

# **CURRENT FINDINGS IN THE PREVENTION AND REDUCTION OF ANXIETY, DEPRESSION AND SUICIDE IN CHILDREN AND ADOLESCENTS**

EDITED BY: Rosanna Mary Rooney, Robert Thomas Kane and Pradeep Rao  
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# CURRENT FINDINGS IN THE PREVENTION AND REDUCTION OF ANXIETY, DEPRESSION AND SUICIDE IN CHILDREN AND ADOLESCENTS

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# Table of Contents

- 04** *Coping With Depressive Symptoms in Young Adults: Perceived Social Support Protects Against Depressive Symptoms Only Under Moderate Levels of Stress*  
Myria Ioannou, Angelos P. Kassianos and Maria Symeou
- 15** *Positive Education Interventions Prevent Depression in Chinese Adolescents*  
Yukun Zhao, Feng Yu, Yiwen Wu, Guang Zeng and Kaiping Peng
- 24** *Gratitude Moderates the Mediating Effect of Deliberate Rumination on the Relationship Between Intrusive Rumination and Post-traumatic Growth*  
Eunseung Kim and Sungman Bae
- 33** *Impact of a Mindfulness-Based Intervention on Basic Psychological Need Satisfaction and Internalized Symptoms in Elementary School Students With Severe Learning Disabilities: Results From a Randomized Cluster Trial*  
Catherine Malboeuf-Hurtubise, Geneviève Taylor and Geneviève A. Mageau
- 42** *Understanding the Needs of Young People Who Engage in Self-Harm: A Qualitative Investigation*  
Sarah E. Hetrick, Aruni Subasinghe, Kate Anglin, Laura Hart, Amy Morgan and Jo Robinson
- 52** *The Relationship Between Resilience and Mental Health in Chinese College Students: A Longitudinal Cross-Lagged Analysis*  
Yin Wu, Zhi-qin Sang, Xiao-Chi Zhang and Jürgen Margraf
- 63** *Adolescent Suicide Ideation, Depression and Self-Esteem: Relationships to a New Measure of Gender Role Conflict*  
Cormac O'Beaglaioich, Jessica McCutcheon, Paul F. Conway, Joan Hanafin and Todd G. Morrison
- 74** *Toward a New Model of Understanding, Preventing, and Treating Adolescent Depression Focusing on Exhaustion and Stress*  
Toon van der Gonde, Leontien Los, Arnoud Herremans, Ronald Oosting, Rafaela Zorzanelli and Toine Pieters
- 83** *Plasma microRNA Array Analysis Identifies Overexpressed miR-19b-3p as a Biomarker of Bipolar Depression Distinguishing From Unipolar Depression*  
Yu Chen, Jiabo Shi, Haiyan Liu, Qiang Wang, Xiangxiang Chen, Hao Tang, Rui Yan, Zhijian Yao and Qing Lu
- 95** *Prevention of Mental Health Difficulties for Children Aged 0–3 Years: A Review*  
Elizabeth Izett, Rosanna Rooney, Susan L. Prescott, Mia De Palma and Maryanne McDevitt



# Coping With Depressive Symptoms in Young Adults: Perceived Social Support Protects Against Depressive Symptoms Only Under Moderate Levels of Stress

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**Introduction:** The interrelationship between social support, depressive symptoms, stress and self-esteem in young adults remains unclear. This study aims to test the mediating role of self-esteem in the relationship between social support and depressive symptoms and the moderating role of perceived stress in the relationship between the two. This is important to inform components of future intervention development targeting youth depression.

**Methods:** Three hundred forty-four ( $N = 344$ ) young adults in Cyprus aged 17–26 (78% female) completed measures of self-esteem, social support, depressive symptoms, and perceived stress. Structural equation models were used to examine the interactions between social support and depressive psychopathology, whereas mediational analyses were run to examine the mediating role of self-esteem. Latent moderated mediation models were applied to examine the potentially moderating role of perceived stress.

**Results:** Perceived social support from family and friends were significantly related to lower depressive symptoms. Self-esteem fully mediated the relationship between perceived family support and depressive symptoms. Perceived stress moderated the model, and perceived social support was found to be more protective against depressive symptoms when moderate levels of stress were presented.

**Conclusion:** The study demonstrates that social support is protective against depressive symptoms. Self-esteem and perceived stress are important mechanisms that interact with this effect. Implications include the efforts to increase perceived family support during college years and management of stress levels before working with depressive symptoms.

**Keywords:** perceived social support, depressive symptoms, self-esteem, perceived stress, mediation, young adults

## INTRODUCTION

Perceived social support refers to how individuals perceive friends, family members and others as sources available to provide material, psychological and overall support during times of need. Perceived social support has been consistently related to well-being, as the perceived levels of support, love, and care can provide positive experiences (e.g., Siedlecki et al., 2014). A review suggested that high perceived social support is related to better physical and mental health outcomes as well (Uchino et al., 2013).

### Social Support and Relationships With Stress and Depressive Symptoms

Perceived social support and connectedness have been found to be stronger predictors of decreased depression in young adults than gender, self-esteem, and sleep quality (Armstrong and Oomen-Early, 2009). Numerous studies have been concerned with the role of perceived social support from parents, peers and the school in the reduction of depressive symptomatology in children and adolescents (e.g., Rawana, 2013).

Additionally, theoretical efforts have been made as well to understand the relationship between social support and depression. Based on the stress-mobilizing hypothesis, stress encourages individuals to seek social support (Singh and Dubey, 2015). However, one should note the high correlation between stress and psychological distress and especially the high comorbidity between stress and depression. This high comorbidity may explain a spurious positive relationship between depression and perceived social support (Starr et al., 2014).

The psychological pathways that mediate the association between perceived social support and mental health outcomes need to be further investigated (Uchino et al., 2013). This evidence is necessary in the effort to theoretically understand the functions of perceived social support, and to inform appropriate areas for interventions that could limit the negative effects of low social support on mental health. One important parameter involved in the relationship between social support and mental health is self-esteem.

### Perceived Social Support and Self-Esteem

According to the social-cognitive perspective, perceived social support promotes self-esteem, which subsequently leads to positive mental health outcomes (Lakey and Cohen, 2000). Perceived social support is suggested to be associated with positive thoughts about self; hence the direct and indirect impact on mental health outcomes through self-esteem. However, the way young adults think about social ties and support may activate different self-evaluations. For example, some may interpret social support as an indicator of their social acceptance and may activate positive self-schemas (e.g., a lovable person). On the other hand, others may interpret social support as an indicator of negative qualities (e.g., a weak person). Social support may trigger conflict and comparison with others, in cases that negative self-evaluations are produced after receiving social support. For

instance, evidence suggests that perceived social support may actually carry a self-esteem threatening message at times, as receiving high social support may be interpreted as a sign of low coping ability, which in turn might increase distress (Choenarom et al., 2005). A more recent theoretical perspective suggests that providers of social support help the recipient through the regulation of affect, thought and action and that people who produce favorable affect and higher self-esteem to the recipients of their support are more likely to be perceived as supportive (Lakey and Rhodes, 2015). It is not clear under which circumstances social support could either enhance or threat self-esteem.

A bidirectional relationship between social support and self-esteem has been previously reported. Lee et al. (2014) found that social support mediates the relationship between self-esteem and depression, and at the same time self-esteem mediates the relationship between social support and depression. Perceived social support may improve psychological health through its effect on self-worth, sense of security and belonging, which are components of higher self-esteem. Social support provides a reassurance of self-worth, as it gives the perception that one is valued and accepted by others. At the same time however, the relationship between social support and self-esteem might be bidirectional. As an example, having low self-esteem may impact perceptions regarding social support and limit efforts to reach out for support, or may promote remembering negative aspects of past social interactions (Swann et al., 2003).

Kleiman and Riskind (2012) tested the mediating role of self-esteem in the relationship between perceived and reenacted social support, and suicidal ideation. They found that perceived social support was associated with increased self-esteem, and self-esteem increased the utilization of social support sources. The resulted model with reciprocal relations between self-esteem and social support partially buffered suicidal ideation. Recently, a longitudinal 4-year study with five waves in Australian adolescents (Marshall et al., 2014) showed that self-esteem was a stronger predictor of perceived social support quality and of the size of the social support network of the adolescents, compared to the reversed effect from perceived social support on self-esteem. This finding, however, may reflect a developmental effect, as adolescents place particular importance on positive self-beliefs that increase their confidence in relationships and results in the desire of more intimate relationships; hence the higher perceived social support quality.

### Summary of Previous Findings and Conflicting Evidence

Even though a number of studies suggested different mechanisms of the impact of perceived social support on mental health outcomes, the specific pathways through which perceived social support promotes young adults' mental health are not well-known (Feeney and Collins, 2014). At the same time, some findings suggest that high perceived social support may not always promote mental health, but may actually be associated with increased distress (Seidman et al., 2006). Specifically, receiving high levels of support may activate self-doubting and



low self-worth due to the perception that one is not capable to take care of himself (e.g., Lepore et al., 2008). Perceived social support may actually be a “mixed blessing” that helps to reduce negative outcomes for some people, but increases psychological distress for others (Bolger, 2014). Specifically, receiving more or less support that a person has provided (over-benefit and under-benefit, respectively) can be psychologically distressing, as this may be related to lower self-esteem and depressed mood.

Specific mental health problems may be related to lower perceived social support leading to conflicting evidence concerning the moderating role of stress in the relationship between social support and mental health outcomes. To illustrate, the perception of the stressful situation that one could not handle by themselves may limit the sense of mastery, productivity and functionality, leading to increased distress. Individuals with anxiety disorders may perceive that social support cannot buffer the negative impact of stress on mental health or protect against the impairments associated with anxiety disorders (Panayiotou and Karekla, 2013). Therefore, perceived social support may not be able to limit the effects of anxiety disorder on other mental health outcomes, such as depression. However, the interactions between social support, stress and depression are not always conclusive. For example, reviews of the literature point out an association between low perceived social support and poor mental health, which exists even if stress is not present (Lakey and Orehek, 2011), and not necessarily when there is comorbid stress (Lakey and Cronin, 2008).

Previous evidence suggests that only certain sources of support may have predictive utility after the experience of negative life events (Burton et al., 2004). Within this context, the examination of multiple sources of social support is important, though this has not been clearly emphasized in the literature. Also, the research exploring the importance of self-esteem in understanding the impact of perceived social support on mental health outcomes and particularly depression is still vague. Though a number of studies are concerned with the role of self-esteem in depression (for meta-analytic evidence see Sowislo and Orth, 2013), concurrent investigations controlling for perceived social support and perceived stress and the effect of self-esteem on depression and anxiety are limited.

## The Present Study

This study combines the evidence investigating mechanisms explaining the effect of perceived social support on depression, and the literature exploring the effects of stress levels on the relationship between depression and perceived social support. Previous studies suggest that clinical and subclinical depression affects a considerable population of young adults, i.e., university and college students (Armstrong and Oomen-Early, 2009; Lee et al., 2014). Also, during the transition to university or college, a number of major changes occur regarding the renewal and reorganization of students' social network, which involves meeting new people and forming new intimate relationships. Perceived social support from family is also changed during this period of time, depending on student's distance from home, previous relationships with parents and siblings and financial dependency. Therefore, we aimed to recruit young adults, in

order to explore the interrelations between social support, self-esteem and depression. Given the diverse findings on the role of perceived stress, we aimed to explore how it can alter the interrelations between depression, social support and self-esteem.

We hypothesized that:

- (a) Perceived social support would be related to lower levels of depressive symptoms.<sup>1</sup>
- (b) Self-esteem would be a mediator of the relationship between perceived social support and depression.
- (c) Perceived stress would be a moderator of the model between perceived social support, self-esteem, and depression. We expected that perceived social support would have a depression-buffering effect in cases of lower perceived stress (low and moderate levels of stress), since individuals with lower stress would be better able to keep people close to them and continue receiving support. As people with lower stress may perceive support as more positive than people with high perceived stress, we expected that perceived social support would be related to less distress for those young adults.

## MATERIALS AND METHODS

### Participants and Procedure

This is an observational non-interventional study with low risk for participants. The Cyprus Bioethics Committee pre-screened and provided approval to the study. Participants were undergraduate and post-graduate students at the University of Cyprus in 2015, who provided informed consent to participate in a larger study involving the validation of the Multidimensional Scale of Perceived Social Support (MSPSS) in Greek (Zimet et al., 1990). The required sample size was computed through the G\*power software with the parameters of multiple regression (as we considered the existence of three predictors including perceived social support, perceived stress, and self-esteem). In order to be able to detect a small effect size of  $f^2 = 0.05$  the required sample was 312 participants [ $\lambda = 15.60$ , critical  $F(308) = 3.03$ , actual power = 0.95]. The participants were randomly selected from different university courses offered. We randomly selected courses from the weekly schedule and questionnaires were administered to these courses after the written consent of the courses' directors and the verbal consent of the students. The average time for the completion of questionnaires was 15 min. The calculation of the intra-class correlation showed that ICC = 0.08 (95% CI 0.074, 0.093), supporting that individuals from the same group (i.e., class) were not similar in terms of their values and that multilevel management of the data (i.e., class, individual) was not advisable.

<sup>1</sup>The literature on the relationship between social support and depression is not conclusive regarding the direction of the relationship. However, a previous pilot study of our research team applied a cross-lagged longitudinal design and supported that the effect of perceived social support on depression was significant ( $b = -0.19$ ,  $p = 0.002$ ), and that the reversed reciprocal effect of depression on perceived social support was smaller in magnitude and non-significant ( $b = -0.03$ ,  $p > 0.05$ ). The direction of the relationship and the formation of the first hypothesis were based on the pilot data.

## Measures

The participants completed socio-demographic information, such as their age, gender, family status, living status, level and year of degree, and a battery of questionnaires.

### Multidimensional Scale of Perceived Social Support

The MSPSS is a self-report 12-item instrument capturing the multidimensionality of perceived social support, through items that measure social support from family, friends and a special person (significant other). The three subscales of family, friend, and significant other perceived social support consist of four items, rated on a seven-point Likert scale ranging from “very strongly disagree” to “very strongly agree.” The subscales’ discriminant validity is satisfactory and the instrument has good psychometric properties in terms of validity and reliability index for all three subscales ranging from 0.85 to 0.92 and 0.87 to 0.93 for the whole scale (Budge et al., 2013). Sample items of the instrument include: “There is a special person with whom I can share my joys and sorrows” (support from a special-person/significant other subscale), “I can talk about my problems with my family” (family support subscale) and “I can count on my friends when things go wrong” (friends’ support subscale). The total score of the three subscales is summed to create the total score of perceived social support with higher scores indicative of higher perceived social support. The scale was translated to Greek using the forward-backward translation. It was forward translated from English to Greek by two authors (APK and MS) and back-translated to English by a third author (MI) who was not aware of the original items in English. Any discrepancies were resolved by consensus. Then, the scale was piloted with 10 students, who tested the clarity of the concepts and items of the scale.

### Center for Epidemiological Studies – Depression Scale

The Center for Epidemiological Studies – Depression Scale (CES-D scale) (Radloff, 1977) is a self-report instrument consisting of 20 items measuring depression that cover affective, somatic, and cognitive and psychological symptoms. Responses are based on frequency of symptoms during the last week, on a four-point Likert scale ranging from “rarely or none of the time last week (less than 1 day of the week)” to “most or all of the time during last week (from 5 to 7 days of the week).” The items of the scale include “I did not feel like eating; my appetite was poor” (somatic symptom), “I had crying spells” (affective symptom), “I thought that my life had been a failure” (cognitive symptom) and “I felt depressed” (psychological symptom). The scale also includes four positively worded items, which were reversed and the scores in each item are summed up in order to form the total depression score, in which higher scores indicate higher depression. The CES-D scales’ reliability index ranges from 0.90 to 0.96. The Greek version has good psychometric properties including high internal consistency, high test-retest reliability and high sensitivity and specificity at the cutoff level of 23/24 for depressive disorder (Fountoulakis et al., 2001). Due to the present study focusing on a college population, depressive symptoms were treated as a continuous instead of a

dichotomous outcome that would categorize individuals based on the depressive disorder cutoff.

### Rosenberg Self-Esteem Scale

The Rosenberg Self-Esteem Scale (RSES) (Rosenberg, 1965) is a self-report instrument consisting of 10 items measuring self-esteem. The items are rated on a four-point Likert scale ranging from “strongly agree” to “strongly disagree.” The scale was validated using a Greek-speaking population in Cyprus (Panayiotou and Papageorgiou, 2007). Items include items such as “I feel that I’m a person of worth.” The negatively worded items are reverse scored and the scores in each item are summed up in order to form the total self-esteem score, in which higher scores indicate higher self-esteem. The scale has generally high reliability index ranging from 0.82 to 0.93.

### Perceived Stress Scale-14

The Perceived Stress Scale-14 (PSS-14) (Cohen et al., 1983) is a self-report instrument consisting of 14 items assessing the perception of stressful experiences by asking individuals to rate how frequently they have feelings and thoughts related to events and situations that occurred during the previous month. The items are rated in a five-point Likert scale ranging from “never” to “very often.” The scale includes items such as “In the last month how often have you felt that you could not cope with all the things that you had to do?” The positively worded items are reversed and the scores in each item are summed up in order to form the total perceived stress score, in which higher scores indicate higher perceived stress. The scale has good psychometric properties with adequate internal consistency ranging from 0.77 to 0.90 (Lee, 2012). The PSS was validated in Greek in non-clinical settings (Andreou et al., 2011).

## Data Analysis

Data were screened for missing values and a missing value analysis was run to examine if there were systematically missing values in particular items. Correlation analyses between the variables under study were conducted. Due to the potential conceptual overlap between depression and self-esteem – as self-esteem is considered an identifying symptom of depression-, the correlations were calculated both using the total depressive symptoms and the depressive symptoms excluding the ones overlapping with self-esteem measure (questions 4 and 9 of the CES-D). Related to the above, partial correlations were calculated for among the variables due to the high comorbidity between anxiety, depression and self-esteem, as observed in previous studies as well (e.g., Hranov, 2007). Both exploratory factor analyses and confirmatory factor analyses (CFAs) were run in order to examine and confirm the factorial structure of the questionnaires. Then, structural equation modeling (SEM) and multi-group analyses were used to test the hypotheses of the present study. SEM was preferred against mediate regression models, in order to concurrently examine mediating and moderating variables while concretely accounting for measurement error and to avoid Type I error (Byrne, 2009).

