hypothesis 3, 5, 6, and 7 were mostly supported. Hence, individuals going through a stressful life event may experience a variety of negative affects and some find meaning in the event through rumination.

Although Hypotheses 1 and 2 were confirmed only partially, the results of the current study support the role of negative affect. First, regret was positively associated with both deliberate and intrusive rumination. Comparing the ideal world and the situation caused by themselves, individuals often regret their actions. Roese et al. (2009) identified repetitive regret, which involves regrets repeatedly coming to mind, such as focusing on self-blame and "what-might-have-been" thoughts. This view is in

TABLE 1 | Means and standard deviations and correlations of all variables.

		M	*SD*	2	3	4	5	6	7	8	9	10	11	12
(1)	Threat evaluation	3.12	0.89	0.23**	0.17**	0.15**	0.44**	0.48**	0.26**	0.44**	0.15**	0.27**	0.21**	0.11**
(2)	Regret	4.62	2.15	–	0.50**	−0.08	0.37**	0.13*	0.39**	0.32**	0.30**	0.21**	0.18**	0.19**
(3)	Guilt	3.34	2.21		–	−0.12*	0.23**	0.21**	0.25**	0.25**	0.22**	0.15**	0.11*	0.10
(4)	Anger	4.60	1.95			–	0.09	0.00	0.11*	0.09	−0.03	−0.02	−0.05	−0.06
(5)	Hopelessness	4.42	1.90				–	0.31**	0.33**	0.35**	0.19**	0.18**	0.19**	0.20**
(6)	Fear	3.92	2.16					–	0.11	0.23**	0.06	0.13*	0.08	−0.01
(7)	Sadness	5.14	1.91						–	0.37**	0.18**	0.25**	0.14**	0.17**
(8)	Intrusive rumination (immediately after the event)	2.90	0.86							–	0.24**	0.36**	0.26**	0.25**
(9)	Deliberate rumination (immediately after the event)	2.59	0.87								–	0.21**	0.41**	0.42**
(10)	Intrusive rumination (at present)	1.58	0.86									–	0.57**	0.13*
(11)	Deliberate rumination (at present)	1.85	0.93										–	0.36**
(12)	Finding meaning	3.02	1.40											–

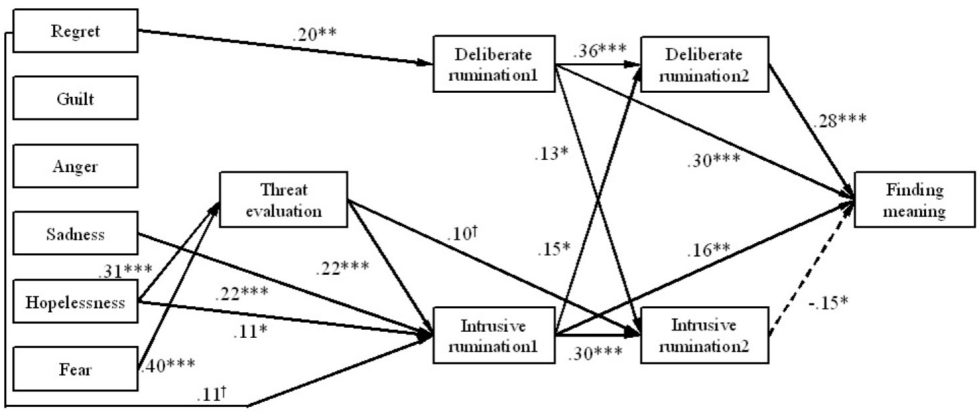

FIGURE 1 | Path analysis of meaning making process. ***$p < 0.001$, **$p < 0.01$, *$p < 0.05$, †$p < 0.10$. The straight lines represent significant positive paths, long dashed lines represent significant negative paths. Intrusive (Deliberate) rumination1 = Intrusive (Deliberate) rumination immediately after the event, Intrusive (Deliberate) rumination2 = Intrusive (Deliberate) rumination at present.

agreement with the results of this study regarding the association between regret and intrusive rumination. Additionally, regret induced deliberate rumination. Regret can help improve performance, as it signals the need for corrective actions and pushes individuals into implementing them (Roese et al., 2009). Hence, those who regret their actions resulting in a stressful event may somehow be motivated to make the best use of the experience, attempt to prevent similar events, and be able to deal with them successfully.

On the other hand, unlike regret, guilt was not correlated with any variables in the current study. Guilt is a self-conscious affect that relates to a sense of responsibility in the cause of harm to others (Lee et al., 2001; Berndsen et al., 2004). When individuals experience a stressful event, they often seem to blame themselves more than others, as this enables them to maintain their pre-existing global meaning, or at least minimizes the need for it to change (Janoff-Bulman, 1989). As such, by recognizing their own fault soon, it is easier for them to understand and interpret their experiences within the framework of their pre-existing global meaning. Since they can protect their beliefs and worldviews, they do not need to reconstruct or repair their global meaning, which will likely remain intact.

Moreover, helplessness, sadness, and fear were positively associated with threat evaluation and intrusive rumination, which reflects the degree of distress and discrepancy between global and situational meanings. These affects are likely to occur when individuals experience stressful events that are difficult to predict, control, and deal with. If individuals believe that they have little control over life events, they are more likely to feel hopeless, frightened, and sad (Tolstikova et al., 2005; Kitamura, 2006; O'Donnell et al., 2007; Reiland et al., 2014). These negative affects may disrupt global meaning (e.g., "Our world is predictable and safety" and "We can directly control our world through our own behaviors"); thus, the discrepancy between global and situational meanings may increase. Furthermore, because it is difficult to interpret and understand their experience based on the framework of previous global meaning, negative affect and discrepancy may induce intrusive rumination. That is, when individuals experience stressful events that cannot be controlled and dealt with by themselves, they may experience hopelessness, fear, and sadness. When this happens, their global

meaning is likely to be disrupted, and intrusive rumination may increase because of the greater discrepancies.

In contrast, anger was not associated with any variables in the current study, although we had predicted a positive relationship between anger and intrusive rumination. This may be because the current study employed a retrospective method, i.e., recalling past stressful and traumatic experiences and answering questions about them. Generally, in prior studies, anger and rumination were positively related (Speckens et al., 2007; Kleim et al., 2013; Dewey et al., 2014; White and Turner, 2014). However, some research reported the adaptive function of anger, which was associated with PTG and induced adaptive coping such as active effort actions (Park et al., 2008, 2012). Hence, although anger is often correlated with rumination (Watkins, 2008; Kleim et al., 2013; Dewey et al., 2014), individuals who feel anger may, however, tend to engage in active coping actions. Consequently, this active coping action after the stressful event may reconstruct the memory that is accompanied by anger; thus, the association between anger and intrusive rumination cannot be reflected in a study using a retrospective method. Further research is thereby recommended.

Furthermore, the current study revealed that the effects of negative affect varied according to the kind of affect. Namely, some negative affects such as helplessness, sadness, and fear may disrupt individuals' global meaning and induce rumination that is intrusive, uncontrollable, and unwanted, which could become an indirect factor interfering with finding meaning. In contrast, other negative affects such as regret, guilt, and anger may not always be maladaptive in relation to meaning making. Specifically, regret may promote deliberate rumination as revealed in this study, and can signal a need for corrective actions and lead individuals to implement them (Roese et al., 2009).

The results showed that threat evaluation induced intrusive rumination but not deliberate rumination; thus, Hypothesis 3 was not completely supported. Discrepancy between global and situational meanings leads to uncontrollable and unwanted images and thoughts, which indicates that individuals have not yet successfully processed their experiences (Joseph and Williams, 2005). This, in effect, signals the need to find meaning to reduce the discrepancy (Helgeson et al., 2006). Given that there is a positive correlation between intrusive and deliberate rumination, intrusive rumination can generate further intentional cognitive processes such as deliberate rumination. Future research is needed to clarify their relationship.

As predicted, deliberate rumination both immediately after stressful experiences and at present promoted finding meaning, while intrusive rumination at present inhibited it. These results supported Hypotheses 4, 5, 6, and 7. Deliberate rumination involves perceiving multilateral sides of the stressful experience including value, meaning, and significance (Calhoun et al., 2000; Cann et al., 2011), and may also decrease the discrepancy between global and situational meanings, as it promote finding meaning. Furthermore, when intrusive rumination still occurs frequently a long time after the stressful event, this may indicate that the discrepancy has not yet decreased, which may interfere with finding constructive meaning, as individuals are likely to pay attention to negative information, images, and thoughts regarding the stressful experience and cannot disengage from it (Koster et al., 2011; Whitmer and Gotlib, 2013).

Additionally, partially supporting Hypothesis 4, intrusive rumination immediately after the stressful events was also related to deliberate rumination at present and finding meaning. As mentioned in prior studies, intrusive rumination is a trigger for the cognitive processes toward deliberate rumination and positive change (Taku et al., 2009) and leads to rich memory of the experience (Krans et al., 2009). According to Joseph et al. (2012), intrusive rumination immediately after stressful events is a normal reaction in response to the traumatic experience. This evidence supports the results of this study, that is, intrusive rumination immediately after stressful events is surely a factor of distress; however, it does not necessarily lead to maladaptation or poor mental health.

Aside from the positive effects of deliberate rumination immediately after a stressful event on finding meaning, there was also a positive effect of this type of rumination on intrusive rumination at present, as described in Hypothesis 6. Hence, it is possible that deliberate rumination may also induce distress and psychological problems. Deliberate engagement in meaning making against one's will may not lead to adaptive meaning making, but contribute to later psychological stress and enhancement of intrusive rumination (Folkman, 2008; Nightingale et al., 2010; Kamijo and Yukawa, 2016). Therefore, it is assumed that the appropriate timing of the two types of rumination for adaptive meaning making may be different.

Finally, several limitations of the present study should be noted. First, due to the cross-sectional nature of our dataset, true mediation could not be established because of a lack of temporal ordering. Additionally, we examined the relationship between negative affect and the two types of rumination that follow immediately after the event, but could not establish a precise mutual relationship. Given that there may be an interaction between them (Joseph et al., 2012), future research needs to implement a longitudinal investigation to reveal the change process of meaning making based on rumination.

Second, there is a possibility of recollection bias in the retrospective method that we used. When negative affect experienced immediately after stressful events is assessed retrospectively, memory and reporting biases can occur (Nightingale et al., 2010; Bonanno, 2013). Moreover, it is difficult to memorize an experience exactly (Park, 2010), and those who found meaning may reconstitute their memory to ensure consistency with their current interpretation and evaluation of the stressful experience (Bluck, 2003; Dekel and Bonanno, 2011). Consequently, future research needs to use other methods beyond retrospective data collection, such as longitudinal investigation or diary method.

Third, we did not consider the contents of the meaning found by participants. Not all meanings are necessarily positive. Even if individuals can find meaning, if this involves negative beliefs, worldview, and self-concept, and is accompanied by a feeling of disgust, it may lead to aggravation of distress, depression, and

PTSD (Joseph and Linley, 2005; Payne et al., 2007; Park, 2008; Joseph, 2009).