To test if self-esteem mediated the relationship between social support and depression we evaluated if the direct effect (from



social support to depression) remained significant after adding self-esteem in the model and also evaluated the change in the variance of depression explained. Two ways are proposed for the examination of the moderating role of perceived stress, when using Mplus. Specifically, when latent variables are involved, the examination of the interaction between the moderating variable and the mediational variable is suggested. Latent moderated structural equations (LMS) have been showed to be accurate in terms of estimated effects and confidence intervals, when compared to regression, which underestimates the magnitude of effects and provides inaccurate confidence intervals (Cheung and Lau, 2015). At the same time, multi-group analyses can be performed as well, which correspond in type to Hayes' PROCESS analysis (Stride et al., 2015), with the aim to examine the changes in the model for those with low, moderate and high levels of the moderating variable (i.e., perceived stress in this case). The way that the three groups are formed is based on the mean score of the variable and the standard deviation (i.e., one SD above and below the mean represent the moderate level, one SD below constitutes the low level and one SD above is considered the high level). Both ways to approach latent moderated mediation testing were applied for the aims of the study.

Firstly, we reversed the items that were positively worded in order to be able to sum the items of the PSS, in a way that higher scores indicate higher perceived stress. The maximum score that any participant could get was 70 and the minimum was 14. The cutoff scores for the aims of the study were 36, 41.375 and 46.75, respectively for low, moderate and high perceived stress.

Model fit was *a priori* decided to be evaluated with the chi-square test, as well as the following approximate fit indices: the Root Mean Square Error of Approximation (RMSEA), the parsimony corrected (PCLOSE), the Bentler's Comparative Fit Index (CFI), the Tucker Lewis Index (TLI), and the Standardized Root Mean Square Residual (SRMR). For an adequate model fit, most of the indices should be met, with the CFI > 0.95, the PCLOSE close to 1, the TLI > 0.95, and the RMSEA and SRMR < 0.05, with < 0.08 considered satisfactory as well (Hu and Bentler, 1999). Bayesian Information Criterion (BIC) was examined (estimated using maximum likelihood ML estimator) as an index of parsimony (difference > 10 was considered very strong evidence that the model with the lower BIC value was better than the comparison models) (Raftery, 1995). All data analyses were conducted using Mplus version 7.3 (Muthén and Muthén, 1998–2012), using the weighted least square mean and variance adjusted (WLSMV) which is a robust estimator for ordinal data that do not assume variables with normal distribution (Brown, 2006). We exploited all available data including the ones partially missing (<90% of the items missing), under the assumption of data missing at random (Little and Rubin, 2002).

## RESULTS

### Demographic Information

Three hundred and fifty participants completed the questionnaires. Two participants who had missing values in

more than 90% of the items were removed, and four participants which were outliers were not included in the subsequent analyses. The resulting sample consisted of 344 ( $N = 344$ ) participants. The age of the participants ranged from 17 to 26, with  $M = 20.78$  ( $SD = 3.94$ ). The 94% of the sample were undergraduate students, and 78% were female, which approximates the percentage of female college students in Cyprus (Meletiyou-Mavrotheris and Maouri, 2011). A percentage of 7% of the sample were married and 6% had children. Correlations between the variables under study were in the expected direction (Table 1).

### Examination of the Factorial Structure of the Questionnaires

The exploratory factor analyses of the scales showed the expected factors and provided the required support to proceed with the CFAs. For the CFAs of the scales, a multi-trait multi-method (MTMM) procedure was used, by considering the method factors in case the scales included positively and negatively worded items. The CFA analyses confirmed the questionnaire's structure and are available as **Supplemental Online Material**.

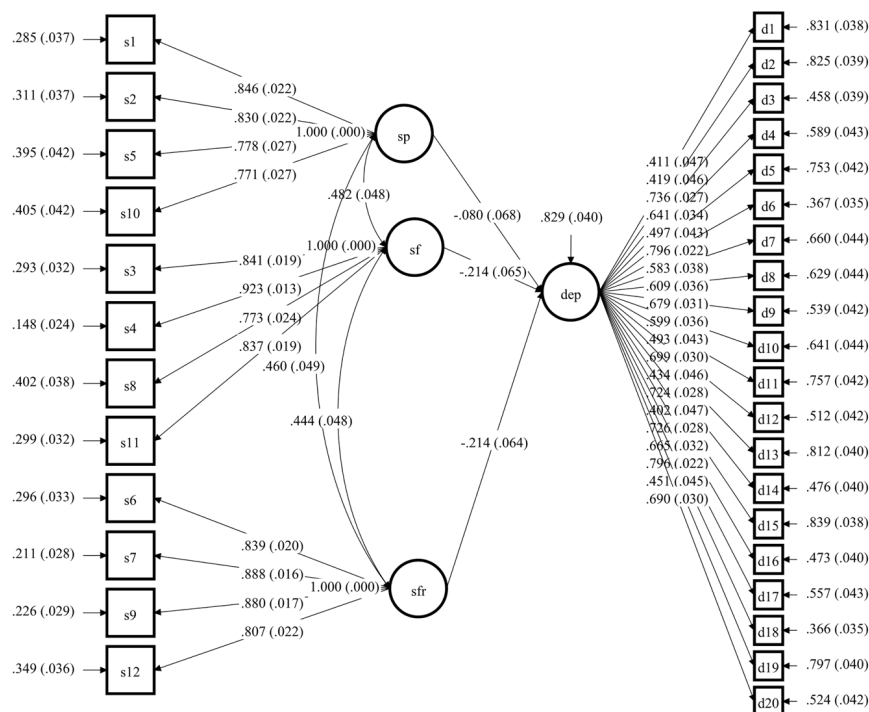
### Associations Between Perceived Social Support, Self-Esteem, and Depression

A model with effects from the three sources of social support on depressive symptoms with the sample of 344 participants was tested (Model A), showing a good fit, with  $\chi^2(447) = 707.588$ ,  $p < 0.001$ , CFI = 0.956, TLI = 0.952, RMSEA = 0.041 (90% CI 0.035, 0.047), SRMR = 0.047, BIC = 24862.483. The model A showed that perceived social support from family ( $b = -0.214$ ,  $p = 0.002$ ) and friends ( $b = -0.214$ ,  $p = 0.002$ ) was significantly negatively associated with depressive symptoms (Figure 1). Perceiving social support from a significant other had a non-significant effect on depression ( $b = -0.080$ ,  $p = 0.238$ ). Having higher support from family and friends was related to lower feelings of depression. Perceived social support accounted for 17% of the variance of depression ( $R^2 = 0.171$ ,  $p < 0.001$ ). The model with self-esteem as a mediator of the impact of social support on depression had a good fit (Model B), with  $\chi^2(796) = 1162.783$ ,  $p < 0.001$ , CFI = 0.946, TLI = 0.940, RMSEA = 0.045 (90% CI 0.041, 0.050), SRMR = 0.056, BIC = 31390.879. Model B showed that when taking self-esteem into account, perceived social support from family stopped having a significant effect on depression ( $b = -0.044$ ,  $p = 0.470$ ). Family support had a significant positive effect on self-esteem ( $b = 0.311$ ,  $p < 0.001$ ) and self-esteem had a significant negative effect on depression ( $b = -0.550$ ,  $p < 0.001$ ). The effect of social support from friends on depression was reduced but remained significant ( $b = -0.223$ ,  $p < 0.001$ ) and perceived friend support did not have an impact on self-esteem ( $b = 0.010$ ,  $p = 0.888$ ), showing that self-esteem was not a significant mediator of the relationship between friend support and depressive symptoms. Based on the model, having high family support is related to feeling less depressed, partly because it increases your sense of self-esteem. The consideration of self-esteem in the model added on the variability of depression explained, as squared multiple correlations showed that from the 17% of the variance

**TABLE 1 |** Correlations between the total scores of the variables under study.

	2	3	4	5	6	7	8
(1) MSPSS_Family	0.405***	0.451***	0.798***	−0.307***	−0.315***	−0.326***	−0.184**
(2) MSPSS_Friend	—	0.429***	0.791***	−0.250***	−0.146**	−0.334***	−0.310***
(3) MSPSS_Significant other		—	0.769***	−0.142**	−0.145**	−0.262***	−0.224***
(4) MSPSS_Total			—	−0.261***	−0.303***	−0.394***	−0.309***
(5) PSS-13 perceived stress				—	0.619***	0.776***	0.631***
(6) RSES self-esteem					—	0.607***	0.585***
(7) CES-D depressive symptoms						—	0.990***
(8) Modified CES-D (excluded items overlapping with SE and partial correlations provided when controlling for SE)							

\*\* $p < 0.01$ , \*\*\* $p < 0.001$ .



**FIGURE 1 |** Model A which shows the effect of perceived social support on depressive symptoms. All the estimates presented are the standardized estimates. Latent factors: *dep*- depressive symptoms; *sp*- perceived social support from significant person; *sf*- perceived social support from family, *sfr*- perceived social support from friends.

of depression explained by model A, the variance explained by model B increased to 55% ( $R^2 = 0.547$ ,  $p < 0.001$ ). The variance of self-esteem that could be explained by perceived social support was 10% ( $R^2 = 0.101$ ,  $p < 0.001$ ). The findings were retained even after controlling for age and gender. After this consideration, the model explained 57% of the variance of depression ( $R^2 = 0.572$ ,  $p < 0.001$ ) and 49% of the variance of self-esteem ( $R^2 = 0.492$ ,  $p < 0.001$ ). Being older ( $b = 0.179$ ,  $p < 0.001$ ) and female ( $b = -0.125$ ,  $p = 0.050$ ) was related to higher depression. Relatively, being younger in age ( $b = -0.100$ ,  $p = 0.027$ ) and male ( $b = 0.616$ ,  $p < 0.001$ ) was related to higher self-esteem. Being male was related to having higher perceptions of social support

from family ( $b = 0.235$ ,  $p < 0.001$ ), friends ( $b = 0.138$ ,  $p < 0.001$ ) and a significant other ( $b = 0.144$ ,  $p = 0.017$ ). Age marginally differentiated only the levels of social support from family, as being older in age was related to lower family support ( $b = 0.113$ ,  $p = 0.046$ ).

## Examination of the Moderating Role of Perceived Stress

The examination of the moderating role of perceived stress, was firstly applied using the interaction terms between the mediating variable (i.e., latent factor of self-esteem) and the

moderating variable (i.e., latent factor of perceived stress), after controlling for the effect of the types of perceived social support on depressive symptoms. The interaction term had a significant effect on depressive symptoms ( $b = -0.689$ ,  $p < 0.001$ ) and the log-likelihood change was significant (LL H0 =  $-14885.173$ ,  $p < 0.001$ , BIC =  $30687.327$ ). Further examination of the multi-group latent moderated mediation model was conducted, in order to investigate the type of interaction found between self-esteem and perceived stress.

The findings supported that the model reflecting the mediational effect of self-esteem in the relationship between perceived social support and depressive symptoms, was not invariant across all groups (i.e., low, moderate, and high levels of perceived stress). The log-likelihood change was significant (LL H0 =  $-21329.892$ ,  $p < 0.001$ , BIC =  $43795.710$ ). Even though the interaction between self-esteem and perceived stress had a significant effect on depressive symptoms ( $b = -0.595$ ,  $p = 0.004$ ), the interaction between perceived social support and perceived stress did not have a similar significant effect ( $b = -0.003$ ,  $p = 0.852$ ). That is, the direct protective effects of perceived social support on depressive symptoms were not significantly moderated by perceived stress. However, the indirect effects of support on depressive symptoms through self-esteem were differentiated based on the levels of perceived stress. The confidence intervals of the effects on depressive symptoms are presented on **Table 2**.

Social support did not boost self-esteem which could subsequently decrease depressive symptoms to a similar extent for those with low, moderate, and high levels of perceived stress. The effect for those with low levels of stress traversed the zero axis, supporting that the indirect effects were not significant. The effect for those with high levels of perceived stress was significant and the slope was larger, suggesting low impact of perceived social support on self-esteem and low decrease of depressive symptoms under high stress. Doubled levels of perceived social support were needed to produce an increase in self-esteem and a subsequent decrease in depressive symptoms for those with high perceived stress, compared to those with moderate perceived stress. On the other hand, those with moderate levels of perceived stress could experience a rather stable significant effect of perceived social support on self-esteem and of self-esteem on depressive symptoms. The slopes of the indirect effects based on the moderating effects of perceived stress are presented on **Figure 2**.

## DISCUSSION

The present study examined self-esteem and perceived stress, as factors explaining, and interacting, respectively, with the effects of perceived social support on depression. Separate examination of the direct effects of different sources of perceived social support, showed that only the social support received from family and friends and not the perceived support from a significant other were negatively related to depressive symptoms. Family and peer support seemed to impact depression through different pathways, as self-esteem was found to be a mediator of the effect of

family support on depressive symptoms, but the same did not stand for peer support. This finding may indicate the differential impact of perceived social support on personal characteristics and might be developmentally sensitive. For example, perceiving social support from friends may not impact on a young adult's self-esteem, as friends' support may be considered more stable, important and granted at this developmental stage (Walen and Lachman, 2000). In the same line, since the relationships with parents and family are subjected to change and adaptation during college years, continuation or re-establishment of family support might be very powerful during these years, as support from family may not be assumed for the general population of young adults.

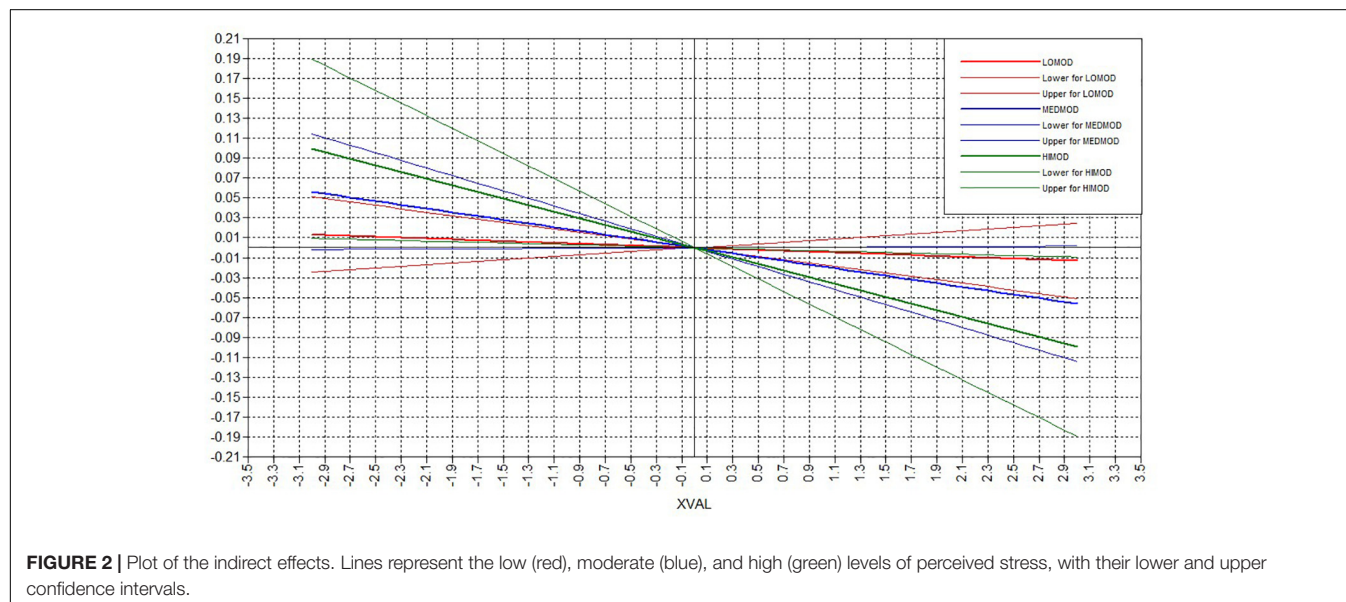
There is support for the depression-buffering hypothesis, though the indirect effect of social support on depression through self-esteem is subjected to and moderated by the levels of perceived stress. Our findings suggested that those with high levels of perceived stress perceive very low social support that has subsequently lower benefits on increasing their self-esteem and decreasing their depressive symptoms. This is in line with the finding that perceived social support does not decrease depression in people with anxiety disorders (Panayiotou and Karekla, 2013). Based on the indirect effect regression slopes, very high levels of perceived social support are needed for people with high levels of stress in order to be able to achieve the protective effects of support on self-esteem and depressive symptoms. People with high levels of stress may be less able to keep contact and tight social connections with other people; thus, keeping others in distance probably because they convey their high stress to their social networks (Coyne and Downey, 1991). The absence of social connections when stress levels are elevated further prevents people from the opportunity to achieve meaning making that could activate them to deal with depressive symptoms (Dulaney et al., 2018). In this framework and having in mind the difference between perceived and actual social support, it is also possible that people with high levels of perceived stress underestimate the social support they receive, and/or are not able to use support in a way that could maximize the benefits for their self-esteem and psychological well-being. It could also be that the increase in their self-esteem is more context-specific when achieved, and not easily transferred and generalized to lower depressive symptoms due to cognitive limitations or errors related to their high levels of stress (e.g., selective attention, intolerance of uncertainty, worry, rumination and catastrophizing, external rather than internal attribution of support and of increased self-esteem).