Finally, in light of the results of this study, more research is needed on the various dimensions and types of meaning (Park, 2010). More importantly, future research should pay attention to not only the degree of finding meaning but also the contents of such meaning. It is through knowledge that we will be able to understand how meaning making could be a central and integral part of life.

ETHICS STATEMENT

This study was carried out in accordance with the recommendations of research ethics committee in University of Tsukuba. The protocol was approved by there. All subjects gave written informed consent in accordance with the Declaration of Helsinki.

AUTHOR CONTRIBUTIONS

NK and SY has made an important contribution in writing this paper. NK took the responsibility as first author and led the writing work.

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Risk and Resilience Among Mothers and Fathers of Primary School Age Children With ASD in Malaysia: A Qualitative Constructive Grounded Theory Approach

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Little is known about the coping and resilience experiences of parents of children with autism spectrum disorder (ASD) in the Malaysian cultural context. This study utilized a qualitative methodological approach adopting constructive grounded theory. The study sought to address the lack of research to date exploring the risk and protective experiences that contribute to parental stress and resilience for parents of primary school age children with ASD in the Malaysian setting. Twenty-two parents of children with ASD (13 mothers and 9 fathers) participated in semi-structured interviews. A strength of the study was the inclusion of both mother and father participant perspectives. The interviews lasted 50–80 min (mean: 67.5 min). The 22 parents had a total of 16 children (12 males; 4 females) formally diagnosed with ASD. Child age ranged between 5 and 12 years (mean age: 8.44). Overall, analysis of the 22 interviews revealed four prominent themes – *"initial reaction to child's ASD symptoms and diagnosis," "family life affected by a child with ASD," "awareness about ASD in Malaysia,"* and *"coping strategies, wellbeing, and becoming resilient."* The first three themes revolved around *stress and adversity*, and, the *adaptability and acceptance* of the parents. These processes illustrated the risks experienced by the parents of children with ASD in Malaysia. The last theme especially highlighted the *strengths and determination* of the parents and illustrated the protective experiences and processes that helped parents to develop and enhance resilience. Overall, the findings revealed that resilience develops synergistically and dynamically from both risk and protective experiences across different levels – individual, family, community, society and government. The findings motivated the development of our theoretical model of resilience that can help health and education professionals tailor assessment and interventions for parents of children with ASD in the Malaysian context. Clinical, policy, and research suggestions were discussed.

Keywords: resilience parenting stress, ASD, autism spectrum disorder, coping, Malaysia, qualitative, constructive grounded theory

INTRODUCTION

There is ample evidence that raising a child with autism spectrum disorder (ASD) is challenging and complex (Gray, 2002a; Meirsschaut et al., 2010; Weiss et al., 2012; Hayes and Watson, 2013; Cridland et al., 2014; Ooi et al., 2016). The clinical diagnostic symptoms of ASD include (a) difficulties in social communication and social interaction across various contexts, as well as (b) an inclination to engage in restricted, repetitive patterns of behavior, interests, or activities (American Psychiatric Association, 2013). Findings from previous studies have shown that the presence of children with ASD in the family impacts various domains of parental and family life (Hayes and Watson, 2013), such as the marital relationship, sibling relationships, family socialization patterns and family routines, etc. The psychosocial aspect of wellbeing in parents and families of children with ASD warrants specific attention in research (Lecavalier et al., 2006; Meadan et al., 2010), as a child with ASD needs greater understanding from the parents, extended family, friends, the community, and professional caregivers (e.g., Quintero and McIntyre, 2010). ASD has been the subject of a large and growing area of research in Western countries (Herring et al., 2006; Firth and Dryer, 2013; McStay et al., 2014). However, problematically, there is scant research that explores these subject matters in non-Western countries, which includes Malaysia (Samadi and McConkey, 2011; Daley et al., 2013; Freeth et al., 2014; Neik et al., 2014; Ilias et al., 2018).

In Malaysia, there have been increasing reports from doctors, psychologists, and psychiatrists with regards to the increasing number of children with ASD referred to their clinics (Toran, 2011; Ministry of Health Malaysia, 2014; Neik et al., 2014). Moreover, the number of children enrolled in special needs programs has also reportedly doubled between 2006 and 2013 (Toran, 2011; Razali et al., 2013). Together, these findings suggest the need for more autism-related research in Malaysia. It is, however, most likely that the response of parents and families to a child's ASD diagnosis would vary from family to family. Showcasing this coping variability is the growing interest in research to discover why and how some parents and families of children with ASD manage to function well and become stronger, whereas, others do not cope so well (e.g., Walsh, 1998; Patterson, 2002; Bekhet et al., 2012; Bayat and Schuntermann, 2013; Leone et al., 2016).

This area of inquiry has in turn given rise to the development of a field known as *family resilience* and efforts to understand resilience in a relational context. Walsh's (1998, 2003, 2016) *Family Resilience Framework* has been widely adopted as one of the key theoretical frameworks in working with families facing adversity and stressors. Walsh (2003) articulated a theory of family resilience, drawing together findings from studies of individual resilience as well as research on effective family functioning. Her framework identifies a number of domains and qualities of family members that contribute to resilience: *family belief systems* (such as spirituality, maintaining a positive outlook, etc.), *family organizational processes* (interpersonal relationships, effective social networks, and economic resources) and *family communication processes* (collaborative communication and problem solving).

Walsh's family resilience theory aims to investigate the factors that contribute to healthy family functioning rather than family deficits (Hawley and DeHaan, 1996). The concept of family resilience extends our understanding of normal family functioning to situations of adversity (Walsh, 2016). This concept is applicable in understanding how parents and family members of children with ASD function as a unit when facing the challenges, difficulties and hardships of raising a child with ASD. Specific to the current paper, families with adversity and stressors would refer to families with a child (or children) diagnosed with ASD.

Resilience has been defined in various ways in the past literature. Recent writings are increasingly highlighting the nature of resilience as a *dynamic process* (e.g., Stainton et al., 2018), as resilience involves the dynamic interaction between perceived risk and a range of protective, attenuating, and recovery factors that can help a person to adapt well in the face of adversities and to thrive. Resilience can be understood as a dynamic process made up of many things, including but not limited to adaptive coping behaviors. Resilience resources can be sourced from personal, relational, and environmental life domains. A similar, but still distinct construct from resilience, *coping* can be viewed as involving purposeful attempts to manage stress, regardless of the effectiveness (Compas et al., 1988). Lazarus and Folkman (1984) classically defined adaptive coping as referring to cognitive and behavioral efforts to manage internal and external demands that are taxing or exceeding the person's resources to cope.

Despite the emerging body of literature on the psychosocial wellbeing and resilience of parents of children with ASD (Bekhet et al., 2012; McConnell et al., 2014; Leone et al., 2016), the risk and protective processes have yet to be explored extensively in a collectivistic culture such as Malaysia (Keshavarz and Baharudin, 2009; Ting and Chuah, 2010; Ravindran and Myers, 2012). Given the fact that traditions, beliefs and values are parts of the cultural piece that could influence and shape how the families of a child with ASD perceive their life experiences and challenges of raising a child with ASD, these factors (cultural factors) are likely to play a role in coping and resilience (Ghosh and Magana, 2009; Cridland et al., 2014; Xue et al., 2014). People who live in a collectivistic culture tend to be more interdependent on each other (Kitayama et al., 2009; Selin, 2013). Their emphasis on in-group relationships and harmony may also influence the way they make sense of experiences and challenges, influencing their coping behaviors as well as their use of the resources available (Dyches et al., 2004; Lam and Zane, 2004). The meanings of health, illness, and disability in regard to ASD can vary a great deal across cultures and across time (Ravindran and Myers, 2012). For example, within the South-East Asia regional context, both cultural similarities and cultural differences have been identified in a systematic literature review on parenting stress and resilience when parenting a child with ASD (Ilias et al., 2018).

Thus, the current study seeks to address the lack of research to date exploring the experiences, risks and protective processes that contribute to parental stress and resilience for parents of children with ASD in the Malaysian setting. Furthermore, there has been little research that explored qualitatively the experiences,

parenting stress and resilience of the parents (Ting and Chuah, 2010; Ilias et al., 2017). Thus, the qualitative nature of this study allows for a deeper analysis, while allowing rich cultural data to be shared in the area where scarce information is present.

Previous studies on risk and resilience in parents of children with ASD have often focused on mothers as opposed to fathers; thus, there remains a gap of research regarding fathers of children with ASD and their experiences (Allen et al., 2013; Braunstein et al., 2013). Also, the experiences of mothers and fathers of children with ASD have been found to differ (e.g., Falk et al., 2014). Mothers were often found to play the primary caregiver role (e.g., Braunstein et al., 2013) and this role expectation may be especially strong in more traditional societies. Additionally, Jones et al. (2013) identified higher levels of psychological distress (stress, anxiety, and depression) in mothers compared to fathers, and also higher levels of reported positive gains in mothers compared to fathers. Parenting stress may be experienced differently by mothers and fathers of children with ASD and may depend on multiple factors; the research remains unclear about the effect of parent gender on risk and resilience (Hayes and Watson, 2013).

No formal hypotheses were formulated as the study was exploratory and used a constructive grounded theory approach (Charmaz, 2006; Creswell, 2007). Well-documented evidence suggests the presence of stressors and challenges in families of children with ASD; yet, past research has highlighted that most parents and families of children with ASD were able to rise above challenges (Gray, 2002b; Woodgate et al., 2008; Bekhet et al., 2012). Thus, it was anticipated that parents of children with ASD would highlight *both* positive (growth) experiences as well as challenging (stress) experiences of raising their child with ASD. Similarly, it was anticipated that culturally specific experiences and processes would be shared by participants that would differ from the themes mentioned in previous literature in Western countries (e.g., Ooi et al., 2016). Unique culturally specific themes might relate to a stronger emphasis on the lack of resources available in the Malaysian context and associated financial challenges; the stigma present in Malaysia; as well as the role of spiritual supports (Ilias et al., 2017).

MATERIALS AND METHODS

Participants

Of the 22 parents of a child with ASD who volunteered to participate in the interview, 13 were mothers and 9 were fathers. Six parents were interviewed in pairs (3 fathers and 3 mothers). Sixteen parents were interviewed individually. To clarify, 3 fathers were interviewed together with their wives; whereas, 6 fathers were interviewed alone. The parents' ages ranged from 32 to 50 years. In terms of their ethnic backgrounds, 19 of the parents identified as Malay, one as Chinese, and two as Indian. Seventeen of the parents resided in the Klang Valley, an urban region, including the capital city Kuala Lumpur and surrounding areas. Two parents were living in Negeri Sembilan, which lies on the Western coast of peninsular Malaysia just south of Kuala Lumpur and borders Selangor on the south. Three parents were living in Melaka, which is in the southern region of peninsular Malaysia. Two parents, a mother and a father, were from Sabah, East Malaysia; however, they were residing currently in Klang Valley. Relationship to the child, religion, ethnicity, marital status, education level, and employment status are illustrated in **Table 1**.

The 22 parents had a total of 16 children (12 males; 4 females) formally diagnosed with ASD (**Table 2**). Child age ranged between 5 and 12 years (mean age: 8.44). Previous studies have suggested that parents may experience stress, cope, and perceive parenting self-efficacy differently depending on the child's developmental stage (Mash and Johnston, 1983; Gray, 2002a; Tobing and Glenwick, 2002; Kuhn and Carter, 2006). Thus, it was judged as important to target one child age group for the current study to ease the achievement of theoretical data saturation and to develop a focused theoretical model. Also, before the present study began, exploratory pilot interviews were conducted with 11 parents of children with ASD using Interpretative Phenomenological Analysis (IPA) qualitative methods, and it was observed the parents of primary school age children presented with different experiences than the parents of adolescents and adults. This observation helped guide the researchers to narrow down the age group and specify the inclusion criteria to include parents of a primary school aged child diagnosed with ASD. The age requirement (5–12 years) also enabled matching of this qualitative sample with a related quantitative study by the authors, which was part of a bigger mixed methods project.

The target age of primary school age children was also chosen as there is evidence that the younger the implementation of mental health promotion and resilience programs, the greater the positive effect (Fenwick-Smith et al., 2018). Thus, we hoped to gather the risk and resilience experiences from these participants in order to inform development of early intervention support prevention programs. Focusing on the pre-school period would have been difficult, especially in this region, given the late (delayed) diagnosis of children. Moreover, compared to the pre-school period, focusing on the primary-school age period would allow the parents to reflect on the developmental trajectory of developing resilience. The study also plans to have a longitudinal follow-up, so re-interviews will occur later in adolescence and early adulthood, thus, the starting point at primary school age was selected. Also, primary school age is a crucial transition period that often places high demands on the parents and children with ASD (Stoner et al., 2007; Fontil and Petrakos, 2015) and we hoped the processes of both risk and resilience would be elucidated.

It has been argued that there is no one size fits all method to reach data saturation due to the variability of research designs (Fusch and Ness, 2015). Charmaz (2006) described that there remains disagreement about the definition of data saturation. There are a few guidelines that have been proposed in regards to theoretical data saturation. Creswell (1998) recommended that 20–30 interviews may constitute sufficient data for a grounded theory study. Charmaz (2006) highlighted that within grounded theory methodology the focus is on "theoretical saturation"; data saturation does not mean stopping gathering new data when a repetitive pattern occurs, but to continue conceptualization of

TABLE 1 | Demographics of mothers and fathers of children with ASD.

Number	Participant	Relationship to child	Age Range	Race/ ethnicity	Religion	Marital status	Level of education	Employment status
1	Aneesa	Mother	40–50	Malay	Muslim	Married	Degree	Free Lance
2	Ahmad	Father	40–50	Malay	Muslim	Married	Degree	Free Lance
3	Beetha	Mother	30–40	Indian	Christian	Married	Degree	Med Doctor
4	Camilah	Mother	30–40	Malay	Muslim	Married	Degree	Housewife
5	Delina	Mother	30–40	Malay	Muslim	Married	Degree	Teacher
6	Farena	Mother	30–40	Malay	Muslim	Married	Degree	Executive
7	Ghaida	Mother	40–50	Malay	Muslim	Married	High school	Housewife
8	Farid	Father	40–50	Malay	Muslim	Married	High school	Clerk
9	Hana	Mother	30–40	Malay	Muslim	Married	PhD	Lecturer
10	Imran	Father	30–40	Malay	Muslim	Married	PhD	Lecturer
11	Junaina	Mother	30–40	Malay	Muslim	Married	Degree	Housewife Previously was a teacher
12	Keen	Mother	40–50	Chinese	Free Thinker	Married	Degree	Housewife Previously was an executive
13	Leena	Mother	30–40	Indian	Christian	Married	Diploma	Housewife
14	Liya (Intan)	Mother	30–40	Malay	Muslim	Married	Degree	Housewife Previously was an executive
15	Mawi	Father	30–40	Malay	Muslim	Married	Diploma	Executive
16	Nasyran (Jo)	Father	30–40	Malay	Muslim	Married	Diploma	Government Servant
17	Tahera	Mother	30–40	Malay	Muslim	Married	Degree	Executive
18	Razila	Mother	30–40	Malay	Muslim	Married	Degree	Senior IT executive
19	Ramli	Father	30–40	Malay	Muslim	Married	Master	Senior IT engineer
20	Rashid	Father	30–40	Malay	Muslim	Married	Degree	Research officer
21	Suhaimi	Father	30–40	Malay	Muslim	Married	Master	Lecturer
22	Tahir	Father	40–50	Malay	Muslim	Married	Master	Lecturer

All names have been changed to pseudonyms; parents' individual ages are reported in 10-year intervals to protect confidentiality.

comparisons of stories and incidents to yield different properties of the pattern until no new properties of the pattern emerge.

Design

Grounded Theory, developed in 1967 by Glaser and Strause, is defined as "the discovery of theory from data systematically obtained from social research" (p. 2). Grounded theory is a qualitative research methodology (Creswell, 1998). Moreover, there are several types of grounded theory such as Staussian Grounded Theory, Glaserian Grounded Theory, dimensional analysis, constructivist, and situational analysis. Commonalities include the use of relatively unstructured interviews, use of specific techniques to categorize data and identify characteristics, and the interest in interactions and processes (Morse and Niehaus, 2009).

This study adopted Charmaz's (2006) social constructivist perspective of grounded theory. Charmaz's social constructivist perspective "emphasizes diverse local worlds, multiple realities and the complexities of particular worlds, views and actions" [p. 65] and recognizes that "the 'discovered' reality arises from the interactive process and its temporal, cultural, and structural contexts" (Charmaz, 2000, p. 524). In-depth, flexible, semi-structured interviews were used to capture the participants' perspectives and life experiences. This method was chosen due to the complexities of the reality of life experiences of the parents raising a child with ASD. Charmaz views grounded theory methods "as a set of principles and practices, not as prescriptions or packages" (Charmaz, 2006, p. 9) and emphasizes "flexible guidelines, not methodological rules, recipes and requirements" (Charmaz, 2006, p. 9). The constructive grounded theory approach assumes that data and theories are neither emergent nor discovered, but rather are constructed by both the researcher and the research participant (Charmaz, 2006; Allen, 2010).

Parent interviewees did not express a desire to review the interview transcripts secondary to time constraints (their very busy schedules), although this possibility was presented as an opportunity for them. In this study, an additional interview with a mother of a teenager with ASD, who also works as an applied behavior analysis (ABA) consultant was used as a method of *data triangulation*, which helped to increase the credibility and trustworthiness of the data. Key informant interviews can be a useful strategy for gaining information from "experts" who have been in a position to put their own interpretations into practice and can share their experiential knowledge (Bogner et al., 2009). She experienced raising her child in the Malaysian context and has worked to empower parents in the country. She reviewed the thematic analysis findings during an audio-recorded

TABLE 2 | Details of child with ASD for each parent(s).

Parent (s)	Child	Child's age and gender	Age diagnosed	Number of people in household	Child school type
Aneesa and Ahmad	Amni	12, female	5 years 8 months	4	Community Rehabilitation Centre supported by government in the morning (4 h). Primary education in typical government school.
Beetha	Bevan	6, male	2 years 8 months	6	Private special education school and private therapies.
Camilah	Danish	9, male	6 years 4 months	5	Community Rehabilitation Centre supported by government in the morning (4 h). Primary education in local government school in special education class.
Delina and Suhaimi	Emran	7, male	4 years 11 months	5	Community Rehabilitation Centre supported by government in the morning (4 h). Primary education in local government school in special education class.
Farena	Faizul	7, male	6 years 5 months	7	Primary education in local government school and private therapies.
Ghaida and Farid	Ghazali	10, male	5 years 8 months	6	Community Rehabilitation Centre supported by government in the morning (4 h). Primary education in local government school in special education class.
Hana and Imran	Hamdi	8, male	6 years 4 months	5	Private religious school and therapies at non-profit autism services centre.
Junaina	Jameela	9, female	4 years 4 months	5	Primary education in local government school in special education class. Therapy at non-profit autism services centre.
Keen	Kevin	9, male	3 years 8 moths	4	Private mainstream school and private non-profit therapy
Leena	Leo	8, male	2 years 7 months	4	Primary education in local government school.
Leeya and Mawi	Laili	7, female	4 years 10 months	5	Primary education in local government school in special education class and continue private therapy.
Nasyran	Nabila	8, female	4 years 6 months	6	Primary education in local government school in special education class.
Taheera	Tamim	7, male	3 years 10 months	5	Primary education in local government school in special education class.
Razila and Ramli	Rafiq	9, male	2 years 6 months	5	Primary education in local government school in special education class. Continue therapy and enhancement class at a government autism early intervention program.
Rashid	Syed	8, male	6 years 4 months	5	Primary education in local government school and continue therapy and enhancement class at a government autism early intervention program.
Tahir	Tamir	11, male	3 years	7	Community Rehabilitation Centre supported by government in the morning and afternoon, Primary education in local government school in special education class.

All names (parents and children) have been changed to pseudonyms. The age of diagnosis reported in the time intervals was identified by the parents themselves (i.e., months or years).

interview of approximately 40 min, and she described that the thematic structure conveyed a very good understanding of the Malaysian situation according to her personal and professional experience.

During the last phase of the study, community engagement events were conducted. This involved workshops and talks organized targeting various stakeholders in different settings and environments. Seven free workshops were conducted by the first author and the final author at the end of the research with targeted parent participants, educators, health practitioners, researchers, university students, and public audiences. Approximately 350 participants attended these workshops in total, which included approximately 40 participants who were parents of children with ASD. The venues were intentionally varied, including a school, university, community hall, and a large government hospital. These occurred in the Malaysian states of Kuala Lumpur, Selangor, and Negeri Sembilan. Feedback was gathered from the parent participants, who shared feeling that the themes well-represented their own experiences. At the university workshop, one of the study interviewees attended the event and described that having the opportunity to see the outcome of the study was very rewarding. In addition to the community engagement events, the innovative use of a different qualitative approach, IPA, for the pilot component and grounded theory for the current study allowed the researchers to have a more extensive understanding on finding meaning in the data and it helped heighten transparency in the analysis process (Frost et al., 2010).

Procedure

Recruitment Strategy

Participants were recruited through various means; mainly through the researchers' collaborative partnership with various ASD-related organizations, whereby contact was initiated via email and phone calls to center administrators. Hardcopy and online flyers for recruitment were posted to treatment centers, schools and online parent support groups. Potential participants were screened to assess if they met the inclusion and diagnostic criteria by one of the authors, who is a doctorally trained and licensed clinical psychologist (in both California and Malaysia) formally trained in ASD diagnostic assessment. The Social Responsive Scale-2 (SRS-2; Constantino and Gruber, 2012) was utilized to help confirm ASD diagnoses, with *T* scores equal or >60 used as an inclusion criterion for the ASD group. All participants in the current study had children who scored equal or >60 on the SRS-2. All diagnoses were performed by a registered professional (i.e., mental health professional or developmental pediatrician). The date of the diagnosis and name of the diagnosing professional was gathered for each child; the researchers confirmed the diagnosing professionals' qualifications in the area. Prior to the interviews, explanatory statements describing the study and informed consent forms were read and signed by the participants. Parents also completed a history and demographic questionnaire.