On the other hand, the effects of perceived social support on self-esteem and depressive symptoms are not significant for those with low perceived stress. That is, people with low stress, may seek less social support, as they might feel more self-competent regardless of the extent of perceived social support. Due to the high comorbidity between depression and anxiety (Sowislo and Orth, 2013) individuals with low levels of stress may also have lower depression levels, and may not seek social relationships in order to improve their mental health as they feel able to take care of themselves (Lepore

**TABLE 2 |** Confidence intervals of the model results.

	Lower 0.5%	Lower 2.5%	Lower 5%	Estimate	Upper 5%	Upper 2.5%	Upper 0.5%
Self-esteem	-1.686	-1.469	-1.357	-0.777	-0.197	-0.115	-0.065
SEXPSS	-1.133	-1.005	-0.939	-0.595	-0.251	-0.185	-0.057
Social support	-0.126	-0.109	-0.101	-0.086	-0.056	-0.011	-0.003
Perceived stress	0.179	0.206	0.220	0.291	0.362	0.375	0.402
SSXPSS	-0.049	-0.038	-0.033	-0.003	0.026	0.032	0.043
Age	-0.072	-0.064	-0.060	-0.040	-0.019	-0.015	-0.007
Gender	-0.055	-0.044	-0.038	-0.008	0.023	0.029	0.040

Only the effects on depressive symptoms are presented. SEXPSS, interaction term between self-esteem and perceived stress; SSXPSS, interaction term between perceived social support and perceived stress.



et al., 2008). These individuals may be more independent and autonomous.

People with moderate levels of perceived stress were able to benefit the most from the effects of social support on self-esteem and the increases of self-esteem further lowered their depressive symptoms. Keeping moderate levels of perceived stress may result in effecting self-monitoring to reach out for social support when needed and to recognize the effects of this support for psychological well-being (in terms of self-esteem and depressive symptoms). At the same time, having moderate levels of stress may be related to more objective estimations of the benefits of perceived social support, compared to when having low or high levels of stress (in both of which underestimation or distorted attribution of the need or the benefits of social support is more plausible).

Overall, this study suggests that self-esteem is important in trying to understand the relationship between perceived social support and depression. Self-esteem significantly mediates the relationship between family support and depression, and also moderates the relationship between perceived support from a special person and depression. However, the level of perceived stress is an important parameter that can completely shape the effects of social support on self-esteem

and especially the effects of self-esteem on depressive symptoms. This seems to be also in line with clinical work suggesting limited effect of, or need for longer, treatment of depression when there are comorbid anxiety disorders, regardless of the existence of a social support network (Doss and Weisz, 2006).

Even though the significant direct effects of perceived social support on depression were retained, the moderated mediation found suggests the complex effects of perceived stress on the mechanisms interplaying between social support and depressive symptoms. Consideration of the moderating effects of stress on the interplaying mechanisms is very important, especially when having in mind the significant increase offered by self-esteem in the present study in regard to the explained variance of depressive symptoms.

## Limitations

One limitation of our study is the over-representation of female participants. This is a common problem in studies using college population. However, gender was inserted in the models as a covariate, in order to account for the effects of the over-representation of females. Another limitation is that other potentially moderating factors were not measured



and should be explored in the future, such as socio-economic status, physical illness, and history of mental health problems. The findings of this study might be culture-specific, as family bonds are considered considerably strong in this population (e.g., Georgiou, 1996). The cross-sectional design of the study limits the conclusions that could be drawn regarding the bi-directionality of the effects between perceived social support and depression. However, the direction of effects was based on the findings of a pilot study on a college population, as it was found that the reversed pathway from depression to perceived social support produced standardized estimates of lower significance and magnitude. Also, this is the first study using the stress-buffering hypothesis to assess how stress relates to social support and depression and suggests that a longitudinal study investigating this further is feasible and necessary. Importantly, one should note that the population was non-clinical. Due to the use of a college sample, one should be cautious with the interpretation of the findings as evidence for depressive symptoms, instead of evidence for clinically-diagnosed depression. More research is needed to investigate if the protective effects of perceived social support could be generalized to clinical populations struggling with depression. The use of MSPSS which is scored on a seven-point scale potentially increases the risk for extreme response style (ERS). However, not enough support for ERS was provided based on the data, as the scale had good psychometric properties, the correlations between the items were in the appropriate range, and the proportion of individuals with consistent extreme responses was low (<25%). Lastly, the moderated mediation using the multi-group approach for low, moderate, and high stress was applied using the latent factor for social support from all three sources of family, friends, and significant person. Due to the complexity of the moderated mediation models, concurrent examination of the effects using all three latent social support sources is not advisable (e.g., Muthén and Muthén, 1998–2012).

## CONCLUSION

The present study adds to the literature investigating the interrelations between perceived social support, perceived stress, self-esteem, and depression. We employed latent structural equation modeling to concurrently test mediating and moderating effects while accounting for the measurement error. With this analysis, we avoided type I error implicated in previous studies that had tested various models to separately test the effects of different social support sources on different mental health outcomes. The use of a multidimensional measure of perceived social support adds to the strengths of the study, as it allowed the distinct investigation of the role of each perceived social support source.

Clinical implications of this study are relevant to the development of interventions for mild to moderate depressive symptoms during college years that involve a considerable degree of family communication and support. Practical suggestions to families during college years should not be discarded, as

family support during college seems to enhance self-esteem and potentially decrease any negative self-evaluations they have and subsequently depressive symptoms. At the prevention level, our findings show the need to educate families to remain close to their offspring even when they are in the developmental stage of early adulthood and are becoming more autonomous, and to keep using parental practices that may increase self-esteem, such as quality communication showing interest for their lives away from home and trust for their personal choices, emotional availability under periods of stress, and positive reinforcement. Theories of popularity-socialization may help further understand this transition and the role of support in coping with depressive symptoms (Reynolds and Crea, 2015).

Important implications stem from the findings of the moderating effect of perceived stress, and its interactions with self-esteem and perceived social support. Stress management and practice on relaxation techniques may need to be applied first in cases with comorbid depressive and anxious symptomatology, before dealing with depression symptoms, low self-esteem, and/or negative self- and others- evaluations. Even though social support may be beneficial even when under high levels of stress, double levels of perceived support are needed to achieve its protective effects, compared to when having moderate levels of stress. Therefore, working with stress management before depressive symptoms may provide skills (e.g., realistic estimation of risk, de-catastrophizing) that will enhance the empowering effects of social support on self-esteem and subsequently on lowering depressive symptoms. After effective stress management, youths can become more functional and motivated to work with their depressive symptoms.

Future longitudinal studies investigating other mechanisms apart from self-esteem through which perceived social support can impact depressive symptoms, need to consider the potentially moderating role of perceived stress. Also, the examination of multiple sources of perceived social support is important. Implementation of similar latent moderated mediation models with clinical populations with depression is highly recommended for future investigations. The findings of the present study have provided important pilot evidence for non-clinically elevated depressive symptoms that could drive research toward this direction.

## AUTHOR CONTRIBUTIONS

AK and MS conceived and designed the study. MS and MI coordinated the collection of data. MI analyzed the data and prepared the first manuscript. All authors provided critical comments and approved submission.

## SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpsyg.2018.02780/full#supplementary-material>



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# Positive Education Interventions Prevent Depression in Chinese Adolescents

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Positive education aims to improve students' academic performance as well as their well-being and character strengths. In contrast to traditional school counseling methods that are typically *post hoc* and pathological, positive education advocates a preventive and positive approach, which teaches students well-being skills that can reduce the chances of depression before it occurs. The current study tested this hypothesis by using a pseudo-experiment design. Six 8th grade classes ( $N = 173$ ) in a Chinese school were randomly assigned into two groups. In the experiment group, students took positive education courses once a week that taught them primarily knowledge and skills related to positive emotions. Students in the control group took regular moral education courses. After one semester, the level of depression of students in the experiment group had no significant change while that of students in the control group increased significantly. The results showed that adolescent depression can be prevented by positive emotion interventions. Implications and limitations are discussed.

**Keywords:** positive education, intervention, depression, adolescents, China

## INTRODUCTION

Depression is rampant among adolescents (Wickramaratne et al., 1989). The age of first onset of depression has become younger, yet many adolescents with depressive symptoms remain untreated (Weissman, 1987). Major depression is more prevalent in younger populations (Lewinsohn et al., 1993). Saluja et al. (2004) found that 18% of students in grades 6, 8, and 10 reported symptoms of depression. A report from the National Institute of Health indicated that the 1-year prevalence of depression in adolescents exceeded 4% (Thapar et al., 2012). Reports from other countries like Australia (Boyd et al., 2000), Italy (Frigerio et al., 2001), and Sweden (Olsson and Von Knorring, 1999) also found that depression was prevalent in these areas.

In China, rates of mental illness, especially depression, grew as rapid economic growth brought about dramatic social changes (Dennis, 2004). In a survey of 17,622 high school and college students from eight large Chinese cities, 44.3% reported depressive symptoms during the past week (Sun et al., 2010). Hong et al. (2009) used a Chinese version of the

Children's Depression Inventory to measure the prevalence of depression in urban junior high schools in Nanjing, China, and found that 15.7% of these adolescent students were at elevated risk of being depressed. In another study that surveyed Chinese high school students, one third reported a history of depression (Hesketh and Ding, 2005). Similar to the findings from Western countries that depression is associated with many negative psychological and behavioral outcomes (Boyd et al., 2000), studies in China also found that adolescent depression is associated with stress (Sun et al., 2010), internet addiction (Yang et al., 2014), lack of physical activity (Hong et al., 2009), smoking (Weiss et al., 2008), and suicidal ideation (Hong et al., 2016).

## A Positive Approach

Various programs are developed to treat and prevent adolescent depression, usually borrowing strategies from cognitive behavioral therapy, focusing on changing the overly negative and unrealistic thoughts of participants (Thapar et al., 2012). In a meta-analysis of depression prevention programs for children and adolescents, Stice et al. (2009) found that these preventive programs were effective in general, though the effect sizes were often small. In China, interventions using group consulting (Pei, 2006), cognitive coping (Wei, 2007), and mental health skills (Qu and Zhang, 2008) were also found to be effective.

However, the pathological approach that these therapy-based interventions adopted can have consequences. The interventions are often given to adolescents who are diagnosed with depressive symptoms or identified as having high depression risks, e.g., children of depressed parents (Garber et al., 2009). The participants may feel that they are being labeled as problematic (O'Connell et al., 2009). Meanwhile, other adolescents who may not have depressive symptoms or high risks of depression at the time can be left untreated and may become vulnerable when adversities hit them in the future.

The rise of positive psychology in recent years has shed light on a different approach. Positive psychology studies positive features of human beings like positive emotions, character strengths, engagement, and positive social institutes (Sheldon and King, 2001; Seligman and Csikszentmihalyi, 2014). It calls for scientific investigation of the positive side of human beings as much as the negative side. Seligman et al. (2005) further argued that positive psychology research could contribute to the alleviation of human suffering and mental disorders. Various positive interventions were developed and tested under rigorous experiments, using research results from positive psychology (Parks and Biswas-Diener, 2013). For example, participants randomly assigned to positive interventions like "gratitude visits" and "three good things" not only increased their happiness levels but also decreased their depressive symptoms as compared to those in a control group (Seligman et al., 2005). A meta-analysis of 51 positive interventions found that positive interventions had moderate effect sizes in both enhancing well-being and alleviating depression (Sin and Lyubomirsky, 2009).

Positive interventions are also used in positive psychotherapies to treat clients with mental disorders (Seligman et al., 2006;

Rashid, 2015). In contrast to the traditional deficit-oriented approach to psychotherapy, positive psychotherapies adopt a strength-oriented approach that encourages clients to find their positive psychological resources, such as character strengths, hope, meaning of life, and social connections and prescribe them with positive activities like using their strengths, positive experiences, and prosocial behaviors. Rashid and Anjum (2008) tested a group version of positive psychotherapy in a randomized control study among middle school students. The intervention lasted 8 weeks with one 90-min session per week. The main components were Positive Introduction, Signature Strengths, Three Good Things, Savoring, and Family Strengths Tree. The level of mental health and well-being of the students in the intervention group measured by the Positive Psychotherapy Inventory (PPTI; Rashid, 2005, unpublished) were significantly higher than that in the control group after the experiment. Teachers also rated the behaviors of students in the intervention group as significantly better than those in the control group. Therefore, Rashid and Anjum (2008) argued that it is both imperative and feasible to use positive interventions to prevent mental health problems in schools.

This approach is adopted by the positive education movement, which applies positive psychology principles and interventions in education to increase both academic performance and student well-being (Seligman et al., 2009), especially through cultivating their character strengths. Waters (2011) reviewed school-based interventions used in positive education and found that they are beneficial to the psychological well-being of students. For example, the Penn Resiliency Program, which teaches students resilience skills including cognitive reframing, social skills, coping, and problem solving techniques, is proven to reduce depression in the United States, the United Kingdom, Australia, China, and Portugal (Gillham et al., 2008; Brunwasser et al., 2009; Seligman et al., 2009). Green et al. (2007) tested life coaching interventions on Australian female high school seniors and found that they reduced levels of depression significantly more than those in the wait list control group. Therefore, Seligman (2015) called on schools to implement positive education to address the high prevalence of depression.

Positive education can reduce depression because well-being is a protective factor against adolescent depression. In particular, interventions that foster positive emotions can reduce negative emotions (Fredrickson, 2001). For example, savoring, a technique that helps people to enjoy and fully engage their positive emotions, can help college students significantly reduce their depressive symptoms and negative emotions (Hurley and Kwon, 2013). Gratitude predicts low levels of depression among high school students (Froh et al., 2011), and adolescents randomly assigned to gratitude interventions reported higher life satisfaction and lower negative emotions compared to those assigned to the control group (Froh et al., 2008). Waters (2011) reviewed interventions that cultivated serenity in adolescents and found they could reduce students' negative emotions. According to Fredrickson (2001), these interventions are effective because positive emotions broaden people's cognitive and behavioral repertoires and build up their psychological resources. First, since positive emotions expand people's attention and negative



emotions narrow people's attention, positive emotions can undo lingering effects on emotions by augmenting people's attention to a broader scope (Basso et al., 1996; Niedenthal and Kitayama, 2013). This undoing effect also manifests itself in physiological mechanisms. For example, positive emotions can help people recover from cardiovascular tension elicited by negative emotions (Fredrickson et al., 2000). Second, positive emotions build psychological resilience that can help people better cope with negative emotions (Fredrickson, 2000). Therefore, positive emotions can trigger upward spirals of emotional well-being that lead to fewer negative emotions.

## Positive Education in China

The essence of positive education is concordant with traditional Chinese culture. Confucius famously said, "the gentleman is not a vessel" (*Analects*, 2:12), indicating that education should adopt a whole-person approach rather than mere accumulation of knowledge. And as pointed out by the *Inner Canon of the Yellow Emperor*, the most ancient Chinese medical classic, "The sages do not treat those who have already fallen ill, but rather those who are not yet ill" (2:7), Chinese culture emphasizes the importance of preventive programs. After the positive education movement was introduced to China (Ren, 2006), it quickly spread to many communities and schools. According to the Global Happiness Council (2018), more than 10,000 schools currently practice positive education in China.

However, though there have been many empirical studies to evaluate how positive education may enhance students' academic performance, well-being, and character in other countries (Waters, 2011; Norrish et al., 2013; Adler, 2016), few have been done in China yet. In one of these rare attempts, Yu and Seligman (2002) found that an intervention adapted from the Penn Resiliency Program significantly reduced depressive symptoms of children randomly assigned to the intervention program than those in the control group at the post-test and the 3- and 6-month follow-ups. But in contrast to positive education programs that are typically applied to a whole-school or whole-class population, the participants in that study were at-risk children selected based on their depressive symptoms and family conflict reports. Furthermore, the intervention program in that study mainly used cognitive skills like optimistic explanatory styles (Peterson and Steen, 2002), while most positive education programs consist of components that directly contribute to human flourishing like positive emotions, interpersonal relationships, character strengths, etc. (Seligman, 2012). And since that study was done among children, we need more empirical evidence on the effectiveness of positive education programs in preventing depression in Chinese adolescents. The current study aims to fill in this research gap.

## The Current Study

In the current study, we designed a positive education program for middle school students, primarily focusing on understanding, awareness, creation, and leveraging positive emotions. All students in the experiment classes were included in the program,

rather than only targeting students who were diagnosed or identified with having high risks for mental problems. Therefore, all students in the experiment classes could build better psychological resources to cope with depression prior to facing mental adversities. Furthermore, no students would have the feeling of being singled out or labeled as problematic. This approach was also positive, in which it mainly taught students how to identify and use positive emotions through positive activities, rather than focusing on correcting negative thoughts and their resulting behaviors. It was expected that these characteristics of the program would make students more willing and motivated to participate, which in turn made the program more effective.

We used a pseudo-random experiment design that randomly assigned six 8th grade classes in a Chinese school into an experiment group and a control group. The students in the experiment group took 10 weekly sessions of positive education content, and those in the control group took the usual moral education classes. We compared the levels of depression of both groups before and after the experiment to examine the effects of positive education programs on adolescent depression.

## MATERIALS AND METHODS

### Participants

Participants were 8th grade students from one public middle school in the city of Chengdu, Sichuan, China. Three classes of that grade were randomly assigned into the experiment group, and three classes into the control group. A total of 173 students (81 males and 92 females, age  $M = 13.54$ ,  $SD = 0.29$ ) participated in this study, with 84 from the experiment group (37 males and 47 females) and 89 from the control group (44 males and 45 females).

### Procedure

Research for this study was approved by the Human Research Ethics Committee of Tsinghua University. Informed consent was obtained from participants. The participants were notified that all of their responses would only be accessible to the researchers.

The students completed online assessments of depression in their computer lab in the 2nd week of the semester. The 10-session positive education program began the following week. Each session took 45 min. It was delivered by the head teacher of each class. The head teachers were trained in the basics of positive psychology before the program started. We provided them with a detailed curriculum and instructions on how to run the 10 sessions and also held discussion sessions with them every other week to make sure they understood the curriculum and were delivering it correctly. We also maintained consistent communication with them throughout the entire semester, answering any questions that came up.

The students in the control group took moral education class delivered in a traditional classroom lecturing style. It consisted of three main components: moral characters like



citizenship, patriotism, honesty, and filial piety; school discipline and class rules, including praising good behavior and criticizing bad behavior; and class culture building, varying from discussing slogans of class sports teams and styles of classroom decorations, to team building games.

The classes in both groups finished their curricula at the end of the semester, before the final exam. The students were asked to complete the online assessment of depression once again at this time.

## Program

As shown in **Table 1**, the positive education program consisted of an introductory session and three main modules: understanding emotions, fostering positive emotions, and managing negative emotions. We started the program with an introductory session on meditation because meditation can help students learn more in class while generating more positive emotions (Waters, 2011). The first major module was about the definition, feeling, expression, and science of emotions, so that the students can fully understand what emotions are and what they can do about them. Then, we taught students practical skills to foster positive emotions like gratitude and serenity. Finally, negative emotions management classes were added as we realized that the promotion of positive emotions would be more effective if the students could manage some of their most common and harmful negative emotions. We chose to teach them how to manage anxiety because it is the most prevalent negative emotion among adolescents (Kashani and Orvaschel, 1990), and anger as its consequence can be particularly severe (Feindler and Ecton, 1986; Lehnert et al., 1994). This way we limited management of negative emotions to two sessions, so that the program was more balanced, yet still focusing primarily on positive emotions.

Walton (2014) argued that psychological interventions should be theoretically solid, context sensitive, and aim for long-lasting changes. Our intervention was designed under the framework of the Broaden-and-Build theory (Fredrickson, 2001), which predicts that fostering positive emotions can reduce negative emotions. We mainly used activities that required students' hands-on participation to enforce habits and embodied memory, as well as practical skills that they could use in frequent daily scenarios. Both components aimed

to produce long-lasting effects. And since interventions for adolescent populations should provide participants with greater respect (Yeager et al., 2018), we avoided long lectures, mandatory instructions, and quizzes, all of which could frustrate adolescents' needs for being respected and discourage their participation. Instead, we focused on activities that generated positive emotions, and practical skills that they could use in their daily lives as they saw fit. We believe this would make the students experience more autonomy and respect during the interventions. Here is a brief description of the activities and skills in each session:

1. Meditation – Meditation by focusing on breathing can increase mindfulness (Levinson et al., 2014) and help regulate negative emotions like stress, anxiety, and depression (Goldin and Gross, 2010). Ren et al. (2011) found that after a 20 min meditation session, Chinese college students became more alert, conscious, and insightful compared to those in the control group. In this kickoff session of our intervention, we taught students basic mediation skills, like abdominal breathing and counting breaths, which will be practiced in the beginning of every following sessions to make them more mindful and engaged in the program.
2. Know your emotions – Based on Russell (2003) psychological constructs of emotion and Fredrickson (2009) classification of positive emotions, we taught students about the basic positive and negative emotions. They also learned the functions of emotions in their daily scenarios. For example, anger means they felt they might be trespassed by other students, interest means they found a field that they might gain substantial growth in.
3. Express emotions – The students discussed experiences of different emotions and learned how to express them, especially the negative emotions. They also learned the facial, verbal, and body cues that could help them identify other people's emotions. They practiced this "emotion-reading" skill by guessing what emotions other students try to express in a charades-style game.
4. Emotions and brains – Using a model of human brains and the movie *Inside Out*, we taught students the basics of affective neuroscience (Panksepp and Watt, 2011), as well as the concept of neuroplasticity (Draganski et al., 2004). Teaching both subjects helped students gain a growth

**TABLE 1 |** Outline of the positive education program.

Module	Session	Subject	Teaching goal
Introduction	1	Meditation	Learn how to meditate and the relationship between meditation and emotions
Understanding emotions	2	Know your emotions	Understand the definition, classifications, and combinations of emotions
	3	Express emotions	How to express your emotions and identify other people's emotions
	4	Emotions and brains	Understand the basic neuroscience of emotions and better accept one's emotions
Fostering positive emotions	5	Find good things	Use "three good things" to foster positive emotions
	6	Gratitude	Experience, understand, and express gratitude
	7	Savoring	Learn to savor positive emotions
	8	Serenity	Learn the benefits and methods of serenity
Managing negative emotions	9	Anxiety	Learn the physiological and psychological characteristics of anxiety and how to manage it
	10	Anger	Learn the physiological and psychological characteristics of anger and how to express anger appropriately

mindset (Dweck, 2006), in which emotions are manageable and controllable. They also learned the “flip your lid” technique (Siegel and Bryson, 2012) that can help them understand the source of their anger and better control this feeling.

5. Find good things – Employed the “Three Good Things” intervention in which students talked with their parents about at least three good things each day to offset the overly negative emotions brought by the natural negativity bias of humans (Baumeister et al., 2001). This intervention was proven effective in increasing happiness and decreasing depression (Seligman et al., 2005). In a team competition game, every six students were assigned into one team. They wrote down good things that happened in the past 24 h on a poster paper with colored pens, and the team with the most good things listed won.
6. Gratitude – Gratitude is one of the most important positive emotions and correlates with many positive outcomes (McCullough, 2004). Following the “three good things” exercise, students then discussed the people responsible for these good things, and their feelings toward them. The teacher summarized these feelings as gratitude and asked the students to express their gratitude on gratitude cards. Each team also chose one person or thing that they needed to thank and wrote a card to/for this person or thing.
7. Savoring – Savoring helps students to be completely submerged in the current positive emotion, so that they can take full advantage of the broaden-and-build effects of the positive emotion (Fredrickson, 2009). Students also used this technique to increase their mindfulness of the environment, especially with regard to its positive aspects (Langer, 1989). Starting from the mindful raisin-eating exercise (Kabat-Zinn, 2006), students were asked to practice savoring food during their next meal.
8. Serenity – Serenity is one of the top 10 positive emotions according to Fredrickson (2009), yet many adolescents do not feel serene in schools (Byrne et al., 2007). Students shared their experiences of serenity and discussed how to keep calm during stressful times. In an exercise, students were asked to deliver a short improvised presentation and use the serenity technique to calm themselves before the presentation.
9. Anxiety – Students learned the psychology of anxiety and how to distinguish between healthy anxiety and unhealthy anxiety (Levitt, 2015). In an improvised classroom activity that supposedly elicits anxiety, students learned how to convert unhealthy anxiety into healthy anxiety that could actually benefit their performances.
10. Anger – Students learned the physiological and psychological characteristics of anger, so that they could better identify anger within themselves and others. They shared the experiences of bad consequences caused by anger and tried to describe the feelings of anger. They also learned anger management skills and practiced them in the class.

## Measures

Depression was measured by the five items that assess symptoms of depression in the patient-reported outcome measurement

information system (PROMIS) pediatric eight-item short forms (Varni et al., 2014). We used a Chinese version created in a previous study (Kern et al., 2018), which showed good reliability and validity. An example item is the statement, “In the past two weeks, I felt sad.” Participants were asked to rate their agreement with each answer choice according to a 5-point Likert scale. In this study, the Cronbach’s  $\alpha$  for the depression measurement was 0.918.

We also measured and analyzed participants’ anxiety before and after the experiment. The details are presented in the **Supplementary Material**.

## Data Analysis

Data was analyzed with *t* tests and repeated measures ANOVA in SPSS 19.

## RESULTS

### Random Assignment Check

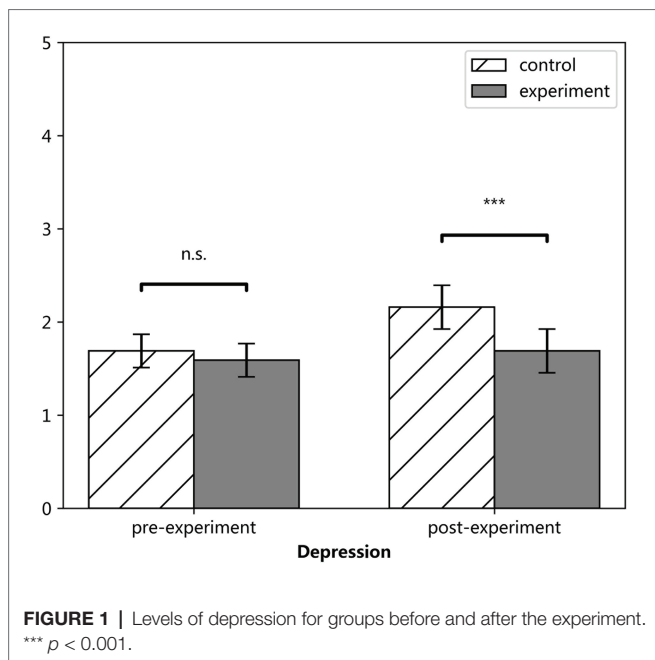
An independent *t* test was conducted on the relationship between the level of depression of students in the experiment group ( $M = 1.59$ ,  $SD = 0.88$ ) and that of students in the control group ( $M = 1.69$ ,  $SD = 0.86$ ). There was no significant difference ( $t = 0.716$ ,  $p = 0.477$ ,  $SE = 0.133$ ), indicating that the random assignment to conditions was effective.

### Effects of Intervention

We conducted 2 (experiment vs. control) by 2 (pre-experiment, post-experiment) ANOVA with the pre-experiment and post-experiment assessments of depression as repeated measures variables. As shown in **Table 2**, the main effects of both time and condition were significant. The interaction between time and assignment condition was significant too, as illustrated in **Figure 1**. The increase of the level of depression of students in the experiment group was significantly lesser than that in the control group. Simple effects analysis showed that there was no significant difference between the levels of depression of students in the two groups before the experiment,  $F(1, 171) = 0.509$ ,  $p = 0.477$ ,  $\eta^2 = 0.003$ ; after the experiment, the level of depression of students in the experiment group was significantly lower than that of the control group,  $F(1, 171) = 9.691$ ,  $p = 0.002$ ,  $\eta^2 = 0.055$ . In the control group, the simple effect of time was significant,  $F(1, 171) = 18.218$ ,  $p < 0.001$ ,  $\eta^2 = 0.096$ ; in the experiment group, there was no significant simple effect of time,  $F(1, 171) = 0.722$ ,  $p = 0.397$ ,  $\eta^2 = 0.004$ .

**TABLE 2 |** ANOVA results of depression between experiment and control groups over time.

Effect	<i>F</i>	Hypothesis df	Error df	<i>p</i>	Partial $\eta^2$
Time	12.842	1	171	<0.001	0.070
Condition	5.887	1	171	0.016	0.033
Time $\times$ condition	5.592	1	171	0.019	0.032



## DISCUSSION

The current study attempted to test the effects of a positive education program that focused primarily on positive emotions on the prevention of depression in adolescents. The results showed that the positive education program successfully protected participating students from increases in depression.

The effect size of the current study was relatively small for two possible reasons. First, the post-experiment assessment was administered right before a final exam, when the level of negative emotions of the students were the highest during the whole semester. Even after we added anxiety and anger management sessions in the positive education program, this ceiling effect of soaring negative emotions might have cofounded the results of the current study.

Second, culture plays a role in the dynamic relationship between positive emotions and negative emotions (Mesquita and Frijda, 1992; Shweder et al., 1993). Bagozzi et al. (1999) found that the emotional styles of East Asians were more dialectical than those of Americans. Generally speaking, East Asians are more likely to experience positive emotions and negative emotions simultaneously than Euro-Americans (Schimmack et al., 2002; Spencer-Rodgers et al., 2010; Miyamoto and Ryff, 2011). Miyamoto et al. (2010) found that East Asians exhibit more negative emotions than Euro-Americans in positive situations or when asked to recall positive memories. In other words, the effects of fostering positive emotions on reducing negative emotions might be smaller for East Asians. Therefore, the dialectical emotional style of the Chinese participants in this study might have offset the effects of the positive emotion interventions on depression.

The current study is, to the best of our knowledge, the first study to test the effects of a positive education program among Chinese adolescents. Many of the psychological characteristics of Chinese students are different from their counterparts in the West. For example, they are more collectivistic

(Triandis, 2001), more dialectical (Schimmack et al., 2002; Spencer-Rodgers et al., 2010; Miyamoto and Ryff, 2011), possessing more holistic thinking styles (Nisbett et al., 2001), and interdependent self-construals (Gudykunst et al., 1996). Therefore, it remained in doubt whether positive education could increase adolescent well-being in China as well. This study provided empirical evidence for the first time that positive education would be beneficial to Chinese adolescents.

This study has important implications in practice too. In contrast to pathological interventions that often focus on correcting students' thoughts and behaviors, positive interventions consist of positive activities that can keep students intrinsically motivated. The more engaged in positive activities the students are, the more effectively the interventions can improve their lives, which would make them even more attracted to the positive education program. This upward spiral is best illustrated by an excerpt of testimony from one of the participating head teachers:

Because (positive education) requires children to communicate with their parents, and they have to talk about happy things, that brings laughter to their families, and everybody becomes happy ... I am happy too. The happiest moment of mine each day is to read the 'three good things' of the students. The children's writings are simple, childish, yet interesting. That kind of simple joy is contagious. I am happy, parents are happy, and children are flourishing. The whole class becomes positive and warm, students become more motivated to study. Who doesn't like this kind of class? When you love the class, you will love learning too.

## Limitations and Future Research Directions

This study has several limitations. First, it was not a double blind study by design. The participating teachers in both the experiment and the control group knew the assignments. This might have caused observer bias by the teachers. Second, only two time points were measured for the intervention. Longer time tracking and more series of measurements are needed for future research, especially assessments that are not at the end of the semester and before the final exam. Doing so would avoid the possible ceiling effects of soaring negative emotions. Third, more indicators of adolescent mental health both positive and negative are needed to be measured in future research. This would present a more comprehensive evaluation of the effects of positive education programs on adolescents.

In the future, we hope to see more research to test the effectiveness of the intervention program in this study in other countries. In contrast to typical positive education programs that often consist of a wide range of positive psychology elements, this program was designed to focus on positive emotions. Similar studies are needed in cultures distinct from Chinese culture, so that we can better understand the interplay between culture and this positive education program. Furthermore, we found teachers participating in the positive education program enjoyed it in this study. It would be helpful

to conduct empirical research to investigate the benefits of positive education to teachers' well-being.

## CONCLUSION

This study found that a positive education program focusing on positive emotion interventions could prevent adolescent depression in a Chinese school. The results provided empirical evidence for the effectiveness of positive education programs in China.

## DATA AVAILABILITY

The datasets generated for this study are available on request to the corresponding author.

## ETHICS STATEMENT

Research for this study was approved by the Human Research Ethics Committee of Tsinghua University. Informed consent was obtained from participants. The participants were notified that all of their responses would only be accessible to the researchers.

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## AUTHOR CONTRIBUTIONS

YZ, FY, and GZ designed the study. YZ and YW collected and analyzed the data. YZ and FY wrote the manuscript. KP supervised the study and edited the final draft of the manuscript.

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## SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/article/10.3389/fpsyg.2019.01344/full#supplementary-material>

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**Conflict of Interest Statement:** The positive education interventions described in this article were designed by the authors. The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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# Gratitude Moderates the Mediating Effect of Deliberate Rumination on the Relationship Between Intrusive Rumination and Post-traumatic Growth

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**Purpose:** This study examines the moderating effect of gratitude on the mediating effect of deliberate rumination on the relationship between intrusive rumination and post-traumatic growth (PTG).

**Methods:** We used self-report questionnaires to collect data from 450 18–68-year-old participants ( $M_{\text{age}} = 39.73$ ,  $SD = 13.73$ ) residing in major cities and regions across South Korea. Data that were collected from 411 participants were subjected to analysis. Version 25 of SPSS (Statistical Package for Social Science) and PROCESS macro were used to analyze mediation, moderation, and moderated mediation effects.

**Results:** Deliberate rumination mediated the relationship between intrusive rumination and PTG. Gratitude moderated the effect of deliberate rumination on PTG. Finally, gratitude moderated the mediating effect of deliberate rumination on the relationship between intrusive rumination and PTG.

**Conclusion:** Deliberate rumination and gratitude facilitate PTG for traumatized adults. In particular, gratitude reinforces the effect of deliberate rumination on PTG.

**Keywords:** post-traumatic growth, intrusive rumination, deliberate rumination, gratitude, trauma

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## INTRODUCTION

Nationwide surveys indicate that 71.9% of Korean (Seo et al., 2012) adults and 89% of American adults (Kilpatrick et al., 2013) experience at least one traumatic experience during their lifetime. Traumatic events can cause serious psychological problems (Christopher, 2004), and approximately 10–15% of those who experience trauma are diagnosed with post-traumatic stress disorder (Green and Lindy, 1994).

While past studies have focused on clinical symptoms (e.g., reexperiencing symptoms, hyperarousal) that result from the experience of a traumatic event, recent research has begun to focus on positive changes and growth that occur after a traumatic experience (Joseph et al., 1993; Nerken, 1993; Tedeschi and Calhoun, 1995). Indeed, researchers have found that PTG can occur after exposure to various types of traumatic events such as bereavement (Taku et al., 2008), cancer (Cormio et al., 2017), physical violence (Kleim and Ehlers, 2009), and traffic accidents (Nishi et al., 2010).

**Abbreviations:** PTG, post-traumatic growth; SPSS, Statistical Package for Social Science.

Post-traumatic growth refers to the positive changes and growth that occur as a result of experiencing trauma (Tedeschi and Calhoun, 2004). PTG can lead to an enhanced sense of personal strength, changes in one's perspective toward life, and improved interpersonal relationships. Some individuals experience positive changes and growth after trauma, although others experience intrusive symptoms such as nightmares, hypo/hyperarousal, depression, and negative changes in cognition and mood. Persistent depression is linked to worse outcomes such as maladaptive coping and maladjustment (Ghio et al., 2015).

Why do some people experience PTG? According to previous studies, factors related to PTG can be classified into three categories: the characteristics of the event, personal characteristics, and cognitive processing of the traumatic experience (Calhoun et al., 2000; Linley and Joseph, 2004; Tedeschi and Calhoun, 2004; Kim and Lee, 2016). In particular, many researchers have focused on the ways in which individuals cognitively process a traumatic event (e.g., intrusive and deliberate rumination).

Rumination plays a key role in the process of PTG and is divided into two categories: intrusive and deliberate rumination (Calhoun and Tedeschi, 2006). Intrusive rumination is a process by which one automatically reexperiences images, emotions, and thoughts that are related to an event. On the other hand, deliberate rumination refers to an intentional thought process through which one attempts to understand the cause and meaning of an incident. After a traumatic event, affected individuals may experience intrusive rumination and extreme emotional distress, but they may also simultaneously attempt to engage in deliberate rumination to alleviate psychological distress (Wu et al., 2015; Zhou and Wu, 2015; Zhang et al., 2018).