Interview Process

Data were collected by the first author (during her Ph.D. study period) through face-to-face semi-structured interviews with open-ended questions. The first author had a Masters degree in Clinical Psychology and was a registered clinical psychologist with experience working with ASD. All interviews were audio-recorded with the participants' consent. In addition, handwritten notations (field notes) were taken. The interviews with parent participants lasted 50–80 min (mean = 67.5 min). Most interviews were conducted at the participants' houses. Four interviews were conducted at quiet restaurants, whereas two were conducted at the participants' workplace and one at the researcher's university. Interview location was chosen by the interviewees. Key events that were explored in the interviews included: early recognition of symptoms, the diagnosis process, treatment and interventions sought, experiences about parenting, the stressors and challenges faced, coping strategies, cultural influences, family and social support, as well as future recommendations to other parents, society and government (see the parent interview guide, **Table 3**).

TABLE 3 | Interview guidelines for parents.

Parents interview guidelines
Interview guide – interview topics, questions, and prompts
(1) Please begin by telling me about your experience of having a child with ASD.
(a) Possible prompts regarding the diagnosis if not mentioned.
(i) Tell me about your experiences of first observing something of concern with your child.
(ii) Tell me about your experience of learning your child has an Autism Spectrum Disorder.
(iii) Tell me about the diagnosis process.
(2) Based on your experiences of raising a child with autism, what experiences have been most meaningful to you?
(3) Tell me about your experience of having a child with autism in your family.
(a) Tell me about how having a child with ASD has affected your family?
(b) What sort of behaviors affected your family the most?
(4) Tell me about the relationships between your child with Autism Spectrum Disorder and his/her siblings, you, your husband, and grandparents?
(a) How was your family affected?
(5) Tell me about any stressors or challenges, if any, that you have faced?
(a) Being a parent to a child with autism.
(b) Having a child with Autism Spectrum Disorder.
(c) Having a child with Autism Spectrum Disorder in your family.
(6) Tell me about what has helped you.
(a) Tell me about what has helped improve your well-being.
(b) Tell me about what has helped improve your family well-being.
(c) Tell me about what or who has helped or supported you.
(d) How have you and your family coped with having a child with Autism Spectrum Disorder?
(e) How much social support (e.g., from friends, relatives, support groups, neighbors, etc.) do you receive?
(f) How much has social support helped you cope?
(7) Tell me about the experience of being a parent to a child with Autism Spectrum Disorder in Malaysia and in your culture.
(8) Please describe the services, treatment, education that you have sought?
(9) What is your understanding of the development of your child's condition?
(10) If you could provide advice or suggestions to other parents with a child with Autism Spectrum Disorder in Malaysia, what would it be? What advice or suggestions would you give to other parents to help improve their family well-being? What advice or suggestions would you like to give to mental health and health professionals in Malaysia?
(11) Please let me know any other comments that you have about this research topic. Please let me know any questions that you have about this research?

Data Analysis Process

All interviews were transcribed verbatim, read and compared with each other. On average, the researcher (first author) took 3–6 h to transcribe each interview. Most of the interviews were conducted in the Malay language given it is the first language that is spoken by most participants at home. This option reduced possible communication breakdowns and helped ensure that in-depth information was obtained. Phrases or statements (i.e., quotes) that were related to the current analysis were translated to English without changing its original meaning. Then, the translated quotes were checked for translation accuracy by another member of the research team, who like the first author also has excellent fluency in both English and Malay. Four interviews were conducted primarily in English, although occasional comments were made in Malay.

The interview transcripts were then imported to NVivo 10. The researchers had attended advanced training on qualitative software analysis tools. Following the grounded theory approach, the primary researcher read each transcript repeatedly before commencing the coding process. The initial analysis process began by labeling each response (open coding). Next, the initial codes were characterized into general categories (axial coding), aligned with the research question. To further analyze the data and identify themes, subcategories were developed within each broad category. The primary supervisor (last author) reviewed

the codes and helped develop themes. A third-party researcher (see Marques and McCall, 2005) checked coding accuracy of one transcript. Then, the first author and co-authors discussed any disagreements of the suggested codes, before agreeing on the final codes and themes. All authors agreed on the final themes. All researchers were female. The fourth author's field of specialization is Education (Special Education), and the other authors' field of specialization is Psychology. The first and last author are trained and registered clinical psychologists. All authors hold doctoral degrees, with the first author completing her Ph.D. soon after completion of this present study.

Ethics Statement

This study was carried out in accordance with the recommendations of the Monash University Human Research Ethics Committee (MUHREC) and was conducted with permission from the participating organizations. All subjects gave written informed consent in accordance with the Declaration of Helsinki. The protocol was approved by MUHREC (CF12/1611-2012000868). Participation was voluntary and with written informed consent. Each parent was given a RM 50 (∼12 USD) shopping voucher. Names of all the participants and the names of any other individual referenced by the participants are pseudonyms to protect confidentiality. Income data is presented in aggregate form (not individually) to protect confidentiality: 40.9% of parent participants reported a personal income below RM3,000, 27.3% reported a personal income of RM3,000–RM5,000, and 31.8% reported a personal income above RM5,000.

According to the Department of Statistics Malaysia (2017a, 2017b), the median salary and wages of paid employees in 2016 was RM2,000 (RM2,000 for women and RM2,000 for men) and the median household income for Malaysians was RM5,228 in 2016. The currency conversion rate is approximately 1USD to 4RM. Personal income in this sample was similar to the median income in the country. However, this is likely insufficient to meet costs of care and afford private education for a child with ASD. Of concern, Kamaralzaman et al. (2018) identified in a sample of 245 Malaysian parents that the total cost of financing a child with ASD is approximately RM35,366 a year, a large and burdensome amount in Malaysia.

RESULTS

The study results were reported following the consolidated criteria for reporting qualitative research (COREQ) checklist (Tong et al., 2007; see **Supplementary Table 1**). Analyses of the participants' interviews, yielded four prominent themes—"*initial reaction to child's ASD symptoms and diagnosis*," "*family life affected by a child with ASD*," "*awareness about ASD in Malaysia*," and "*coping strategies, wellbeing, and becoming resilient*"—that interact to foster growth and empowerment when adapting to a child with ASD in the family system. **Table 4** illustrates the themes, subthemes and categories of the findings.

Theme 1: Initial Reaction to Child's ASD Symptoms and Diagnosis

The first theme illustrates the parents' initial reactions and understanding when they first learned about their child's ASD symptoms and diagnosis.

Help Seeking Behaviors

The first subtheme explained how parents engaged in *help seeking behaviors* after they first noticed differences and/or delays in their child's development. Most parents (54.5%) reported that they directly had taken proactive action, which included researching about autism on the internet, reading books and magazines, and seeking assessment from a specialist. Nasyran shared:

> We wonder, is Nabila having a hearing problem? She just focused 100% to the television. My wife took her own initiative, she Googled a few websites to search for the information, and she got some information about autism symptoms. . .so it was her own initiative to find an answer.

Only a small number of parents (13.6%) went ahead and began treatment for their child prior to a formal diagnosis. Leeya spoke about her experience seeking alternative treatments and beginning interventions, while in queue on the long waiting list to see the pediatrician:

> We brought her whenever anyone told us that this fellow can do this and this. I remember one fellow just pulled her hands and legs. I also don't know what kind of treatment that is. . .(small laugh).

There were a number of parents (22.7%) who delayed further investigations and treatments due to reasons such as busy work schedules, cultural beliefs, "denial," and obeying their families' opinions. Hana recalled:

> We noticed the difference when he was 3 years old, but most family members and friends kept telling, he still a young kid, so it is normal. Many of our friends and in fact relatives advised us to go and see a '*bomoh*'[1] first (small laugh). But we didn't do that.

Adjusting Parents' Cognition, Daily Routines, and Life Plans

Following diagnosis, the parents embarked on a "new journey" in parenting. Parents reported having to adjust many aspects of their life, including their cognitions, feelings, daily routines and their overall life plans. The majority of parents (72.7%) recalled that they initially went through the stages of grief and denial upon discovering their child's diagnosis. Four out of eight fathers reported the feeling of "dismissal" and being in the denial stage for quite some time. Ramli shared:

> My wife and I. . .we don't expect to have a child with autism. We were shocked at the initial stage. Really shocked. . .(a bitter smile).

Nasyran expressed his sorrow:

[1] Bomoh is a Malay shaman and traditional medicine practitioner.

TABLE 4 | Themes, subthemes, and categories.

Themes	Sub themes	Categories
Initial reaction to child's ASD symptoms and diagnosis	Help seeking behavior	Proactive action Began the treatment prior to diagnosis. Delayed for further investigation and treatment
	Adjusting parents' cognition, daily routines and life plans	Initial dismissal/Grief Redefine future dreams and hope Constant worries and anxious over future Positive self-thought and belief Busy daily living Redefine life priorities
	Stress due to the inadequate "system"	Limited awareness about autism Financial burden Difficulties in finding appropriate school, childcare, therapies and healthcare Shortage of qualified healthcare practitioners, teachers and caregivers Government policy and support on ASD Limited access due to logistic areas
Family life affected by a child with ASD	Parents' emotional turmoil	Dealing with the symptomatic ASD condition Isolation due to child's challenging behaviors Strain on family Job and career adjustments
	Impact on significant others	Siblings rivalry Burden on siblings and other family members
	Increase sense of connectedness	Family closeness Mutual relationship and understanding with others
Awareness of ASD in Malaysia	Lack of knowledge	Ignorance Inadequate understanding about ASD
	Judgemental environment	Bad parenting style and practices Stigma from others
	Pervasive cultural beliefs	Previous generations or parental sins Inadequate explanation and belief about the causes of ASD
Coping strategies, wellbeing and becoming resilient	From zero to hero	One little step at a time The power of knowledge Increase sense of competence
	Growing stronger together	Recognizing the joys Celebrating the little triumphs
	Stronger spiritual faith	Believe chosen by God Pure and innocent gift from God
	Social support	Immediate vs. extended family members Formal and informal support groups • Professionals, therapists and government • Community

> Hmm (long pause and deep breath). . .initially it's tough. . .(pause) when the doctor said it is under OKU[2] category. It is really tough for us. . .(long sigh).

The majority of parents (63.6%) also reported that since they learned about their child's ASD diagnosis, their lives had been filled with anxiety over their child's future. However, most parents (81.8%) reported that after a period of time, they readjusted their thoughts and beliefs about their child's condition and future; and hence, became more positive and optimistic to persevere. The parents mentioned having to readjust their routines and life plans. Also, many parents (40.9%) expressed how they needed to redefine their priorities. Keen described, "Our family planning, first we thought we wanted three kids, but after we found out my eldest son's case, so we stopped the idea and just concentrated on him."

Stress Due to the Inadequate "System"

The third subtheme describes the stress that parents experience due to the inadequate "system." "System" in this context was defined by parents as the existence (or lack thereof) of child-related agencies, either private or government-funded, that specifically accommodates the needs and development of a child with ASD. Inadequacy in the "system" included difficulties in finding appropriate schools, childcare therapies and healthcare; as well as a shortage of qualified healthcare practitioners, teachers, and caregivers for this group of children. Parents also described the financial burdens they face.

According to the majority of parents (63.6%), a contributing factor to this problem of stress is the limited awareness about autism in Malaysia. Several of the parents (31.8%) directly

[2]OKU stands for *Orang Kurang Upaya*, which means individual with disability in the Malay language.

mentioned the poor governmental policy on ASD in Malaysia. Mawi expressed his opinion:

> "All disabilities were mixed in the school. I think our government should look into this case more serious".

Leeya (Mawi's wife) added:

> "Less places or centers that cater specifically for a child with autism. I think this is the government role."

Many parents (45.5%) also described logistical problems for people who live in rural areas or in the outskirts of the city, where there are even more limited resources for interventions and more limited access to schools and therapy centers.

Theme 2: Family Life Affected by a Child With ASD

The second theme illustrates how the sampled parents and their families have progressed with raising a child with ASD and describes how having a child with ASD in the family impacted the parents and their significant others.

Parents' Emotional Turmoil

In the first subtheme, *parents' emotional turmoil*, the majority of parents (81.8%) reported the difficulties they face in managing ASD symptomologies as one of the biggest challenges they face. Leena reiterated how her son's rigidness triggered her stress:

> He didn't want to go to school, he sees the building, he starts screaming. Inside the car itself, he will start. . .he knows the road. His memory is very good *lah*. So, he knows we are taking the road, so he will already start crying. Inside the car, he will be pinching me, kicking me, I tell you. . .that jam itself is already stress, then behind me some other noise.

One father unhappily expressed how his sexual relationship is "disturbed" due to his daughter's challenging behaviors, "She just want to sleep with us. . .she is very attached to me. It is a problem also. . .so my libido time is also NO. So how to spend my libido?" Another parent, Beetha, also spoke about the loss of spontaneity during family trips, due to Bevan's difficult behavior.

Slightly more than half of the parents (59.1%) expressed feeling isolated as a consequence of their child's challenging and difficult behaviors. Seven parents explained that they isolated themselves from family and friends because of their child's behaviors. Leeya shared, "We decided not going to some social events, I don't like the uneasy face that people made." On the other hand, four parents described how other people excluded them and/or their child. Delina said, "I can see my nieces and nephews would exclude Rafiq from the group when we had a family gathering, as Rafiq is so disgusting to them. . ." (gloomy face, long sigh). Similarly, Camilah remembered how she felt isolated during a family gathering at her sister in-law's house, "From their face reaction, I already can sense that they are not really welcome us. Maybe they just invited us as a matter of courtesy."

Most of these experiences were mainly due to the child's challenging behaviors, like "impulsivity." Likewise, Camilah said, "There were many same incidents happened, you can see that people started to worry when you reached, as a little monster has come to destroy the event, to make chaos."

Several parents (40.9%) also expressed how their child's unexpected behavior puts a strain on their family life. Hana said, "Sometimes, when he's back from school, he still didn't know how to express his feelings. We were also tired, just came back from work, just out of blue, he throws tantrums, with the baby, another sister. . .quite stressful sometimes."

Raising a child with ASD was also found to impact the parents' employment and career. Some of the parents (45.5%) needed to readjust their working hours, shift from a full-time to part-time position, take unpaid leave, and/or even live separately from the family due to work commitments. Junaina explained, "I need to bring her to see OT, speech therapist, but I have very limited time. Every night before sleep, I asked myself, until when?"

Nasyran spoke about how his wife was negatively affected after he transferred to Peninsular Malaysia due to his work commitment, "Right now we are not living together, I am here alone and all of them are there, sometimes my wife did complain, she is the one who is taking care of all children plus Nabila, it is tough you know, but what to do? I need to grab this opportunity, then I can earn more to support them. Every night I would call her. When she talked to me at least relief her a bit." Similarly, Keen lamented, "My husband is now working in East Malaysia, we are planning to live together there, but what I'm doing now is bringing my child back to KL for the therapies and schooling (sad face)."

Impact on Significant Others

Raising a child with ASD was also found to impact their significant others in many ways. Being a sibling to a child with ASD can be both a challenging and wisdom-developing experience. It was difficult for parents to allocate time to fulfill the needs of their other children. As such, parents occasionally experienced guilt. Suhaimi expressed, "Now my concern also on his eldest brother, because he always compares himself with Emran. Their age difference was only 1 year. After Emran was born, he got less attention. I can see that he is now, isolating himself from us and kept asking, why Emran always got more attention than me?" His wife, Delina also expressed, "Now he started complaining, everything Emran, why it is always Emran?"

Camilah talked about how Danish's brother vented out his stress when their friends make fun of Danish at school, "He told me, I don't like when my friends laughed at Danish. They make fun of Danish and called him '*budak cacat*' (child with mental disorder)". Camilah mentioned she would continue to explain to Danish's brother about Danish's condition and encourage him to help his brother at school.

Increase Sense of Connectedness

On the other hand, the results showed that half of the parents (50%) perceived the positive impact that having a child with ASD brought to their relationship and understanding with their spouse and other family members. One clear finding is that the spouses felt the need to rely on one another more, and this brought them closer as a parent or couple to take care of their child with

ASD. The family members would be more alert and aware of the needs and any little improvements showed by the child with ASD.

> Nasyran - "When we brought her to my mother's house, she has been treated like a 'princess.' Everyone is trying to take care of her. She made us closer and connect to each other."

> Ghaida - "I thank Allah, for me from the day he was born until today. He made our family relationship stronger, more bonded to each other."

> Mawi - "Having her made me have more time to communicate with my wife, yeah almost all the topics are related to her, but it increase our communication in a good way."

Theme 3: Awareness About ASD in Malaysia

The third theme illustrates how ASD is viewed within the social context in Malaysia. This theme also describes how differing ethnic groups, religious values, and family traditions may differently affect parental perceptions, stress, and coping strategies.

Lack of Knowledge

The first subtheme, lack of knowledge, is based on the mutual finding among all parents (100%) that while the awareness on autism is growing, there are still stigmas associated with ASD, and accordingly, there are still various misconceptions about ASD among the public in Malaysia. Two prominent categories emerged from this subtheme, which were ignorance and inadequate understanding about ASD.

A number of parents (38.8%), in fact, directly pointed out their own ignorance at the initial stages of the diagnosis. They expressed some remorse, by stating that they could have started the intervention earlier, and should have learned much more about their child's condition, which could have helped them accept their child's condition sooner. Reflecting back, Imran said, "I knew about autism quite late, when it happened to my son, then only we wanted to know more." Farid similarly described, "Initially I was blank. . .I don't know what is autism. I have no knowledge at all." Likewise, Farena mentioned, "I think the awareness is still low, even myself I did not really know and bother about autism. When it happened to us now, then we started to bother. This is what happening in our society."

Overall, all parents (100%) agreed that inadequate understanding about ASD in Malaysia is the most significant factor that contributed to the lack of awareness. It occurred within themselves, immediate and extended family members, the community, and the society as a whole. The word "autism" still remains a mystery to the general public as there seems to be little motivation for an individual to learn more about it unless they are affected by its conditions. Aneesa was explaining about her mom's curiosity:

> My mom kept asking, why she behaved like that, when would she be "normal" like her other grandchildren, is there any medication for her, when would she be cured. . . and the same questions keep going and going. . . until one point I just said to her, until she DIES mom. . . because I'm tired of explaining the same thing. . . (sighed with gloomy face).

Her husband, Ahmad, in turn explained how the community perceives autism:

> Our community doesn't understand. . .because she looks normal physically like other kids. . . we have to explain and explain most of the time. I said it is not related to a psychiatric condition and it is not a contagious disease.

Suhaimi shared his experience,

> I brought him to Department of Education to discuss his schooling matter. We decided to put him in the special education class. The staff looked at us with puzzled expression and repeatedly said that he looked normal. . . I explained to them, he is an autistic boy. But I don't think they really understand. That is what I can see in our society.

Judgmental Environment

The second subtheme explains how a judgmental environment contributes to the low awareness among the public in Malaysia. A number of parents (40.9%) described how they have been labeled as a parent who has bad parenting styles and practices. The manifestation of their child's challenging behaviors, such as throwing tantrums and picky eating habits, are continuously being associated with bad parenting. Junaina stated, "Especially her picky eating. . . they questioned me why she must have her own and special food, and sort of accusation I felt sometimes when they said that I'm giving in too much to her, that's why she became like that. . .".

Razila shared her experience of when her son throws tantrums at the shopping complex:

> Sometimes our community they always being good observers and commenters. They won't help you much. . .yeah, there were some that would help, but most of the time, the kind of look that they gave you, especially when you have a child with special needs and they were throwing tantrums in public for instance. . . people would give you the unkindly stare and say, "Excuse me, do you know how to take care of kids?" (small laugh, long sigh).

Her husband, Ramli compared his experience of raising his child with ASD in Japan during his study leave in comparison to that in Malaysia. He described,

> In Malaysia, we can see that people were not so comfortable with Rafiq's tantrums and difficult behavior. From the way they stared at us, we know (smile). Even though we apologized and explained that he is OKU, people still complain. Compared to the Japanese, they also have little knowledge on autism, but the ways they approached us were different. They would try nicely to start a conversation and ask about the child, have you brought him for any treatment and so on and other nice questions.

Parents of children with ASD unfortunately, face social stigma from the public, which in turn makes their life more challenging. In this study, almost half of the parents (45.5%) reported how "social stigma" has affected their life. Mawi shared his experience of having to cope with such stigma from his superior at work:

> It was the 1st day Laili is going to school, and I applied for leave earlier. She asked me, which of your child going to school? Is it the one who is disable (*cacat*)? I was really. . . argh (loud voice and sighed).

And he continued:

> What really upset me, anything that related to my work, even my yearly performance appraisal, she would relate to my daughter's condition. . .

Ramli shared his experience of managing Rafiq's tantrum in the public:

> I brought him for groceries, suddenly he started to cry and yelling. There was one Chinese uncle angrily stared at me and came to me and said, "Could you please bring your spoiled child to other place, I just want to enjoy my moments."

Pervasive "Cultural Beliefs"

Another factor that influences the level of awareness among Malaysians is pervasive "cultural beliefs." Some mothers directly described the beliefs of family members with regards to autism; whereby their child with ASD was seen as a consequence of previous wrongdoings of the parents and ancestors. They have been blamed for having "brought" autism into their families. Leena shared her experience:

> That kind of comment sometimes just eat my mind why. . . why this is happening to me? What have I done until he became like this. . . your family doesn't have any problem. . . you have no Down syndrome. When I first got to know that he has problem. . . they started to investigate my background. Are you having a problem? Or your family has a problem? All these really stress me out because they say that it could be your previous generation's wrongdoing. . .