Deliberate rumination can facilitate the expansion of existing schemas and help one better understand a traumatic experience (Triplett et al., 2012). An individual's beliefs and values may be changed and enriched through the process of deliberate rumination, and this in turn may promote PTG. PTG can lead to various positive changes such as an increased appreciation of life and self-understanding as well as changes in life priorities (Calhoun et al., 2010).

Tedeschi and Calhoun (1996, 2004) noted that the process of PTG occurs across several stages. Individuals possess a schema that corresponds to a cognitive framework of the self, others, and the world. After traumatic events, affected individuals experience distortions of their belief systems, and intrusive rumination is activated in response to extreme psychological stress (Zhou and Wu, 2015; Zhang et al., 2018). However, intrusive thoughts may activate deliberate rumination, which may help individuals better understand their traumatic experience and rebuild a new schema (Triplett et al., 2012; Tsai et al., 2016; Gwak and Park, 2018).

Deliberate rumination is an attempt to accommodate trauma into one's cognitive schema. It is an active cognitive process that involves reconstructing an existing schema to promote PTG. The effects of deliberate rumination on PTG have been demonstrated in the literature (Tedeschi and Calhoun, 2004; Calhoun and Tedeschi, 2006), and higher levels of deliberate rumination have been found to be associated with greater PTG (Linley and Joseph,

2004; Taku et al., 2008; Triplett et al., 2012; Zhou and Wu, 2015; Cárdenas et al., 2019). In particular, Triplett et al. (2012) found that deliberate rumination mediates the relationship between intrusive rumination and PTG.

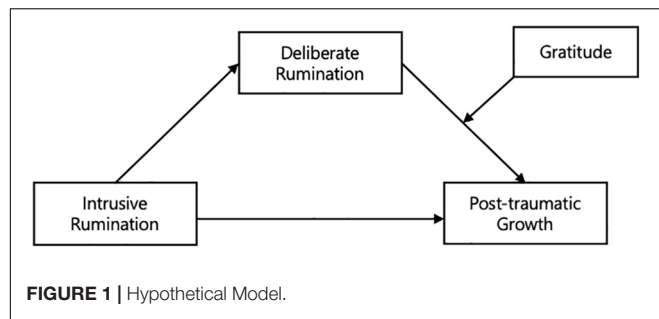
Gratitude has been identified as a factor that promotes PTG. Gratitude refers to an attitude of thankfulness and joy for the benefits and blessings that one has received from other people and nature (Emmons and Shelton, 2002). Adler and Fagley (2005) noted that gratitude involves "noticing and acknowledging its value and meaning of something—an event, behavior, object—and feeling a positive emotional connection to it." Gratitude includes cognitive, emotional, and behavioral factors (McCullough et al., 2001; Watkins et al., 2003; Adler and Fagley, 2005) and is an attribution-dependent characteristic (Weiner, 1985) that allows one to perceive the benefits that have been gained from others and various life experiences (Emmons, 2007). Gratitude consists of an appreciation of others and various aspects of daily life and the ability to recall positive past experiences (Watkins et al., 2003).

A recent meta-analytic study found that gratitude is a significant predictor of PTG (Jang and Kim, 2017). Recent studies have also shown that gratitude moderates the effect of post-traumatic stress on PTG (Vieselmeyer et al., 2017; Leppma et al., 2018). Highly grateful individuals tend to be more likely to appreciate everyday events (McCullough et al., 2002), which in turn can facilitate adaptive coping (Fredrickson, 2004). Such individuals experience gratitude more frequently in daily life and across a wider array of circumstances compared to those with lower levels of gratitude. Further, experiences of gratitude in the midst of trauma may be significant because gratitude not only inspires and transforms individuals, it also offers meaning in life by helping people interpret their life as a gift. Gratefulness may also have long-term survival benefits by making people more open-minded and flexible, ultimately allowing them to better perceive and take advantage of opportunities, which in turn can facilitate adaptive coping (Johnson and Fredrickson, 2005). Past studies have also shown that gratitude promotes deliberate rumination, which promotes PTG (Wood et al., 2010; Zhou and Wu, 2015; Kim and Lee, 2016).

In particular, Zhou and Wu (2015) longitudinally examined the relationship between gratitude, deliberate rumination, and PTG among people who had experienced an earthquake. Specifically, the participants were assessed three and a half years (T1), four and a half years (T2), and five and a half years (T3) after the earthquake. The results showed that gratitude predicted PTG from T2 and T3. This result indicates that gratitude is a stable predictor of PTG. Additionally, gratitude at T1 predicted PTG at T3 through deliberate rumination at T2.

In summary, the mediating effect of deliberate rumination on the relationship between intrusive rumination and PTG has been established in the literature. In the present study, gratitude was expected to moderate the relationship between deliberate rumination and PTG. Accordingly, five research hypotheses were formulated (**Figure 1**).

**Hypothesis 1:** Intrusive rumination will be negatively related to PTG.



Hypotheses 2: Deliberate rumination will mediate the relationship between intrusive rumination and PTG.

Hypothesis 3: Gratitude will be positively related to PTG.

Hypothesis 4: Gratitude will moderate the relationship between deliberate rumination and PTG.

Hypothesis 5: The mediating effect of deliberate rumination on the relationship between intrusive rumination and PTG will be moderated by gratitude.

## MATERIALS AND METHODS

### Participants and Procedures

Participants in this study were recruited from community centers in major cities and regions across South Korea. Trained investigators (e.g., psychology graduate students) provided participants with a detailed introduction to the study. All participants provided written informed consent in accordance with the Declaration of Helsinki and signed a consent form before completing the questionnaires. After the participants completed the questionnaires, they were compensated. This study was approved by the Institutional Review Board of Dankook University.

This study was conducted among 450 adults with an age range of 19–68 years; the mean age of participants was 39.73 years ( $SD = 13.73$ ). The sample consisted of 245 women (59.6%) and 166 men (40.4%). The age distribution of the participants was as follows: 123 (29.9%), 98 (23.8%), 83 (20.2%), 69 (16.8%), and 38 (9.2%) participants were in their 20s, 30s, 40s, 50s, and 60s, respectively. Further, 155 (37.7%), 105 (25.3%), 56 (10.6%), 41 (10.0%), and 53 (12.9%) participants were college, graduate school, university, professional college, and high school graduates, respectively; 0.5% had no educational experience. Additionally, 230 (56%) and 163 (36.7%) participants were married and unmarried, respectively (Table 1). Finally, using Allen's (2005) categorization of trauma into three types – interpersonal, impersonal, and interpersonal related trauma – 143 (34.8%) participants of this study experienced interpersonal trauma inflicted by human perpetrators (e.g., physical or sexual abuse), 146 (35.5%) experienced impersonal trauma caused by human or natural origins (e.g., accidents or natural disasters), and 122 (29.7%) experienced interpersonal related trauma (e.g., death of a partner, severe illness).

**TABLE 1 |** Demographic Information.

		<i>N</i> = 411	
		Frequency	percent
Sex	Male	166	40.4%
	Female	245	59.6%
Age	20–29	123	29.9%
	30–39	98	23.8%
	40–49	83	20.2%
	50–59	69	16.8%
	60–69	38	9.2%
Education	No experience	2	0.5%
	Primary School and Middle school	53	12.9%
	Community college graduate	41	10.0%
	College undergraduate	56	13.6%
	College graduation	155	37.7%
	Graduate grad school	105	25.3%
Marriage	Single	163	39.7%
	Marriage	230	56.0%
	Divorced	14	3.4%
	Bereavement	4	1.0%
Income Status	High	5	1.2%
	Middle-high	83	20.2%
	Middle	210	51.1%
	Middle-low	94	22.9%
	Low	19	4.6%
Religious	No religion	159	38.7%
	Catholic	26	6.3%
	Protestant	197	47.9%
	Buddhism	28	6.8%
	Won Buddhism	1	0.2%

**TABLE 2 |** Correlations, mean, and standard deviation among variables (*N* = 411).

	Intrusive rumination	Deliberate rumination	Gratitude	Post-traumatic growth
Intrusive rumination				
Deliberate rumination	0.36**			
Gratitude	−0.29**	0.02		
Post-traumatic growth	−0.03	0.36**	0.45**	
Mean	17.94	22.98	34.95	79.47
SD	6.97	7.01	5.96	22.60

\*\**P* < 0.01.

## Measures

### Trauma Experience Questionnaire

In the present study, the Trauma Experience Questionnaire, which was developed by Song et al. (2009) and revised by Shin and Chung (2012), was used to obtain information about traumatic events participants had experienced (e.g., type, duration, and severity of the traumatic event). The questionnaire contained seven items. Participants were asked to disclose the most painful traumatic event that they had experienced and to categorize the type of the event. They were then instructed to respond to the items of the assessment based



**TABLE 3 |** Mediating effects of deliberate rumination in relationship between intrusive rumination and post-traumatic growth).

DV	IV	B	S.E	t	p	95% CI		F	R <sup>2</sup>
						Lower	Upper		
Deliberate rumination	(constant)	16.33	0.90	18.10	0.00	14.56	18.10	62.51***	0.13
	Intrusive rumination	0.37	0.05	7.91	0.00	0.28	0.46		
Post-traumatic growth	Intrusive rumination	0.60	0.16	−3.80	0.00	−0.91	−0.29	38.63***	0.16
	Deliberate rumination	1.36	0.16	8.77	0.00	1.06	1.67		

\*\*\* $P < 0.001$ .

on the aforementioned event. They reported whether they experienced psychological pain and scored the severity of the subjective pain that they had experienced at the time of the event and more recently on a scale of 1–7 (1 = no pain; 7 = very painful).

### Korean Version of the Event-Related Rumination Inventory

The Korean version of the Event-Related Rumination Inventory was developed by Cann et al. (2011) and revised by Ahn et al. (2013). The scale consists of 20 items that assess intrusive and deliberate rumination using a 4-point Likert scale (0 = not at all; 3 = always). A few examples of items that assess intrusive rumination are as follows: “Thoughts, memories, or images of the event came to mind even when I did not want them” and “I could not keep images or thoughts about the event from entering my mind.” A few examples of items that assess deliberate rumination are as follows: “I thought about whether I could find meaning from my experience,” “I thought about the event and tried to understand what happened,” and “I deliberately thought about how the event had affected me.” In the present study, the Cronbach’s alphas of the intrusive and deliberate rumination subscales were 0.93 and 0.91, respectively.

### Korean Version of the Post-traumatic Growth Inventory

The Korean version of the Post-Traumatic Growth Inventory that was developed by Tedeschi and Calhoun (1996) and validated by Song et al. (2009) was used to measure individual perceptions of positive changes after a traumatic experience. The scale consists of 21 items with four subscales: relating to others, new possibilities, personal strength, and spiritual change. For each of the subscales, responses are recorded on a 6-point Likert scale (0 = no change; 5 = very high degree of change). Higher total scores are indicative of greater PTG. The following are representative scale items: “I changed my priorities about what is important in my life,” “I established a new path for my life,” and “I am more likely to try to change things that need changing.” The Cronbach’s alpha of this scale was 0.94 in the present study.

### Korean Version of the Gratitude Questionnaire

We used the Korean version of the Gratitude Questionnaire that was developed by McCullough et al. (2002) and validated by Kwon et al. (2006). It measures the intensity, frequency,

**TABLE 4 |** Indirect effects on post-traumatic growth (Bootstrapping).

Pathway	Coefficient	SE	95% CI	
			Lower	Upper
Intrusive rumination → Deliberate rumination → Post-traumatic growth	0.50	0.08	0.36	0.67

extent, and density of gratitude, consisting of 6 items that require responses to be recorded on a 7-point Likert scale (0 = strongly disagree; 6 = strongly agree). The following are representative scale items: “I have so much in life to be thankful for” and “As I get older, I find myself better able to appreciate the people, events, and situations that have been part of my life.” Two items are reverse-scored, and higher total scores are indicative of greater gratitude. The Cronbach’s alpha of this scale was 0.89 in the present study.

### Data Analysis

Version 25.0 of SPSS and PROCESS macro 2.16 for SPSS (Hayes, 2013) were used to test the research hypotheses. First, frequencies and descriptive statistics were computed to examine the demographic characteristics of the sample, and Pearson’s correlation analysis was conducted to examine the relationships between the study variables. Second, model 4 of PROCESS macro for SPSS was used to examine the mediating effect of deliberate rumination on the relationship between intrusive rumination and PTG (Zhao et al., 2010; Rucker et al., 2011). Next, a bootstrap test was conducted and the resultant 95% confidence intervals were inspected to examine the significance of the indirect effects that resulted from mediation analysis (Preacher et al., 2007).

Model 1 of PROCESS macro for SPSS was used to examine the moderating effect of gratitude on the relationship between deliberate rumination and PTG. Additionally, simple regression was conducted to examine the effect of deliberate rumination on PTG as a function of the level of gratitude (i.e., high vs. low). Finally, model 14 of PROCESS macro for SPSS was used to examine whether gratitude moderates the mediating effect of deliberate rumination on the relationship between intrusive rumination and PTG.

**TABLE 5 |** The moderating effects of gratitude on the relationship between intentional rumination and post-traumatic growth).

DV	IV	B	S.E	t	p	95% CI		F	R <sup>2</sup>
						Lower	Upper		
Post-traumatic growth	(constant)	79.50	0.92	86.79	0.00	77.20	81.30	66.79***	0.33
	Deliberate rumination	1.12	0.13	8.55	0.00	0.85	1.36		
	Gratitude	1.61	0.16	10.27	0.00	1.30	1.91		
	Deliberate rumination × Gratitude	−0.04	0.02	−2.10	0.03	−0.08	−0.01		

\*\*\* $p < 0.001$ .

## RESULTS

### Correlation Analysis

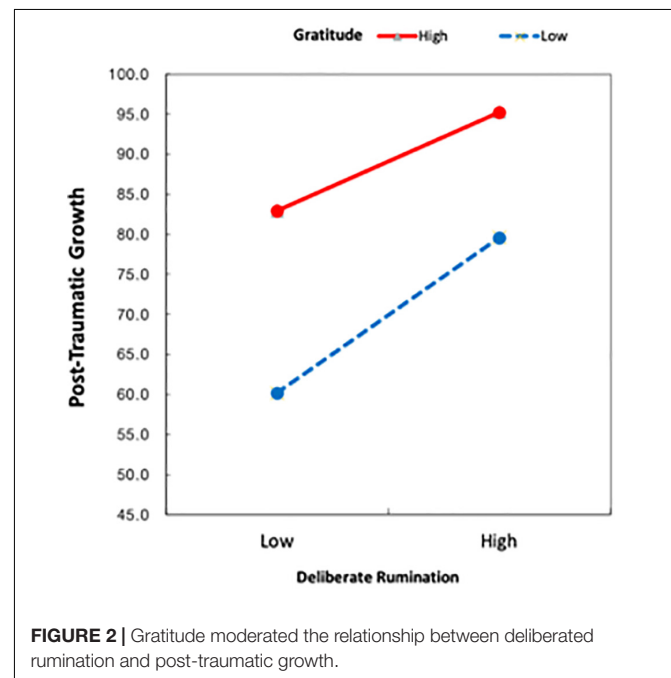
Emergent correlations between the study variables are shown in **Table 2**. Intrusive rumination correlated positively with deliberate rumination ( $r = 0.36$ ,  $p < 0.01$ ) and negatively with gratitude ( $r = -0.29$ ,  $p < 0.01$ ). On the other hand, deliberate rumination was unrelated to PTG. Deliberate rumination correlated positively with PTG ( $r = 0.36$ ,  $p < 0.01$ ) but was unrelated to gratitude. Finally, there was a positive correlation ( $r = 0.45$ ,  $p < 0.01$ ) between gratitude and PTG.

### The Mediating Effect of Deliberate Rumination on the Relationship Between Intrusive Rumination and PTG

The mediating effect of deliberate rumination on the relationship between intrusive rumination and PTG was examined (**Table 3**). Intrusive rumination had a negative effect on PTG ( $B = 0.60$ ,  $t = -3.80$ ,  $p < 0.001$ ) and a positive effect on deliberate rumination ( $B = 0.37$ ,  $t = 7.91$ ,  $p < 0.001$ ). Deliberate rumination had a positive effect on PTG ( $B = 1.36$ ,  $t = 8.77$ ,  $p < 0.001$ ). In addition, the mediating effect of deliberate rumination on the relationship between intrusive rumination and PTG was statistically significant (95% confidence interval = 0.36, 0.67) (**Table 4**).

### The Moderating Effect of Gratitude on the Relationship Between Deliberate Rumination and PTG

The moderating effect of gratitude was examined by entering deliberate rumination, gratitude, and their interaction terms (i.e., deliberate rumination × gratitude) into the model. **Table 5** shows the results of the analysis that was conducted to examine

**FIGURE 2 |** Gratitude moderated the relationship between deliberate rumination and post-traumatic growth.

the moderating effect of gratitude on the relationship between deliberate rumination and PTG.

The main effects of deliberate rumination ( $B = 1.12$ ,  $t = 8.55$ ,  $p < 0.001$ ) and gratitude ( $B = 1.61$ ,  $t = 10.27$ ,  $p < 0.001$ ) as well as their interaction effect (i.e., deliberate rumination × gratitude) ( $B = -0.04$ ,  $t = -2.10$ ,  $p < 0.05$ ) were statistically significant. Simple regression analysis was conducted to examine the effect of deliberate rumination on PTG as a function of the level of gratitude (**Table 6**). The results revealed that the 95% confidence intervals did not include a 0. In other words, the effect of deliberate rumination on PTG differed between individuals who reported low (i.e.,  $M - 1$  SD) and high (i.e.,  $M + 1$  SD) levels of gratitude (**Figure 2**). Gratitude reinforced the effect of deliberate rumination on PTG.

### The Moderating Effect of Gratitude on the Mediating Effect of Deliberate Rumination on the Relationship Between Intrusive Rumination and PTG

**Table 7** shows the results of the analysis that was conducted to examine the moderating effect of gratitude on the mediating

**TABLE 6 |** Conditional indirect effect at specific levels of the gratitude when deliberate rumination as a mediator.

Conditional effect of gratitude	Estimate	S.E	t	p	95% CI	
					Lower	Upper
−1SD	−5.95	0.17	7.99	0.00	1.02	1.68
M	1.05	0.13	8.06	0.00	0.80	1.32
+1SD	0.86	0.18	4.83	0.00	0.51	0.1.21

**TABLE 7 |** Moderated mediation effects of gratitude on the relationship between intrusive rumination, deliberate rumination, and post-traumatic growth.