She continued sharing about her own father's comment:

> Indians they have these old beliefs and all that. . .Even my father. . .he used to comment to me his name is not nice, the day he was born is not a good day. All this until now they still pressure me. I still talk to my parents, but I just put them aside. I just tell them I already have accepted him. From the day one up till now, I'm the one taking care, nobody else, nobody else comes and visits me all that. So, it is fine to me. I don't need. . .I'm not going to ask anybody's help.

Similarly, Camilah shared her experience of people's belief of her wrongdoings and sins, "Yes, there were people that said jokingly, maybe you have made many sins, so now you paid what you did" (sighed). On the other hand, Keen and her husband, who are free thinkers, nonetheless went to temples to seek explanations for their son's condition. Keen further explained that, they did it not because they did not accept their child's condition, but for their own peace of mind in knowing that she did the best that she could do. She said,

> Yes, toward the things like that also, we will go and get some advice, because me and my husband. . .we didn't have a specific belief or religion, but we went to temple and asked about this. . .what's happening, what did we do wrong?

The last category on this subtheme describes how inadequate explanations and beliefs about the causes of ASD has in part contributed to pervasive cultural beliefs, and thus, the low awareness of ASD among Malaysians. Half of the parents (50%) in this study stated that the complexity of ASD symptoms makes it difficult for parents, family members, and the community to understand the causes of autism. This difficulty in turn, invites stigma, and leads to prejudiced behavior.

Aneesa spoke,

> Many of my friends said my daughter has 'the unseen friends', that's why she behaved differently. . . (laugh). And some people, especially a pregnant mother, they would try to avoid us because they are afraid it would infect their baby later, like the Malay say, '*Kenan*'[3] or '*Badi*'[4].

Ahmad, her husband added, "Our culture, for some people they believed this happened because you have "*saka*"[5] even you tell it is not, but they would advise you, go and see "*bomoh*" (shaman)."

Ramli shared his experience with his own father and other extended family members:

> Not all my relatives understand, even you have explained to them in a simple way about autism. Some of them still believe and relate to the mystic. And it is hard to change people's belief.

Ramli then continued, "Even my own father, had a hard time to understand him. Even you have explained to him thousand times. He said to me, there is nothing in this world that has no cure. Go and seek alternative treatment. . .". Nasyran shared his experience bringing his daughter for alternative treatment to see an "*ustaz*" (a pious religious man):

> He explained to me about Amira's condition is not because "*gangguan*" (being disturbed by the unseen spirit or ghost). She behaved like that because she has different aura. So, he gave me few verses from Quran for us to practice to soothe her emotion and behaviors.

Theme 4: Coping Strategies, Wellbeing, and Becoming Resilient

The last theme illustrates how parents coped during the early process and continue to cope in this journey of raising a child with ASD.

From Zero to Hero

With the first subtheme, *from zero to hero,* parents reminisced of the initial stages, when they had just learned of the diagnosis. The majority of parents confessed that they had "zero" knowledge (i.e., no awareness) about "autism" until their own child exhibited symptoms of ASD and thereafter, was diagnosed. Nonetheless, as this subtheme illustrates the majority of parents *transformed themselves* to a "hero" despite struggling with the challenges of raising a child with ASD.

[3]Kenan in this context refers to the presence of a peculiar or odd habit since birth.

[4]Badi in this context refers to revenge in the form of illness from a spirit for harming or violating it.

[5]Saka is the term that use to describe about spiritual possession in Malay.

Three parents shared their thoughts on taking one step at a time. For example, Mawi said, "For us, we try to take things progressively. Right now, our focus is on her primary schooling. So, both of us only focus on the related activities and tasks for her primary school enrolments." Likewise, Razila said, "You have to solve one by one, if not it would drive you crazy." Lastly, Beetha shared her thoughts,

> Just take it 1 day at a time. What drove me to seek all this knowledge is my desperation. I need something for Ryan. I need to sometimes educate (other) people and I need to know what he needs or wants and how to get it. If I can't find people to get it, I have to get it (myself) in that situation. If I can't find the people to deliver the services, I will need to equip myself to deliver the services, that's my mentality I suppose.

More than half of the parents (68.2%) also explained about the power of knowledge in helping them cope. When parents were equipped with knowledge, it enabled them to develop a sense of competence. This could have subsequently enhanced their wellbeing and increased their resilience to face adversity. They also reported that knowing the facts and information of their child's condition not only helped them in dealing with their child, but also acted as a foundation from which parents could inform and educate other family members, community, and the government about ASD.

Ghaida stated,

> Nowadays, we have many platforms like 'Autisme Malaysia' on Facebook, and many more. They maybe can come out with a good approach to tell the parents, share with parents, and help each other in terms of education for the ASD children. We as a parent to this special child, we need explanation sometimes. Also, as a parent, we have to be more open-minded too about our child. And gain knowledge, the scope of knowledge is wide not only knowledge related to our child with ASD, but other things as well like how to handle other children, family, etc. It must be like a package. . . inclusive of all. And regarding our child's education, don't leave it to the teachers alone, sometimes we have to inform the teachers, share with them too, and work with them.

Six parents described how they empowered themselves by enrolling into a course related to special education, and simultaneously attended workshops and seminars. Ramli stated, "As a parent with a child with ASD, we must first be equipped with knowledge, go out and seek knowledge." Similarly, two mothers, Beetha and Farena enrolled themselves into a course related to special education. Beetha mentioned:

> I took up the advanced training in special education, took a whole course for 1.5 years because in between I had my fourth baby, so I did the whole course and I wanted to be better informed, and not be in doubt.

Growing Stronger Together

The second subtheme denotes how parents aim to grow stronger day after day. Half of the parents (50%) in this study had surprisingly viewed their child's behavior problem as delightful and as a joy for them. Ghaida expressed, "His tantrum is a kind of therapy for us. . . I know it sounds a bit awkward. But that is what we feel. . ." (smile). Further, Delina expressed her thought about her son: "There is a moment where you 'missed' his part of tantrums when he was small. Because at that time everyone was giving attention to him" (small laugh).

Cherishing even a small achievement shown by a child with ASD helped to uphold parents' sense of hope. The majority of parents (77.3%) reported that this practice helped them sustain and endure the challenges they experienced together, as Beetha expressed:

> When your child actually makes eye contact with you and wants your attention for something, for his case, that is a major breakthrough, because otherwise he is not interested, he wants to do it just himself, but if he wants you to participate he actually wants you to join him or help him out, that's the meaningful thing.

Razila similarly expressed how his son made his father feel content just through an instance of meaningful eye contact:

> We had dinner together with the whole family members at my parents' house. My father was asking my son, "Which type of food that you want" . . . and my son did not answer for sure but looked at him delightfully. I realized my father's happiness face.

Stronger Spiritual Faith

The third subtheme explained how having and raising a child with ASD strengthened their spiritual faith, which consequently helped them get through the challenges faced. Half of the parents (50%) stated that God has given them a child with ASD not because of fate or any past sins or wrongdoings, rather they were specially chosen by God to take care and raise this special child. In addition, several parents (27.3%) reported a belief that a child with ASD is a pure and innocent gift from God.

Leena reflected, "Sometimes, you just sit down and think, what else can you do. We started going to church. The motivation came from God actually. Basically, God. . . God really push me to one real level actually." Leeya stated, "This is our assignment. . .and we are selected mothers to have this kind of child." Razila described her feeling,

> I think Allah want to teach me something different by sending Rafiq to us. Sometimes, we make rules and laws, but we should bear in mind that they are only human laws, you must have toleration, understanding and loves. Those are things that I lack in myself before."

Farena shared, "We sit down and think about him. Why our child? And my husband whispered to me, 'Allah won't bear us with something out of our capability'. From there, I need to move on and stay strong until now" (smile).

Suhaimi described how he felt blessed that his son was sent to him as an opportunity to gain more rewards in his afterlife:

> I am a person that can accept everything, so like having him is an opportunity for all of us to go to *Jannah*[6], opportunity to gain more "*pahala*" (reward from Allah), going to *Jannah* together. So, if I do not treat him nicely, I feel bad.

Ramli similarly shared his thoughts by saying:

[6]Jannah in this context is refers to paradise according to Muslim belief.

> "He is our '*saham*' (treasures). We already have a valuable treasure. So, if we take care of him and treat him nicely, our treasures will grow. Send him to learn Quran, it will be more growing."

Finally, Nasyran said contentedly, "Autism is a gift, a valuable gift to parents, it is not a disaster."

Social Support

The final subtheme, *social support*, explained how parents found that it is imperative to have a good support system from different parties. This not only helped the child with ASD to cope with his/her difficulties, but also helped parents improve their wellbeing and build resilience. The majority of parents (59.1%) described that they require support from immediate as well as extended family members. They reported that it takes a team to raise a child with ASD and that every member of the immediate family should be part of the child's growth and development. Participation from extended family members was also found to be a support.

Half of the parents (50%) highlighted the importance of good communication between immediate family members and mutual understanding with their spouses. Farid said, "I would try my best to utilize the time that I have with my wife, we would discuss, do activities together, we need to create the situation, more understanding of each other, then we can help him." His wife Ghaida added,

> Also support from your spouse. Really important and helpful. Support that you only can get if you understand each other. . . you understand him and he understands you. . . you must have a mutual understanding on how to deal with the children. And I am lucky because my husband supports me more than 100%. Support doesn't really mean you give a lot of money to your partner, but every second you try to understand and help each other, good communication, being with you in thick and thin.

They additionally reported that assistance from extended family members (e.g., grandmothers, in-laws and relatives) provided relief from being overwhelmed with numerous responsibilities. Beetha said, "If it weren't (for) my mum's help, I don't think we could have done so much, she was very helpful, even though she cannot understand, she still wants to help a lot." Keen similarly stated, "I got brothers stay nearby with me, my son very close with them."

Most of the parents (77.3%) reported that formal and informal support groups were good sources of social support and gave them an opportunity to network with other parents helping them cope. Formal support groups include governmental and non-governmental organizations, as well as people who have specialized training. Parents also suggested "two-way communication" between them and health professionals or ASD related organizations to be very important. Particularly, it is important for health professionals and the staff of the organizations to include the parents as part of the team in caring for the child. Tahera said, "I'm so lucky, the school principal was very understanding. She always advises me to look at my son's strengths rather his weaknesses. Most of the time she would share many tips, experience how to handle kids with autism." Hana likewise said, "Like in NASOM (National Autism Society of Malaysia), all therapists are helpful, they would discuss with me many things and techniques about how to handle Hamdi."

Parents also reported that they appreciate the government's effort in providing some assistance for the OKU (people with disabilities). Nearly all the parents in this study registered their child with the Department of Social Welfare (JKM) under the category of person with disabilities. The child, therefore, has an identification card that is categorized under learning disabilities, which would also be applicable to children with Down syndrome, dyslexia, ADHD, etc.