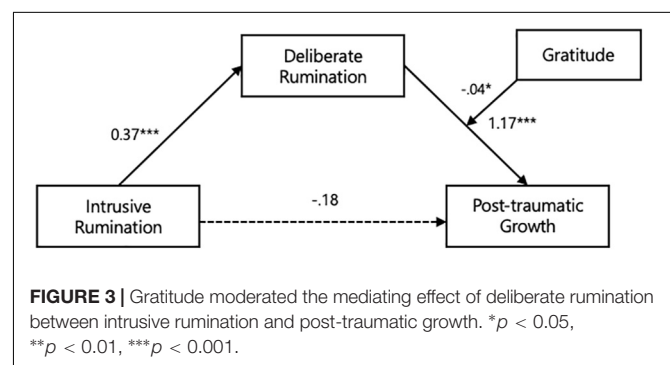
Mediator variables models (DV: Deliberate rumination)						
	<i>B</i>	<i>S.E</i>	<i>t</i>	<i>p</i>	Lower	Upper
(constant)	−0.0005	0.33	−0.0017	0.9987	−0.6421	0.6410
Intrusive rumination	0.37	0.05	7.91	0.00	0.28	0.46
Moderator variable models (DV: Post-traumatic growth)						
	<i>B</i>	<i>S.E</i>	<i>t</i>	<i>p</i>	Lower	Upper
(constant)	0.03	0.92	0.04	0.97	−1.76	1.84
Intrusive rumination	−0.18	0.15	−1.19	0.23	−0.47	0.12
Deliberate rumination	1.17	0.14	8.36	0.00	0.90	1.45
Gratitude	1.54	0.16	9.29	0.00	1.21	1.87
Deliberate rumination × Gratitude	−0.04	0.02	−2.25	0.03	−0.08	−0.01
Moderate mediation index		<i>S.E</i>			Lower	Upper
−0.016		0.008			−0.033	−0.002

effect of deliberate rumination on the relationship between intrusive rumination and PTG. The direct effect of intrusive rumination on PTG was not significant ( $B = -0.18$ ,  $t = -1.19$ ,  $p = 0.23$ ). However, deliberate rumination had a positive effect on PTG ( $B = 1.17$ ,  $t = 3.88$ ,  $p < 0.001$ ), the interaction term (deliberate rumination  $\times$  gratitude) ( $B = -0.04$ ,  $t = -2.25$ ,  $p < 0.05$ ) was significant, and the index of the moderated mediation effect was significant (95% confidence interval =  $-0.033$ ,  $-0.002$ ) (**Figure 3**). Further, **Table 8** shows the results of the bootstrap test, which revealed the conditional indirect effect of gratitude. The 95% confidence intervals did not include a 0. In other words, the moderating effect of gratitude through deliberate rumination on PTG differed for individuals who reported low (i.e.,  $M - 1$  SD), average (i.e., mean), and high (i.e.,  $M + 1$  SD) levels of gratitude.

## DISCUSSION

The major findings of the present study are discussed in this section. The previously observed mediating effect of deliberate rumination on the relationship between intrusive rumination and PTG was verified. Intrusive rumination facilitated PTG by promoting deliberate rumination (Taku et al., 2008; Triplett et al., 2012; Wu et al., 2015). These results are consistent with past findings that post-traumatic intrusive rumination stimulates deliberate rumination, which in turn promotes PTG (Triplett et al., 2012; Tsai et al., 2016; Zhou and Wu, 2016; Zhang et al., 2018).

The results of this study support the PTG model that was proposed by Tedeschi and Calhoun (2004). According to this model, deliberate rumination plays a key role in the PTG process. Many individuals experience intrusive rumination after traumatic events (Scarpa et al., 2009), and intrusive rumination can activate deliberate rumination. Persistent intrusive rumination can adversely impact PTG and is likely to cause post-traumatic stress disorder (Triplett et al., 2012). In particular, deliberate rumination can help one reconstruct



an incident and correct dysfunctional beliefs about a traumatic event (Seo and Chae, 2006).

Second, in the present study, gratitude had a positive impact on PTG, and deliberate rumination and gratitude had an interaction effect on PTG. These results concur with past findings that the influence of deliberate rumination on PTG is strengthened by high levels of gratitude (Zhou and Wu, 2015; Kim and Lee, 2016). This suggests that the effect of deliberate rumination on PTG is reinforced by gratitude.

Past studies have only examined the direct relationship between gratitude and PTG. In this regard, the present findings further our understanding of the specific role that gratitude plays in PTG by delineating the moderating effect of gratitude on the relationship between deliberate rumination and PTG.

**TABLE 8 |** Conditional indirect effect of gratitude when deliberate rumination mediated between intrusive rumination and post-traumatic growth.

Mediator	Gratitude	Estimates	S.E	95% CI	
				Lower	Upper
Deliberate rumination	−1SD	0.53	0.09	0.36	0.73
	M	0.42	0.07	0.29	0.56
	+1SD	0.34	0.07	0.20	0.49

Gratitude can alter the perspectives from which traumatic experiences are interpreted (Watkins, 2014). Highly grateful individuals tend to find positive resources in their lives after a traumatic event and perceive themselves and their environments positively (Fredrickson, 2004). In other words, gratitude can help individuals find new meaning and value after a traumatic experience and accept painful experiences as a part of their lives.

One of the key findings of this study pertains to the moderating effect of gratitude on the mediating effect of deliberate rumination on the relationship between intrusive rumination and PTG. This result is consistent with past findings that highly grateful individuals experience greater PTG as a result of their cognitive efforts to understand a traumatic event (McCullough et al., 2006; Chun and Lee, 2013; Watkins, 2014). This suggests that the impact of deliberate rumination on PTG varies as a function of the level of gratitude. In this regard, gratitude can activate deliberate rumination and act as a buffer against the psychological distress that is caused by intrusive thoughts (Tsai et al., 2016; Leppma et al., 2018).

This study makes several contributions to the literature. First, past studies that have examined the impact of gratitude on PTG have been conducted using developmentally homogeneous samples such as adolescents and middle-aged adults. However, in this study, we used a heterogeneous sample of participants who represented all the developmental stages ranging from youth to older adulthood. This enhances the generalizability of the observed effect of gratitude on PTG to people of all ages. Second, the association between the gratitude and PTG has been observed in previous studies, but the moderating effect of gratitude on PTG has not been clearly delineated. In addition, there has been a lack of understanding about how deliberate rumination contributes to PTG. In this study, we have delineated the moderating effect that gratitude has on the mediating effect of deliberate rumination on the relationship between intrusive rumination and PTG.

The present findings have clinical implications. Specifically, therapists must be informed that repetitive and intrusive thoughts are natural reactions to a traumatic event and that traumatized individuals do not need to excessively suppress or avoid thoughts about their traumatic experience. In addition, it is necessary to implement training and intervention programs that can help individuals engage in deliberate rather than intrusive rumination. In particular, the present finding that gratitude enhances the effect of deliberate rumination on PTG suggests that psychological interventions should aim to promote gratitude among traumatized individuals (e.g., gratitude writing).

This study has several limitations. First, self-report measures were used to collect data in the present study; thus, future studies

should use behavioral observations and the reports of family members and acquaintances to measure the study variables. Second, as this study used a cross-sectional research design, inferences cannot be drawn about the causality of emergent relationships. Future studies should use a longitudinal research design to test the validity of the present findings. Third, we did not distinguish between different types of trauma and the period after trauma occurrence; we weighed all traumatic experiences equally, although research suggests that different types of trauma and the period after occurrence might differently influence PTG.

Despite its limitations, this is the first study to assess the moderating effect of gratitude on the mediating effect of deliberate rumination on the relationship between intrusive rumination and PTG. These findings shed light on how and when gratitude is associated with PTG via deliberate rumination. Further, this study provides grounds for gratitude interventions for adults who have experienced trauma to facilitate growth. It also implies that in the midst of distress, those who have experienced trauma may be able to consider their life more meaningful through gratitude.

## DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

## ETHICS STATEMENT

All subjects gave written informed consent in accordance with the Declaration of Helsinki. This study was approved by the Institutional Review Board of Dankook University.

## AUTHOR CONTRIBUTIONS

EK collected and analyzed the data and wrote the first draft of the manuscript. SB led manuscript writing and revised it critically for important content. Both authors participated in the final approval of the version to be published and agreed to be accountable for all aspects of the work.

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**Conflict of Interest:** The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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# Impact of a Mindfulness-Based Intervention on Basic Psychological Need Satisfaction and Internalized Symptoms in Elementary School Students With Severe Learning Disabilities: Results From a Randomized Cluster Trial

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**Background:** Mindfulness is hypothesized to lead to more realistic appraisals of the three basic psychological needs, which leads people to benefit from high levels of need satisfaction or helps them make the appropriate changes to improve need satisfaction. Mindfulness-based interventions (MBIs) have also shown promise to foster greater basic psychological need satisfaction in students with learning disabilities (LDs).

**Objective:** The goal of the present study was to evaluate the impact of a MBI on the satisfaction of the basic psychological needs and on internalized symptoms in students with severe LDs. A randomized cluster trial was implemented to compare the progression of need satisfaction, anxiety, and depression symptoms in participants pre- to post-intervention and at follow-up.

**Method:** Elementary school students with severe LDs ( $N = 23$ ) in two special education classrooms took part in this study and were randomly attributed to either an experimental or an active control group.

**Results:** Mixed ANOVAs first showed that the experimental condition did not moderate change over time such that similar effects were observed in the experimental and active control groups. Looking at main effects of time on participants' scores of autonomy, competence, and relatedness across time, we found a significant within-person effect for the competence need ( $p = 0.02$ ). *Post hoc* analyses showed that for both groups, competence scores were significantly higher at post-intervention ( $p = 0.03$ ) and at

follow-up ( $p = 0.04$ ), when compared to pre-intervention scores. A significant main effect was also found for anxiety levels over time ( $p = 0.008$ ). *Post hoc* analyses showed that for both groups, scores were significantly lower at post-intervention ( $p = 0.01$ ) and at follow-up ( $p = 0.006$ ), when compared to pre-intervention scores.

**Conclusion:** Although the MBI seemed useful in increasing the basic psychological need of competence and decreasing anxiety symptoms in students with severe LDs, it was not more useful than the active control intervention that was used in this project. Future studies should verify that MBIs have an added value compared to other types of interventions that can be more easily implemented in school-based settings.

**Keywords:** basic psychological need satisfaction, autonomy, competence, relatedness, severe learning disabilities, mindfulness, anxiety, depression

## INTRODUCTION

Students with learning disabilities (LDs) represent 13% of the total student population in the United States (Cortiella and Horowitz, 2014). Research has shown that teachers tend to be more controlling with students who have severe LDs than with students with no identified disability, resulting in lower perceived competence and autonomy (Grolnick and Ryan, 1990). Yet, feeling autonomous, competent, and related to others is just as important for these students as for students in regular education curriculum; high satisfaction of these needs is indeed associated with academic achievement and psychological adjustment of students with identified LDs (Deci et al., 1992; Carter et al., 2006; Konrad et al., 2007; Anctil et al., 2008). Providing opportunities for self-determined skills instruction and learning has been suggested as a cornerstone of specialized education for students with severe LDs (Field et al., 2003). Indeed, the positive effects of self-determined education can be seen later in life in students with severe LDs, as those with higher basic psychological need satisfaction secure higher-paying and more stable jobs (Wehmeyer and Schwartz, 1997). However, to date, there is a paucity of interventions that specifically target the satisfaction of psychological needs for these students (Malboeuf-Hurtubise et al., 2017c).

Among other potential interventions that have been proposed, the intervention *Mission Méditation*, which targets mindfulness, has shown promise (Malboeuf-Hurtubise and Lacourse, 2016). Mindfulness can be defined as the process by which we “[pay] attention in a particular way: on purpose, in the present moment, and non-judgmentally” (Kabat-Zinn, 1994). According to Ryan and Deci (2000), mindfulness could lead to optimal self-regulation by allowing individuals to be in touch with their basic psychological needs for competence (feeling effective in our actions with the environment), autonomy (feeling volition, willingness, and choice in our actions), and relatedness (feeling connected and loved by others (Ryan and Deci, 2000; Brown and Ryan, 2003). Specifically, Brown and Ryan (2003) have argued that mindfulness acts through an unveiling of moment-to-moment experiences, in which barriers such as judgmental thoughts and environmental factors clouding one’s judgment are removed. Such barriers

are thought to have an impact on one’s perception of basic psychological need satisfaction. As such, mindfulness is hypothesized to lead to more realistic appraisals of the three basic psychological needs for autonomy, competence, and relatedness (Malboeuf-Hurtubise et al., 2017c), which in turn leads people to either benefit from high levels of need satisfaction or help them make the appropriate changes to improve need satisfaction. An increasing amount of research within the self-determination theory (SDT) framework has supported this proposition (Brown and Kasser, 2005; Brown et al., 2007; Levesque and Brown, 2007).

Self-determination theory is a macrotheory of human motivation and functioning that posits that the satisfaction of the three basic psychological needs are considered to be good indicators of one’s well-being (Ryan and Deci, 2000). Research suggests that in children, high satisfaction of the basic psychological needs is associated with thriving in their everyday environment (at home, in school), whereas frustration of these needs can lead to mental health issues (van der Kaap-Deeder et al., 2017). For example, in a school-based setting, a child may feel an obligation to think in a given way and thus feel that his/her autonomy need is frustrated or fail to report meaningful relationships, thus feeling his/her affiliation is frustrated. A child may also report feeling like a failure, thus feeling his/her competence is frustrated, which is a common occurrence in children with severe LDs (Malboeuf-Hurtubise et al., 2017b,c). In addition, children with severe LDs are likely to experience lower levels of need satisfaction either because of a highly controlling environment, because they find it difficult to make friends and tend to be ostracized or because they have less opportunities to experience successes at school as a direct consequence of their severe LDs (Grolnick and Ryan, 1990; van der Kaap-Deeder et al., 2017). In school settings, previous research has reported that high satisfaction of the competence need was negatively associated to depression, which is a commonly observed comorbidity to severe LDs (Véronneau et al., 2005; Bauminger and Kimhi-Kind, 2008). As such, interventions that aim to decrease symptoms of psychological disorders, while also aiming at increasing basic need satisfaction, are of special relevance for children with severe LDs. Mindfulness-based interventions (MBIs) may represent such an alternative.



Few published studies have attempted to experimentally manipulate basic psychological need satisfaction, especially in children. The available literature on interventions to foster need satisfaction targets physical education or overall sports practice, and mainly aims to increase motivation. Examples from the literature include a study by Tessier et al. (2010), in which physical education teachers were offered training to promote autonomy-supportive behaviors and to support student motivation. Results from their study showed that, following this training, teachers used more need-supportive behaviors and displayed a change in their interpersonal teaching style. Furthermore, their students also reported increases in the basic psychological need of relatedness, although autonomy and competence remained unchanged. Similar results have also been reported elsewhere, where teacher autonomy-supportive training had an impact on students' perception of basic psychological need satisfaction, while decreasing their perception of need frustration, when compared to no-treatment controls (Cheon et al., 2016). Noteworthy, to date, no article including a control condition seems to have been published detailing an intervention tailored to increase basic psychological need satisfaction while also improving mental health in children. One quasi-experimental study presenting the impact of a parenting program has reported significant increases in autonomy support and affiliation, along with increases in well-being and overall mental health in children (Joussem et al., 2014).

To our knowledge, only one quasi-experimental study evaluating the impact of a MBI on basic psychological needs satisfaction in children has been published to date. Results from this study showed that, although the MBI had a positive impact in reducing internalized and externalized symptoms in students with severe LDs, it was negatively related to need satisfaction (Malboeuf-Hurtubise et al., 2017b,c). These mixed findings suggest that the MBI may result in a more accurate perception of need satisfaction in these students and that less defensive appraisals could in turn improve mental health, despite students' experiences of need dissatisfaction. Given the potential of MBIs to improve the mental health of students with severe LDs and the positive impacts of MBIs on need satisfaction typically found with the adult population (Levesque and Brown, 2007), it appears crucial to further investigate the link between MBIs and need satisfaction.

Recently, MBIs have been increasingly implemented in school settings to foster better mental health and higher resilience to stress, anxiety, and depression. Results from recent meta-analyses tend to support the fact that MBIs constitute a promising option to help reduce internalized symptoms such as anxiety and depression in elementary school children, in both regular and specialized education (Zenner et al., 2014; Zoogman et al., 2014; Crescentini et al., 2016; Carsley et al., 2018). However, it appears crucial to compare MBIs to other types of interventions aimed at improving mental health (e.g., cognitive-behavioral therapy, social skills curriculum), as most studies have only used wait-list control groups, and this would allow us to eliminate potential expectancy effects as explanations for the results. Furthermore, as MBIs are costly, namely, because of its lengthy certification process, its cost-effectiveness

should be further evaluated and compared to other types of interventions.

## PRESENT STUDY

Malboeuf-Hurtubise et al.'s (2017c) previous study was limited by its design, as it implemented a quasi-experimental study with no control group. The present study was thus conducted in order to improve the methodological rigor of our research team's previous pilot study (Malboeuf-Hurtubise et al., 2017c). As such, in this study, an active control condition in the form of a social skills curriculum was used, and participants were randomly allocated to either condition. Furthermore, the impact of the MBI on basic psychological need satisfaction was evaluated in conjunction with its impact on internalized symptoms, in order to grasp a more complete portrait of the MBI's impact on mental health. Indeed, in the context of this study, mental health was evaluated with both positive (basic need satisfaction) and negative (internalized symptoms) indicators. The goal of the present study was thus to evaluate the impact of a MBI on the satisfaction of the basic psychological needs of autonomy, competence and relatedness and on internalized symptoms in students with severe LDs in a special education curriculum. In order to do so, a randomized cluster trial with an active intervention control group was implemented to document and compare the progression of basic psychological need satisfaction and symptoms of anxiety and depression in participants pre- to post-intervention and at follow-up.

## Hypotheses

Given the contradiction between our own previous preliminary findings in which a MBI had a negative impact on need satisfaction and findings from the adult literature in which mindfulness typically has a positive impact on need satisfaction (Brown and Ryan, 2003; Brown et al., 2007; Levesque and Brown, 2007), we could not formulate a definite hypothesis for the impact of the MBI on need satisfaction. Rather, we sought out to re-evaluate the impact of a MBI on need satisfaction in children with severe LDs, with an experimental longitudinal design and an active control condition.

Based on the previous literature on the impact of MBIs for children's mental health (e.g., Zenner et al., 2014; Zoogman et al., 2014; Carsley et al., 2018), and more specifically on the impact of MBIs internalized symptoms in children with special education needs (Malboeuf-Hurtubise et al., 2017b), our first hypothesis was that the MBI would have a positive impact on children's internalized symptoms. Our second hypothesis was that the MBI would have a significantly larger impact on mental health than the social skills curriculum used in the active control condition.

## MATERIALS AND METHODS

### Participants

Twenty-three elementary school students aged 9–12 years old with severe LDs in two special education classrooms took part in

this study. The two classrooms were randomly attributed to either an experimental ( $n = 13$ ) or an active control group ( $n = 10$ ). Students in both classrooms matched the following criteria: (a) they all had severe LDs and displayed significant academic delays of 2 years or more in reading, writing, and mathematics; and (b) they had borderline intellectual functioning ( $70 < \text{IQ score} < 79$ ), as was shown by previous cognitive assessment. In order to take part in this project, participants had to consent to participate in an 8-week MBI or social skills curriculum and be available to fill out pre, post, and follow-up questionnaires. All had to have sufficient knowledge of French, as the interventions and questionnaires were provided in this language. There was no attrition in this study.

## Procedure

An experimental longitudinal randomized cluster trial with an active control condition and three assessment time points was used in this project. Participants in the experimental group completed a MBI, whereas participants in the active control group completed a social skills development curriculum. The modalities of both interventions were identical: both were delivered once a week, during 8 weeks, in a group format (i.e., in the classroom), by the same individual. There were no mindfulness activities in the social skills curriculum.

Measures were obtained at pre-test, post-test, and during a 3-month follow-up. This project was conducted in collaboration with a school board and elementary school from Vaudreuil-Dorion, Canada. Ethics approval was obtained from all institutions involved. Informed consent was obtained from all students involved in the project, their parents, and their teachers.

## Mindfulness-Based Intervention

Participants in the experimental group took part in an 8-week MBI, called *Mission Méditation*, specifically adapted and tailored to fit elementary school children's developmental needs and attention span (Malboeuf-Hurtubise and Lacourse, 2016). This intervention was developed after many years of research in school-based settings and has demonstrated its effectiveness and appropriateness for elementary school students in regular and special education classrooms with diverse disabilities, including severe LDs, ADHD, anxiety, and depressive disorders (Malboeuf-Hurtubise et al., 2017a,b,d, 2018). The MBI is composed of eight 45- to 60-min sessions in which various meditations were introduced to students (e.g., sitting meditation, mindful stopping, mindful listening, walking meditation, and body scan). Detailed descriptions of the intervention have been published elsewhere (e.g., Malboeuf-Hurtubise et al., 2018). MBI sessions were led by a trained community involvement school counselor with prior experience and extensive training in mindfulness practice. Sessions were scheduled to occur once a week, and the MBI condition teacher was asked to practice concepts at least once in between sessions. The intervention did not include a silent retreat.

## Social Skills Curriculum

Participants in the active control group took part in an 8-week social skills curriculum, provided by the same community

involvement school counselor. This curriculum was an in-house school-board-wide program in which the students were exposed to different social skills activities, with the overarching goal of finding purpose in life, becoming responsible and engaged citizens, and developing a sense of belonging to the school and community (Commission Scolaire des Trois-Lacs, 2015). The following themes were explored as part of this intervention: using your own personal strengths, using classmates' personal strengths, finding meaning and pleasure in life, and being creative.

## Measures

Both measures chosen for this study have been shown as valid in a sample of children with severe LDs (Malboeuf-Hurtubise et al., 2017b,d).

Participants rated how competent, autonomous, and related they felt in school, by answering a nine-item scale adapted from a scale used in a previous, similar study (Savard et al., 2013; Malboeuf-Hurtubise et al., 2017c). Children were asked to rate their agreement to items such as "In school, I feel free to be myself" (autonomy); "I am able to reach my goals" (competence) and "In my relationship with others, I feel appreciated" (relatedness). Internal consistency was acceptable ( $\alpha = 0.74$ ).

Participants also completed selected items from the anxiety (three items, e.g., "I worry about little things") and depression (five items, e.g., "Nothing ever goes right for me") subscales of the *Behavior Assessment Scale for Children* (BASC II) (Reynolds and Kamphaus, 2004). Internal consistency was acceptable for both subscales ( $\alpha_{\text{depression}} = 0.61$ ;  $\alpha_{\text{anxiety}} = 0.76$ ).

## Data Analysis

Hypotheses were tested using mixed ANOVAs allowing comparison of pre-to-post and follow-up scores as moderated by the experimental condition. Effect sizes were also computed in order to assess the magnitude of the observed effects.

## Statistical Power

An *a priori* statistical power calculation was done using G\*Power software (Faul et al., 2007) and showed that, in order to ensure a statistical power of 0.8, with three assessment time points, two groups, and a moderate effect size ( $F = 0.25$ ), a total sample size of 28 students was required to ensure sufficient statistical power in this study. A *posteriori* statistical power analyses were conducted using the following parameters: effect size  $F$  (converted  $\eta^2$  value),  $\alpha$  error probability (0.05), total sample size (23 participants), number of groups (2), number of measurements (3), correlation among measures for each variable (values can be found in **Tables 2** and **3**), and non-sphericity correction  $\epsilon$  (obtained from Mauchly's sphericity test in SPSS = 1 for each variable). Power associated with each analysis can be found in **Tables 2** and **3**.

## RESULTS

Preliminary analyses using independent  $t$ -tests first showed that the two groups differed at pre-intervention [ $t(21) = -2.80$ ,

$p = 0.01$ ] only on measures of competence. Mixed ANOVAs revealed that these initial differences were unaffected by the experimental manipulation, suggesting that the effects in the experimental and active control groups were similar over time for all dependent variables. Detailed results can be found below and in **Tables 1–3**.

## Basic Psychological Need Satisfaction

The experimental condition thus did not moderate change in participants' scores of autonomy, competence, and relatedness across the three time periods. Looking at main effects of time, we found no within-person difference on scores of autonomy and relatedness (please refer to **Tables 1** and **2**). However, a significant main effect was found for the competence need over time [Wilks Lambda = 0.66,  $F(2,20) = 5.10$ ,  $p = 0.02$ , partial  $\eta^2 = 0.34$ ]. Bonferroni-adjusted *post hoc* analyses showed that for both groups, scores were significantly higher at post-intervention ( $p = 0.03$ ) and at follow-up ( $p = 0.04$ ), when compared to pre-intervention scores. There was no significant difference between scores at post-intervention and follow-up ( $p = 0.76$ ). Hence, participants from both groups displayed higher competence scores from pre- to post-intervention, and these improvements remained stable at follow-up.

## Internalized Symptoms

The experimental condition also did not moderate change in participants' scores of depression and anxiety across the three time periods. Looking at main effects of time, we found no within-person difference on scores of depression (please refer to **Tables 1** and **3**). However, a significant main effect was found for anxiety levels over time [Wilks Lambda = 0.61,  $F(2,42) = 6.19$ ,  $p = 0.008$ , partial  $\eta^2 = 0.38$ ]. Bonferroni-adjusted *post hoc* analyses showed that for both groups, scores were significantly lower at post-intervention ( $p = 0.01$ ) and at follow-up ( $p = 0.006$ ), when compared to pre-intervention scores. There was no significant difference between scores at post-intervention and follow-up ( $p = 0.49$ ).

## DISCUSSION

Results from this study show that although the MBI appears to be useful in increasing the basic psychological need of competence

and decreasing anxiety in students with severe LDs, it was not more useful than the active control intervention that was used in this project. These findings contradict previous results in which a MBI led to decreases in need satisfaction of students with severe LDs (Malboeuf-Hurtubise et al., 2017c). These seemingly more intuitive results are in line with those reported in adults in the literature on SDT and mindfulness (Brown and Ryan, 2003; Brown et al., 2007; Levesque and Brown, 2007). However, although this study was more rigorous in its attempt to implement an experimental design with an active control group, this rigor alone cannot explain these opposite results, as one would not expect the addition of a control group to change students' perception of need satisfaction.

One potential explanation for these results may lie in the need satisfaction scale that was used in this project and in our previous study. This scale measures how children's basic needs are satisfied when they are at school, which means that it is highly context-dependent. Since mindfulness training allows children to "see more clearly," to become aware of their environment for what it is, a child who has become more mindful and who evolves in a classroom where the teacher is need-supportive will become more aware of this and might have a higher need satisfaction score after the intervention. On the other hand, a child who has become more mindful and more aware of a less need-supportive, or even controlling, classroom context may rate their need satisfaction as lower than at the beginning of the intervention. It has been proposed that children's perceptions are likely to be a direct consequence of environmental feedback rather than the product of internal factors (Abela and Taylor, 2003), especially given that they have not reached the formal operational stage of cognitive development. In order to disentangle this, future studies should compare elementary school children to adolescents whose perceptions are less likely to be a direct product of the school context. Another option would also be to evaluate directly and control for classroom climate in future studies. Moreover, these studies should use a broader measure of need satisfaction to capture the different environments that the children are exposed to in their life.

For now, we observe that the present results are in line with recent findings and meta-analyses published on the impact of MBIs for youth in school-based settings, in clinical and non-clinical populations (Zenner et al., 2014; Zoogman et al., 2014; Carsley et al., 2018). However, in this sample, the MBI was not

**TABLE 1 |** Means and standard deviations for basic psychological need satisfaction, anxiety and depression symptoms.

Dependent variable	Control group			Experimental group		
	Pre-test (SD)	Post-test (SD)	Follow-up (SD)	Pre-test (SD)	Post-test (SD)	Follow-up (SD)
<b>Need satisfaction</b>						
Total need satisfaction	8, 58 (2, 69)	8, 96 (2, 31)	9, 74 (2, 47)	10, 26 (1, 30)	9, 60 (2, 16)	10, 26 (2, 25)
Autonomy	8, 92 (2, 60)	8, 12 (3, 21)	9, 66 (3, 97)	9, 67 (1, 43)	8, 85 (2, 38)	10, 23 (2, 46)
Competence	8, 44 (3, 20)	9, 36 (2, 99)	11, 19 (2, 03)	11, 39 (1, 83)	12, 28 (2, 26)	11, 81 (1, 10)
Relatedness	8, 38 (3, 56)	9, 38 (4, 05)	7, 92 (2, 50)	9, 70 (2, 00)	7, 69 (3, 25)	8, 75 (3, 38)
<b>Mental health</b>						
Anxiety	3, 50 (2, 72)	1, 99 (2, 89)	1, 22 (4, 37)	3, 83 (2, 34)	2, 43 (1, 50)	2, 78 (1, 65)
Depression	6, 51 (4, 95)	2, 09 (8, 14)	1, 83 (7, 16)	4, 12 (3, 72)	3, 14 (3, 10)	4, 18 (4, 07)

**TABLE 2 |** Results of Mixed ANOVAs for basic psychological need satisfaction.

	Total need satisfaction					Autonomy					Competence					Relatedness				
	Overall model					Overall model					Overall model					Overall model				
	df	F	p	Partial $\eta^2$	Power	df	F	p	Partial $\eta^2$	Power	df	F	p	Partial $\eta^2$	Power	df	F	p	Partial $\eta^2$	Power
Time	2,20	0.99	0.39	0.09	0.89	2,20	1.7	0.21	0.15	0.99	2,20	5.10	0.02*	0.34	1.00	2,20	0.40	0.67	0.04	0.52
Group condition	1,21	1.91	0.18	0.08	0.85	1,21	0.79	0.39	0.04	0.52	1,21	7.03	0.02*	0.25	0.99	1,21	0.03	0.86	0.001	0.06
Time $\times$ Group condition	2,20	0.61	0.56	0.06	0.72	2,20	0.01	0.99	0.001	0.06	2,20	1.99	0.16	0.17	0.99	2,20	2.45	0.11	0.20	0.99

\* $p \leq 0.05$ , \*\* $p \leq 0.01$ . Bolded values are simply those that are statistically significant.

more useful to increase basic psychological need satisfaction or to improve mental health than the active control intervention, in which a social skills curriculum was offered. Others studies comparing the impact of MBIs to active control conditions have reported similar positive – yet not significantly different from the control intervention – effects, namely, in elementary school students from regular classrooms (Britton et al., 2014) and in a variety of other contexts [e.g., teenagers with eating disorders (Atkinson and Wade, 2015); mindful coloring in elementary school students (Heath and Fajnerova, 2015)]. In a recent meta-analysis published by Carsley et al. (2018), the authors were not able to perform impact analyses with regards to the type of control condition, given the small number of studies in which MBIs were compared to active control conditions. However, the available evidence suggests that although MBIs can be useful to improve mental health and well-being in children, perhaps they are not the most effective, or cost-effective, interventions. Indeed, as mindfulness certification is a long process requiring several months or even years of personal practice and training, it appears relevant to question its added value in school-based settings. Furthermore, given previous results in which a MBI had a deleterious impact on need satisfaction in youth with severe LDs, this ongoing reflection should warrant serious attention and thought from the research community (Malboeuf-Hurtubise et al., 2017c; Baer et al., 2019).

## Strengths and Limitations

This study counts notable strengths, among which the most important resides in its design. Indeed, this study used a randomized cluster trial with an active control condition. Studies evaluating the impact of MBIs in children have historically lacked rigor in their designs, and, as such, we have aimed to correct for this (Carsley et al., 2018). Furthermore, this study is one of few that aims to document the impact of MBIs on basic psychological needs satisfaction, specifically for students with severe LDs, whereas the vast majority of the published literature on this subject is correlational. Another strength of the present study is that there was no attrition such that our main findings could not be explained by differences in the sample across time points.

Despite these strengths, the small sample size represents an important limitation of this project. Indeed, a larger randomized cluster trial would have provided more robust and generalizable results, and should thus be planned as future steps in this line of research. Increasing the sample size would also help to ensure meeting minimal requirements for adequate statistical power. As such, given this final sample size fell short of a few participants to meet such requirements, it is possible that we were not able to detect significant pre-to-post changes in participant scores and across conditions for some variables, increasing the risk of making a Type II error. Choosing different measures for future research studies may also be recommended, as the internal consistency for both scales in this project was acceptable, but could have shown higher values. Administering a more important number of items could help solve this issue, as only a few selected items were administered in the current project, thus reducing the sensitivity of our measures to changes in our participants. It could thus be possible to detect significant pre-to-post changes



**TABLE 3 |** Results of mixed ANOVAs for anxiety and depression symptoms.

	Anxiety					Depression				
	Overall model					Overall model				
	df	F	p	Partial $\eta^2$	Power	df	F	p	Partial $\eta^2$	Power
Time	<b>2,20</b>	<b>6.19</b>	<b>0.008**</b>	<b>0.38</b>	<b>1.00</b>	2,20	1.35	0.28	0.12	0.96
Group condition	1,21	0.35	0.56	0.02	0.28	1,21	0.40	0.84	0.002	0.07
Time × Group condition	2,20	0.26	0.78	0.03	0.39	2,20	2.50	0.11	0.20	0.99

\* $p \leq 0.05$ , \*\* $p \leq 0.01$ . Bolded values are simply those that are statistically significant.

with a larger number of administered items. We note, however, that with this sample size and this number of items, we were able to detect changes in perceived competence and anxiety scores across time points. Finally, adding specific items measuring need frustration could also have been helpful in getting a broader and more complete picture of how mindfulness can have an impact on basic psychological needs, although existing scales would require an adaptation to be adequately understood by children (Chen et al., 2015). Finally, given that improvements were observed in participants from both conditions, it remains possible that the documented effects were not due to the interventions themselves, but rather to the simple passage of time.

## Suggestions for Future Studies

Future research is needed to determine the impact of MBIs on need satisfaction for students with special education needs. Optimal contexts for implementation would also need to be determined, as the removal of barriers clouding one's appraisals of basic psychological need fulfillment may not always be optimal for children. Indeed, compared to adults, children have less control over their situation in school or at home such that making the changes needed to increase their satisfaction of autonomy, competence, and relatedness when these are found to be low may not always be possible. One way to correct this issue could be to train teachers themselves to become generally more mindful and specifically more mindful of their actions and words toward their students, as previous research has shown that teachers in special education classrooms tend to be more controlling and less autonomy supportive than their colleagues in regular classrooms (Grolnick and Ryan, 1990). It has been suggested that teachers can be trained in mindfulness using a program called CARE (Cultivating Awareness and Resilience in Education), to become more supportive of their students and promote their learning and engagement (Taylor, 2017). In fact, a recent randomized control trial among 224 teachers showed that, compared with control teachers, CARE teachers felt less stressed and more mindful and provided more emotional support and structure to students as observed by independent raters (Jennings et al., 2017). This research shows that a MBI specifically designed for teachers improves their functioning and influences their behavior in class to be more supportive of their students. Future studies should evaluate whether increasing teachers' own levels of mindfulness influences how much they support their students' autonomy, competence, and relatedness, according to SDT.

Although teachers seem to be familiar with concepts of self-determination and basic psychological need satisfaction, and consider them to be important in the classroom, the extent to which they use specific autonomy-supportive practices (e.g., self-instruction, opportunities to make choices in classroom routine, self-scheduling, and goal setting) varies greatly and is not reflective of the importance given to these concepts (Wehmeyer et al., 2000). This translation issue from theory to practice seems even more problematic for teachers in special education classrooms who work with children with severe LDs and, as such, warrants close attention and guidance from the research and clinical community.