Ahmad shared:

> That OKU card is helpful sometimes, when she throws tantrums and we can't control her, people started looking at you. Some people stare and some make faces. . . The security guard came to me and asked me to bring her out. I said to him, "My daughter got problem." He still insisted me to remove Auni. And, I showed the OKU card to him. Then, he just walked away.

Camilah shared the same experience, "We just photocopy the card and at the back we write some information about autism."

Parents further stated that they perceive the government to now be taking greater initiatives in helping children with autism as well as their families. Ramli said, "I heard there would be a specialized center that will be opened soon by the government for children with autism. I am really looking forward for that center." Ghaida shared her experience of enrolling her son at the Community Rehabilitation Center,

> Even though it is mixed with the other disabilities, there were a few activities that still benefited Ghazali. But I think the government should increase the salary of the teachers at the center. They are doing a great job but got less pay.

Suhaimi similarly shared her thoughts:

> I can say the government is now more helpful, it is such a good movement. Now I can see the system in the special education class at the government school is improving. The teachers would provide one to one report in detail about all the students.

On the other hand, parents reported that informal support groups could come from anywhere in the community, such as other parents of a child with ASD, neighbors, religious groups, social welfare groups, etc. Sharing information and experiences with other parents, who have a child with ASD yielded many positive outcomes for the parents. For example, Hana elucidated, "You feel relief when you talk to the other parents that have a child with ASD too. In other words, share with people that in the same boat with you."

Leena shared her experience on how the support group at her son's school improved her wellbeing:

> We met around 13 parents. We had a small group of parents and teachers where every 2 weeks we met the teachers. We went to the upstairs of the school and did activities together. . . So, there were a lot of stories. A lot of motivation from the teachers. We ate together, chit-chatted, exchanged small gifts. Oh, these 2 h really a good break for us (pleasant smile).

The majority of parents in this study, reported not only gaining psychological strength from social groups, rather they also used it as an opportunity to uptake the role of an advocate within the community. For instance, Ghaida expressed:

> Being involved in the teacher–parent committee in my son's school was such a golden opportunity. I have a space to educate the teachers and other parents about autism. It gave me hope and peace for my son.

There were several parents (22.7%) who directly expressed that "good people" still existed in the community. They described these members of the community as people who tried to understand and accept their child and his/her family unconditionally. Ahmad said, "The next door neighbor gave free WIFI to her. So just buy the laptop." Likewise, Leena contentedly said, "We have nice people around here. . . . you don't have it in the family but people around like friends, neighbors and all that, they are very nice to us" (smile).

DISCUSSION

This is one of the few studies that has, to date, explored the experiences, risk and protective processes of resilience in parents of children with ASD in Malaysia. Analyses of parent interviews in the present study revealed the dynamic mechanisms of becoming resilient in the Malaysian context. The first three themes–"*initial reaction to child's ASD symptoms and diagnosis,*" "*family life affected by a child with ASD,*" and "*awareness about ASD in Malaysia*"–revolved around the (i) *stress and adversity* and the (ii) *adaptation and acceptance* of the parents. These two propositions describe the risk experience process of the parents. The last theme–"*coping strategies, wellbeing, and becoming resilient*"–highlights the (iii) *strengths and determination* of the parents and describes the protective experience process that helps them to build and maintain resilience.

Stress and Adversity

The earlier themes found in this study illustrate the mechanism and dynamic process of resilience of the parents of children with ASD in the Malaysia context. Resilience refers to the person's capacity to rebound and overcome trauma, negative experience and hardships (Garcia-Dia et al., 2013). Hence, from this perspective, one cannot be perceived as resilient unless he/she has faced some hardship and adversity. The findings support the conceptualization of resilience as a dynamic construct, similar to recent literature (Stainton et al., 2018).

In regard to the parent participants in this study, our findings describe how the diagnostic experiences of the majority of parents were marked by a series of difficulties, which were further exacerbated by limited resources in Malaysia. To a certain extent, the findings about the initial parents' reactions and process toward child diagnosis were similar to previous studies in other countries (e.g., Myers et al., 2009; Giallo et al., 2013; Hodgson et al., 2016). However, the intense stress specific to the inadequate "system" such as healthcare, education and government systems and the limited support for ASD in this country could be due to the economic differences and limited involvement of the government. These factors were found to underlie the differences in how these processes were uniquely manifested and/or experienced in Malaysia. For instance, poorer policy and insufficient economic support for mental health and special needs in the region may play a role (e.g., Foronda, 2000; Ting and Chuah, 2010; Tait and Mundia, 2012; Foo et al., 2014; Ha et al., 2014; Ilias et al., 2017; Kamaralzaman et al., 2018). This situational factor may have intensified the difficulties and challenges faced by the parents in this country in comparison to those in a Western context.

Previous research supported the notion that differences of cultural beliefs, family traditions, and religious values contribute to the widespread prejudices and stigmas toward the child and family of children with ASD (Ghosh and Magana, 2009; Kang-Yi et al., 2013; Ha et al., 2014). The findings show that the majority of participants described their difficult experiences living in the judgmental environment and being labeled as a bad parent. A number of parents described how cultural beliefs influence the people's understanding toward their child. The findings explain about how certain concepts or beliefs that are held by particular groups may negatively affect the perceptions of the people. The stigmas and false evaluation of the people, community and society at large can have a negative impact on the parents and family members. The findings highlight evidence that the negative emotional and social consequences due to stigma tend to increase the experiences of parenting stress.

Another prominent finding in Theme 3 was that the insufficient explanations and lay beliefs about ASD contribute to the low awareness about ASD in Malaysian society. Many Malaysian parents believe that having a child with ASD is related to "mystic" concepts. The beliefs that the child has the "unseen friend," "*saka,*" or "*badi*" were common, especially among the Malay ethnic groups. Some of the people and family members have advised the parents to go and seek help from a "*bomoh*" or "*pawang*." In another occasion, there was a group of people, especially pregnant mothers, that would avoid making contact with the child because they believed that it would "infect" their baby. These findings helped explain the culturally transmitted fears and concerns that they may have done something wrong in the past to cause the disorder (e.g., karma or spirit possession). This belief, which is relatively more prevalent in an Asian context, might influence how parents of children with ASD cope with challenges (e.g., Ting and Chuah, 2010; Rahman et al., 2012; Ha et al., 2014; Ilias et al., 2017).

Adaptation and Acceptance

Adaptation to the child's diagnosis and condition was the beginning of the healing process of parents and family members' grief. The beginning of the journey was overwhelming and brought heartache to most of the parents. However, overtime, they learned and realized that the way they perceived the child's condition and situation would powerfully influence the outcome or consequences. Accordingly, the majority of parents started to alter their *cognitions* and adjusted their routines and life plans. These processes were described by parents as acceptance and empowered them to be more vigilant in raising their child.

The findings in this current study also illustrate two different scenarios that have played out in family relationships over time. Initially, the majority of parents cited that dealing with the behavioral difficulties and ASD symptoms of their child with ASD was the most challenging parenting experience. The consequences of these difficulties would impact other family members as well, by creating misunderstanding, tension, and dissatisfaction, and reducing time spent with the other children (e.g., Angell et al., 2012; Nealy et al., 2012).

Furthermore, more than half of the parents reported the feeling of isolation that resulted from the challenging behaviors and ASD symptomologies that made them withdraw to avoid the unwanted trouble. This result was in turn related to stigma. Previous studies also found that the majority of parents that have a child with ASD may feel blamed for their child's behaviors (Neely-Barnes et al., 2011), isolated and excluded from family and friends (Gray, 1993; Woodgate et al., 2008; Farrugia, 2009), and have an overall feeling of distress and burden because of stigma (Green, 2003).

On the other hand, nearly half of the parents directly perceived the positive impact that having a child with ASD brought to their relationship and understanding with their spouse and other family members. One clear finding is that the spouses felt that the need to rely on one another more brought them closer as a parent or couple. They also described that the presence of a child with ASD increased the sense of family *connectedness*. This result is similar to Rivers and Stoneman's (2003) discussion of the importance of considering the family context and family wellbeing as contributing to the quality of sibling relationships in families with a child with ASD. At times, the child with ASD would be the center of attention for everyone in the family. The family members would be alert and aware of the needs and/or any little improvements showed by the child. This result supports the previous findings that families of children with ASD do not differ significantly from those without an ASD child in terms of cohesion and feelings of closeness (Altiere and von Kluge, 2009).

In addition to that, the identification of Walsh's three domains of family resilience (the *family's belief system*, *organizational skills*, and *communication processes*) were clearly evident in the participants' interviews. For instance, a number of parents in this study expressed their positive experience raising a child with ASD and how this led to improvement in communication with their spouse and other family members, which acted as a buffer or protective factor against stress (Bayat, 2007; Ekas and Whitman, 2011). The findings also illustrated that having a child with ASD enhanced family cohesion within the nuclear as well as the extended family. The ability of the parents and other family members to make meaning out of the life changes that accompany raising a child with ASD is vital to the resilience development (Becvar, 2012). When parents and other family members accept the diagnosis and conditions of a child with ASD, the adaptation would further increase. The adaptation and acceptance is further related to the vital factors of strength and determination.

Strengths and Determination

The abilities of parent participants to call forth and exhibit inner strength to proactively meet the personal challenges and manage adversities in relation to their child with ASD were important characteristics of resilience development. The study findings identified that despite the challenges faced, our parent participants have prevailed to accept the child unconditionally, cherishing the little joys and achievements and redefining their hopes and dreams which help them to developed strengths and determination.

The current findings also support previous studies that raising their child with ASD changed their life in a more positive way indirectly (Kayfitz et al., 2010; Bayat and Schuntermann, 2013). At times, they needed to redefine their dreams, hopes and expectations toward the child, but also many participants mentioned developing increased tolerance, patience, sensitivity toward others and self-advocacy skills in their everyday life. These results showed that the majority of parents in this study found positive meaning by raising a child with ASD. Findings supported previous studies that making meaning is a central aspect of coping with the adversity and resilient families build up from the ones who make meaning out of the adversity (Bayat, 2007; Myers et al., 2009).

The findings also revealed the good adaptive coping strategies of this group, such as thought reframing. It appeared that good coping strategies as suggested by the parents boosted their sense of purpose and in turn helped to build resilience. The findings further support previous studies' recommendations that strengths and coping strategies are important indicators of a parent's psychosocial well-being and result in reduced anger, anxiety and depression among parents of children with autism (Siah and Tan, 2016).

Along the journey, they described spiritual growth. The findings illustrate how parents learn and draw upon their faith following the diagnosis to help them make sense and construct meanings around the disorder. Their religious and spiritual beliefs played an important role in helping them to positively interpret and perceive the child's disability. The belief that their child with ASD was a pure and innocent gift and they felt blessed that God chose them as a special parent was evident across the religions (i.e., Islam and Christianity). Supporting the current findings, previous research explained about how spiritual and religious beliefs influenced parents' understanding and helped them in making positive interpretations about having a child with ASD (Tarakeshwar and Pargament, 2001; Ekas et al., 2009; Jegatheesan et al., 2010).

A few parents described that there was a group of "special people" in the community that were very supportive and understanding. In their explanation, these people are special because they accept the special child and the family members with an open heart and mind. A couple of parents described community acceptance as simply 'understanding without being judgmental' and 'looking at the child with ASD as not being different but being the same as other children with different needs and different ways of thinking.' Their acceptance and positive attitude brought happiness to the parents, improved

their emotional wellbeing, and helped to build resilience. The findings can be related to the norms and courtesy of culture that anchor the Malaysian way of life. Although Malaysians may have different religious beliefs and practices, paying respect to and caring for people's emotion, and being polite despite the differences, are part of the good virtue and vital concern for those people that live in the Malaysian multicultural country (Ramli, 2013).

Finally, the analyses further revealed the importance of society and governmental supports and resources (e.g., ASD parent support groups and online resources, school, therapy centers) to enhance parents' resilience. The majority of parents agreed that currently there were some supports as well as resources provided by the government, however, there are still many gaps in terms of quality and accessibility. For instance, those parents that live in the sub-urban or rural areas would find difficulties in getting access to the places that offer intervention and face added struggles due to lack of resources. Those living in rural and even sub-urban areas face added risks and have less resources available to boost their resilience. The findings indicate that society and governmental support also plays a key role in building resilience, which therefore, necessitates the urgent need to increase support services to address the unmet needs of these parents on a nationwide level.

Initial Theoretical Model of Resilience

Figure 1 illustrates the dynamic mechanisms of the initial theoretical model of resilience development. It illustrates the transformative experiences of parents of children with ASD in Malaysia, which could be translated as the risk and protective experiences throughout the process of resilience development. The figure depicts the road to resilience that involves the stress and adversities faced. The sources of stress come from different levels, such as from individuals, family members, the community, and society. Having a child with ASD may give tremendous and deep impacts due to the lifelong nature of the condition. Over time, the parents learned to accept and adapt with the situation. Accepting circumstances that cannot be changed enables parents to alter their cognitions and *adapt with* the stressful situation. These notions–"stress and adversity," and "acceptance and adaptability"–are best described as the risk experiences of the parents of children with ASD that interplay in the process of resilience development.

Resilience is described as an ongoing process which requires time, constant effort and strong willpower from the individual and family. "Strengths and determination" is another notion that emerged from the findings and adds to this theoretical resilience model development. This notion is described as the protective experiences of the parents. With respect to the different coping strategies, these enable parents to deal with the stress and have a greater sense of control of their life.

There is a combination of factors at the different levels associated with resilience development. At the individual level, it involves thought, behavior, and action that can be learned, supporting the theoretical conception that resilience is malleable. The values and beliefs that are held by the individual parent

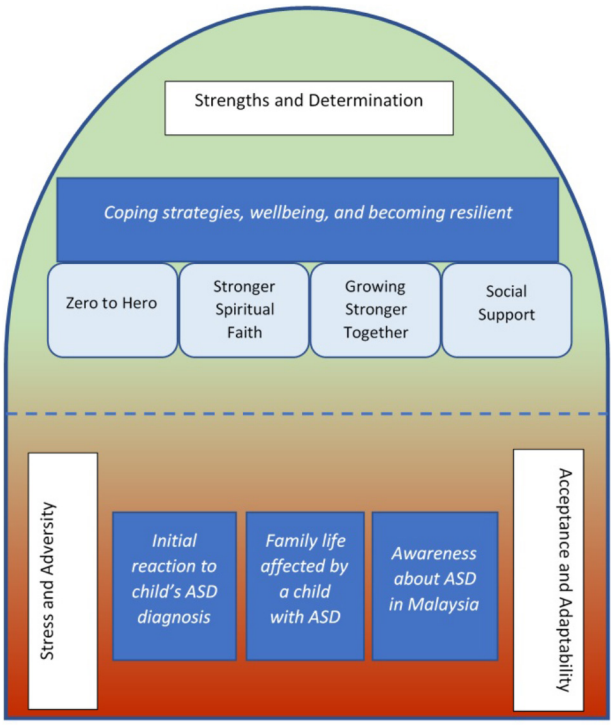

FIGURE 1 | The dynamic mechanisms of resilience in parents of children in the Malaysian context.

also give impact to the process of resilience development. For instance, if a parent strongly believes that he/she was specially chosen by God, this belief lifts their sense of wellbeing and enhances resilience. Furthermore, the understanding, support and involvement of the family members and significant others enhance resilience development. Increased family cohesion helps build individual and family resilience. The social supports drawn from the community and society also help to promote resilience development. The risk and protective experiences are viewed as a dynamic, synergetic mechanisms rather than linear.

At this point, it is important to note that culture can influence and have impact on the resilience development process. How parents communicate and deal with the stress and adversities might be influenced by cultural differences. Family members and community understandings about the etiology of ASD and possible associated stigmas can have consequences and impact the parents. How other family members and the community connect themselves with the parents of children with ASD also might vary in respect to cultural practices and belief. Both *community risk* and *community resilience* processes are present. The findings in this current study theorized that the resilience of parents of children with ASD in the Malaysian context is best understood as the dynamic interplay between the risk and protective experiences of the parents. The process of resilience requires the functioning of many interacting systems within and around the parents and operating at different levels. These risk

and protective experiences *blend together* (see **Figure 1**) resulting in transformative growth.

Clinical Implications

The overall aims for the study were to address the lack of research to date exploring the experiences, risks and protective processes that contribute to parental stress and resilience for parents of children with ASD in the Malaysian setting. The application of the in-depth, constructive grounded theory qualitative approach contributes to the novel data obtained from parents. With reference to the Malaysian population, findings can help construct a more comprehensive theoretical understanding integrating a more expert understanding of the contextual environment.

The present study expands the knowledge base regarding the experiences, adaptation, wellbeing and resilience development of mothers and fathers of children with ASD in the Malaysian context. The findings from this study can help to inform about parents' experiences in similar contexts (e.g., non-Western, Asian, collectivistic and developing countries) in terms of the differences in cultural, religious and spiritual beliefs and practices that might influence other people's understanding and awareness. The findings lend support to the importance of acknowledging the culture-specific components that might influence how parents perceive, give meaning and adapt. It also shows how parents utilize certain coping strategies that might help them to grow through adversity. Therefore, the findings can be used to shape and guide the future clinical assessment and interventions to be used by healthcare and education professionals that tailor policy and services to the needs of the parents and the contextual environment.

The study's inclusion of fathers helps expand the existing literature as some different emphasis areas were focused upon in the father interviews. The analyses of the transcripts indicated that most of the father participants expressed significant concern about the challenge of facing the behavioral issues exhibited by their child with ASD. Also, the findings described how fathers dealt with the difficult situation and learned to be self-aware and to control their emotions. Imran expressed,

> I almost lost my control when he throws his tantrums after came back from school. . . just out of sudden. . . at that I time I also tired, just got back from office. If I just follow my irrational gut at that time. . . finish (small laugh).

Inclusion of both fathers and mothers in specialized parenting programs may help them to better manage a range of behavior problems common in children with ASD and help them increase their parenting skill self-efficacy. Also, fathers highlighted in somewhat greater depth their feelings of "denial" and "distancing" in the early period of noticing symptoms in their children. This observation points to the importance of actively involving both parents in the diagnostic and treatment planning process.

The study's findings also help illustrate the truths about raising a child with ASD within the developing country where the "system" (e.g., health and education) for the children with ASD is still largely inadequate to provide good services. Greater attention needs to be placed upon the parents' struggle to find and make use of the limited resources and supports available in Malaysia, especially in sub-urban and rural regions. Likewise, the shortage of qualified health practitioners, doctors, and teachers that have specified knowledge about ASD make the diagnostic process, therapies and treatment interventions tougher on the parents.

The findings provide strong implications for the Malaysian government to broaden autism awareness and services through different initiatives. For instance, in the health domain, extensive training should target all medical and allied health professionals, rather than just those who are specializing in ASD and related neuro-developmental disorders. In the education domain, more well-trained teachers are needed in teaching and educating children with ASD, and in helping to educate all children to learn more inclusive and accepting attitudes toward those with ASD, thereby helping build community resilience and reduce hurtful judgments and stigmas. Professionals across disciplines can be encouraged to increase the involvement of all family members during the assessment and intervention processes. Efforts to build resilience in the individual parents, the family system, and the community are recommended as applied initiatives in practice.

In a nutshell, this study has much potential significance to impact the local society and government. The findings make contributions in line with the Malaysian national priorities and objectives. A newfound commitment has arisen in top government circles, illustrating the current timely implications of the study. The findings in this study can serve as guidance for the Malaysian government in moving forward to plan services and education for those with ASD and their families.

The current study was unique, where the researchers took the initiative to conduct several workshops as an innovative and effective way of communicating and receiving feedback on the research findings. The underpinning rationale for these workshops assumed that the wider the audiences, the more opportunities to reach the community and create more awareness about ASD in the Malaysia.

Limitations and Future Research

There are some limitations that are recommended to be addressed for future research. It is clear the parent participants in this study were Malaysian and not representative of parents in other cultural contexts. Furthermore, techniques of the participants' recruitment for this study were purposive and utilized convenience sampling. Thus, the sampled mothers and fathers who volunteered for this study were likely those parents who had higher insight and motivation, further constraining the generalizability of the findings. However, it is worthwhile to mention that Malaysia shares common cultural traits and attributes with other Asian countries like Singapore, Indonesia, Vietnam, etc. Therefore, the findings illustrated in this study may be pertinent and applicable to families that share similar demographic backgrounds in these cultures. It is recommended for the future research to more cautiously identify the parents who are really struggling and those who are flourishing and

observe over time the resilience process through interviews longitudinally. Future research can also make more detailed observations of participants' sociodemographic background, which might influence how they shape their experiences. The largest proportion of the sample identified as Malay, and future research is recommended to explore in more depth other groups and the impact of their unique cultural views.

Also, the current findings were focused on parents whose children are of primary school age and we are uncertain how much our findings are relevant to parents whose children are in different stages of the developmental process (e.g., toddlers, adolescents, and adults). It is imperative and highly recommended for the future research to highlight the life experiences, challenges and coping of the parents across the developmental process as the challenges facing them may be different at every stage of child development. Especially, in Malaysia, there is an urgent need to provide services for adults with ASD and their families.

Additionally. our findings highlighted the importance of a family systems perspective to understanding resilience in mothers and fathers of children with ASD in Malaysia. Future research is recommended to explore in greater depth other family sub-systems. For example, the experience of the parents with respect to their other children and relationships between siblings are recommended focus areas. Additionally, inquiry exploring the quality of the relationship with professional caregivers and educators is important to develop a better understanding of the inter-disciplinary solutions to promote resilience development. The importance of adopting a holistic family centered approach is highlighted and the needs of all family members should be addressed and supported.

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All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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SUPPLEMENTARY MATERIAL

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