It is also suggested that future studies investigate the possible interplay between mindfulness and sensory processing patterns in conditions such as severe LDs (Serafini et al., 2017). Past studies have highlighted the involvement of sensory perception in emotional processes, with, namely, depressed and anxious adults displaying a general hyposensitivity profile (Engel-Yeger et al., 2016). As such, sensory processing patterns might be "trait" markers of individuals with neuropsychiatric conditions and psychological disturbances. Importantly, the involvement of extreme sensory processing patterns has been hypothesized to contribute to the complex pathophysiology of these conditions. The careful assessment of sensory profiles and of their possible interaction with mindfulness may help in developing targeted interventions and improve functional/adaptive strategies in children with severe LDs.

Finally, in light of our results, future studies should verify that MBIs have an added value compared to other types of interventions, especially in cases where these other interventions are more easily implemented in school-based settings (e.g., requiring less intensive training for school professionals or teachers). Further research comparing the effectiveness of MBIs to other types of school-based interventions is thus warranted.

## ETHICS STATEMENT

This study was carried out in accordance with requirements of the Research and Ethics Committee of the Université du Québec à Montréal and Université du Québec en Outaouais, in Montreal and Gatineau, Canada. The protocol and study were reviewed and approved by both institutional Research and Ethics Committees, responsible for granting ethics approvals.

All subjects and their parents gave written informed consent in accordance with the Declaration of Helsinki.

## AUTHOR CONTRIBUTIONS

CM-H and GT conceptualized and coordinated the study, adapted the mindfulness-based intervention and trained the school counselor involved in this study, performed data analysis, and drafted the manuscript. GT contributed extensively to data interpretation

and revision of the manuscript. GM contributed significantly in data analysis and to the revision of the manuscript.

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# Understanding the Needs of Young People Who Engage in Self-Harm: A Qualitative Investigation

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Self-harm is common and associated with adverse outcomes. Research about the risk factors for self-harm has informed the field with regard to clinical interventions that should be delivered for young people who engage in self-harm. Missing is an in-depth understanding of what the triggers of an urge to self-harm might be, including in young people being treated with a clinical intervention. Therefore, there is little knowledge about what techniques young people find helpful to deal with urges to self-harm when they occur. This qualitative study engaged seven young people with lived experience of self-harm in semi-structured interviews about the immediate triggers of the urge to self-harm, and helpful strategies to manage this urge. Thematic analysis using a general inductive approach revealed distressing emotions and a sense of isolation as key themes, with other triggers associated with their induction. Highlighted was the wide range of situations and emotions that can be triggering, such that a further key theme was the idiosyncratic nature of the self-help strategies young people found helpful. Interventions that are developed to support young people who self-harm must address this complexity and findings highlight the need for young people to maintain some autonomy and control while being supported to connect with others for support. This research adds to the literature on self-help strategies to support young people in moments when they are experiencing distressing emotions, feel isolated, and have an urge to self-harm providing important insight to the prevention and intervention for self-harm among young people.

**Keywords:** self-harm, suicide risk, young people, qualitative, interventions

## INTRODUCTION

There is no standard definition of self-harm. For the purposes of this paper it is defined as intentional self-poisoning or self-injury irrespective of intent (Hawton et al., 2003). While variously referred to as non-suicidal self-injury (NSSI) and deliberate self-harm; the former has been criticized because the term assumes the absence of intent, but it is accepted that intent can be difficult to determine and those who engage in NSSI have higher rates of suicidal ideation (intent) and suicide attempt (Whitlock et al., 2006; Joiner et al., 2012), and the second due to self-harm often occurring in a dissociative state so that the person may not be completely aware of what they are doing (Robinson, 2017).



Self-harm is a critical issue affecting up to 25% of young people and can result in adverse outcomes including repetition of self-harm, suicide and mortality, mental health morbidity, poorer education and employment outcomes, and overall decreased quality of life, as well as being costly to treat (Fergusson et al., 2005; Harrington et al., 2006; Madge et al., 2008; Bergen et al., 2012; Clark et al., 2013; Mars et al., 2014; Robinson, 2016). The Second Australian Child and Adolescent Survey of Mental Health and Wellbeing reports that approximately 8% of young people aged between 12 and 17 years old engaged in self-harm without suicide intent in the previous 12 months. Rates were higher in those who identified as having any mental disorder (Lawrence et al., 2015; Zubrick et al., 2016). A New Zealand study examining rates of non-suicidal self-harm found life time rates of 48.7% (Garisch and Wilson, 2015). Compared to young people who don't engage in self-harm, those who do are more likely to report suicidal ideation and plans for suicide and to report greater levels of emotional distress, difficulties with anger and low self-esteem, as well as antisocial behavior and health risk behaviors such as illicit drug use (Laye-Gindhu and Schonert-Reichl, 2005). Indeed, the rates of suicide attempt are higher in those who have engaged in NSSI (self-harm without suicide attempt) (Asarnow et al., 2011; Wilkinson et al., 2011; Guan et al., 2012; Klonsky et al., 2013; Knorr et al., 2016; Muehlenkamp et al., 2018). Self-harm in young people has been shown to have an impact on family relationships, wellbeing, and mental health (Morgan et al., 2013; Mars et al., 2014; Beckman et al., 2016).

There is a significant literature describing the risk factors for self-harm, an understanding of which is important for developing interventions. The literature about risk factors in young people has been summarized in a recent review highlighting previous abuse, mood disorder, borderline and other personality disorders, severity of symptoms of depression and hopelessness, and suicidal ideation (Witt et al., 2018) as key risks. Community-based studies similarly highlight mood disorder and history of abuse, and add bullying as more distal to engaging in self-harm, substance use, as well as psychological characteristics (Plener et al., 2015). Many interventions currently recommended for young people whose self-harm are clinic based, delivered by mental health clinicians, and primarily aimed to address the underlying mood and personality disorders (Hawton et al., 2015; Ougrin et al., 2015; Carter et al., 2016). These interventions are critical to deliver; however, many young people do not engage in traditional face-to-face mental health services (Whitlock et al., 2006; Ystgaard et al., 2009; Michelmores and Hindley, 2012; Doyle et al., 2015), and for those who do, the urge to self-harm can continue to occur, often and outside of the clinic setting, for some time. While these interventions include strategies specific to aiding a young person deal with the "in the moment" urge to self-harm, there is little literature exploring how young people perceive these strategies, and more particularly the extent to which the specific strategies designed to help them deal with the urge to self-harm are helpful or not.

To ensure young people have access to effective strategies when they experience the urge to self-harm, there is a need to move from describing generic risk factors to examining the triggers of this urge to self-harm. Understanding the

phenomenology of self-harm from the perspective of young people with lived experience is critical (Brown and Kimball, 2013). In-depth insight into the perspectives of young people about the triggers of self-harm, and what might mitigate the urge to self-harm in the moment it occurs, provides opportunities for more powerful strategies, including those that young people can use themselves outside the clinic setting.

Therefore, the aims of this study were to identify both specific triggers of the urge to self-harm, and helpful strategies to manage this urge to engage in self-harm behaviors from the lived experience of young people.

## MATERIALS AND METHODS

This study was given ethics approval by Melbourne Health Human Research Ethics Committee (HREC/15/MH/340).

Qualitative methods were used because these allow for an in-depth exploration of the lived experience of participants (Fossey et al., 2002). The raw data supporting the conclusions of this manuscript will be made available by the authors, without undue reservation, to any qualified researcher.

### Setting and Participants

The study was undertaken in a tertiary youth mental health service, Orygen Youth Health, and several secondary mental health services, headspace Glenroy and headspace Craigieburn (McGorry et al., 2014; Rickwood et al., 2014). These services are all located in Melbourne, Australia. Young people were recruited from the Youth Mood Clinic (Rice et al., 2017) at Orygen Youth Health and from the youth participation groups operating within Orygen Youth Health and the headspace services, and via chain-referral sampling where participants informed young people they thought might be eligible for inclusion. Young people were eligible if aged 18–25 years and had lived experience of suicidal ideation and/or self-harm (i.e., had experienced suicidal ideation or engaged in self-harm at some stage in their lives); but were ineligible if they had engaged in self-harm or had experienced severe suicidal ideation (frequent thoughts indicating an intent to kill themselves) in the past 3 months.

Recruitment was purposive and continued until saturation (no new data/concepts emerged) was reached. Guest et al. (2006) suggested that meta-themes often emerge within six interviews; we recruited seven young people.

### Procedure

Young people who were interested in the study were directed by their clinicians and the coordinators of the youth advisory groups to a webpage where they could register their interest. One of the investigators (SH), a clinical psychologist, contacted interested young people to describe the study, screen against the exclusion criteria, and to organize a time and place for written informed consent to be gained and the interview to be conducted. We reimbursed all participants for their time (AU \$30 per hour).

We conducted semi-structured interviews, lasting between 40 and 60 min, using open-ended questions, that allowed flexibility and the opportunity to clarify and explore responses



(Knox and Burkard, 2009). Initially, we provided a brief summary of the study, reiterating the aims, and affirmed participants as experts in their own experience to avoid the tendency of participants to omit information if they perceive that the researchers are the experts (Leech, 2002). The least potentially threatening questions were asked first and questions were worded in a non-threatening and non-judgmental manner, e.g., asked about use of alcohol or drugs rather than substance abuse (Leech, 2002). Informal prompts and restating (without reinterpreting) participants response allowed us to show interest in responses, confirm understanding, and encourage disclosure (Leech, 2002).

The interview schedule (see Online **Supplementary Material**) was developed on the basis of a systematic synthesis of both academic peer reviewed and gray online literature. Four electronic databases (PsycINFO, MEDLINE, EMBASE, and SCOPUS) and the United States, Australian, New Zealand, and United Kingdom Google platforms (google.com, google.com.au, google.co.nz, and google.co.uk) were searched. Within the academic literature controlled vocabulary (MeSH) terms were used in conjunction with keywords. The online search terms were developed iteratively until an acceptable level of relevance was found. Independent raters screened the retrieved studies and included English language studies relevant to participants aged 15–25 years, that were relevant to self-harm. There are differences in the terminology used to describe self-harm, particularly in regards to its underlying intent (Madge et al., 2008; Muehlenkamp et al., 2012); therefore, a range of terms were used in the search.

If webpages did not specify an age range for their intended audience, they were included; however, media sources such as video and audio were excluded. We extracted relevant data from the included studies and webpages into a structured template.

We developed a template for recording interview responses and included the questions and planned prompts that formed the semi-structured interview schedule, along with space to record each idea arising for each question.

## Analysis

We undertook a thematic analysis using a general inductive approach (Thomas, 2006), which allowed themes to be derived in the context of specific objectives. Raw data were condensed in the context of being guided by the objectives; however, findings were based on the raw data rather than *a priori* expectations derived from the objectives. The raw data were the responses of participants recorded by a researcher who sat in on each interview in our *a priori* designed template by a researcher.

Three principals of trustworthiness in qualitative research underpinned the analysis to ensure it was robust (Guba and Lincoln, 1985, 1989; Koch, 2006). The first principal was *credibility*, whereby participants were provided a summary of their responses at the completion of the interview to check for accuracy and to allow for further responding. Data were then independently coded by two researchers and discrepancies discussed and resolved by consensus. Interviews were audio recorded to ensure accuracy of direct quotes to exemplify themes. The second principal was *dependability*, whereby we followed

an established procedure for analysis. This was the method of Braun and Clarke (2006), which includes six phases of analysis: (1) Familiarization with data including transcribing, reading, and re-reading transcripts; (2) Generating initial codes (on the basis of aims rather than research questions); (3) Searching for themes by collating codes into potential themes; (4) Reviewing themes and generating a thematic map of the analysis; (5) Defining and naming themes; and (6) Producing the report. *Transferability* or the degree to which the responses were representative was enhanced by recruiting from different services and we paid attention to the background and characteristics of recruited participants to ensure a range of experiences were included. Participants' background and the recruitment and data collection processes used were consistently considered for their impact on results.

## RESULTS

Saturation was achieved by the sixth interview, as expected according to the established procedure of Braun and Clarke (2006). In total, seven young people aged 18–24 years were interviewed (mean age 20.6, SD = 2.23); five females and two males. Three participants were past clients; two of headspace (Craigieburn; Glenroy) and one of Orygen Youth Health. Two participants were current clients, both of Orygen Youth Health and two participants had never been clients of either service but were receiving treatment from a private psychologist in one case and via a general practitioner in the other. **Tables 1 and 2** provide a summary of the themes and subthemes that arose from the interviews.

### Precipitating Factors and Triggers for Self-Harm

From 48 different triggers identified by participants, six themes arose: (1) distressing emotions, (2) sense of isolation, (3) exposure to self-harm, (4) relationship difficulties, (5) social comparison, and (6) school/work difficulties.

The theme of distressing emotions was described by all participants and appeared to be considered the primary trigger for urges to self-harm, along with a sense of isolation, with other themes becoming triggers by causing distressing emotions. Participants noted that in some instances they felt responsible and helpless in response to others' self-harm, which would trigger their own urges to self-harm: *"I felt responsible especially because I was really close to some of them, so it was knowing about them going through [tough times] I blamed myself"* (Pt 5). One participant felt guilty because she did not feel like she was worthy of being depressed because she had a good family and was not experiencing any major difficulties compared to others: *"These people have gone through actual stuff and I'm just a sad teenager"* (Pt 1). Participants described feeling like a burden: *"They [my parents] didn't intend on having me so when they had to deal with me it was a huge financial stress. . . I would feel like it's my fault I shouldn't have been born"* (Pt 4). Feelings of shame and embarrassment after alcohol use were also identified as triggers; participants stated that self-harm was not triggered by being

**TABLE 1 |** Themes and subthemes about triggers that arose from interviews.

**(1) Distressing emotions**

Helpless and guilty  
 Helpless and responsible for others' self-harm  
 Guilty and unworthy of being depressed  
 Feeling like a burden on others  
 Felt unwanted and like a burden because parents had an unplanned pregnancy  
 Financial burden  
 Shame  
 Ashamed and embarrassed after alcohol use  
 Being overwhelmed  
 Lack of control  
 Confused because of mental health and emotions  
 Anxious because of school stressors  
 Anger  
 Angry because not "normal"  
 Rage because of bottled up emotions  
 Rage because there was no way to express emotions

**(2) Sense of isolation**

Family conflict  
 No friends at school  
 Did not belong  
 Stigma because of sexual orientation  
 People were not accepting of who they were  
 Mental illness  
 No support

**(3) Exposure to self-harm**

Contagion  
 Relationship with someone else who also engages in self-harm  
 Friends and peers who self-harm/attempt suicide  
 Visual triggers  
 Graphic images on Tumblr and Instagram  
 Normalized, reinforced, and encouraged behavior  
 Instagram quotes  
 Scars  
 Self-harm personal stories  
 Details of methods used  
 Empathizing with other' negative experiences

**(4) Relationship difficulties**

Family  
 Unwanted and like a burden because parents had unplanned pregnancy  
 High parental expectations/disappointing parents  
 Lack of understanding  
 Lack of support  
 Lack of communication

**(4) Relationship difficulties continued**

Friends and peers  
 Explaining self-harm scars  
 Bullying (including cyber-bullying)

**Partners**

Relationship with someone who also engages in self-harm  
 Lack of communication  
 Relationship break-up

**(5) Social comparison**

Graphic images on Tumblr

(Continued)

**TABLE 1 |** Continued

Identifying with others' personal stories  
 Peers on social media  
 Perceived social norms  
 Academic performance to peers

**(6) School/work difficulties**

Exams  
 Deadlines  
 Year 12 pressure  
 Academic performance to peers  
 Hostile work environment  
 Rude customers and co-workers  
 Forced to attend work

intoxicated but by emotions experienced following excessive alcohol use: "*[I] felt so embarrassed because I let her down*" (Pt 1). Participants described feeling overwhelmed because of their mental health and emotions: "*I was so confused. . . I didn't know how to feel, and was so used to feeling worthless*" (Pt 7) and with school stress: "*So much pressure put on you, particularly in year 12. [there's so much] pressure to do well*" (Pt 6). Frustration and anger were also described as triggers; related to theme 5 (social comparison) one participant described being triggered when she saw "normal" people on Facebook: "*I feel. . . angry because I see what they are doing that I can't do*". Related to theme 2 (sense of isolation), participants described how the inability to express emotions or concerns triggered feelings of anger and a sense of isolation: "*I would have rages at any time of the day. . . it was all the bottled up feelings that resulted in rages*" (Pt 5).

A sense of isolation (theme 2) was reported to arise from issues with friends or family and this triggered the urge to self-harm: "*They [my family] don't love me anymore, I don't mean anything to them*" (Pt 4); "*100% felt like I didn't have support [from family]. . . I couldn't find someone to confide in*" (Pt 6). Experiencing stigma as a result of a different sexual orientation and due to a mental illness was also reported to lead to a sense of isolation: "*Trying to maintain [a] relationship when people would tell me it's disgusting and it's wrong. It would be stressful. [they were] not accepting of who I am*" (Pt 4); "*Feeling isolated and alone probably comes from having bipolar because I feel like I'm alone in it and that no one can support me through it*" (Pt 3).

Exposure to self-harm (theme 3) included hearing about others' experiences, seeing scars and images of self-harm, and reading personal self-harm stories; this was in the context of personal relationships: "*Having her [partner] around and seeing her do it, I felt the need to also do it*" (Pt 6) and more generally: "*I know a few people in year nine and year 10. . . hearing about it and knowing that others were doing it too was triggering*" (Pt 3). Visual content on online platforms like Tumblr and Instagram were noted as triggering: "*When I was sad sometimes I wouldn't want to hurt myself because I was scared, so I would. . . look at those blogs, it felt normal and then I would do it [self-harm]*" (Pt 1). Seeing scars from self-harm, either on themselves or others, was also reported as triggering: "*When the cut would heal and it would start to scar, I would think 'it's going away, let's do it*

**TABLE 2 |** Themes and subthemes about self-help strategies that arose from interviews.

**(1) Idiosyncratic nature of self help**

- Dependent on level of distress/mood
  - Some things don't work on a bad day
  - Dependent on type of mental illness; symptoms
- Dependent on personal interests
  - Depends on individual triggers
  - Depends on what particular activities you enjoy
- Dependent on what point in time the strategy was used
  - Difficult if it is the first time you use it
  - Not useful early in course of illness/treatment
- Dependent on environment/setting
  - In public, e.g., at school
  - At home, in bedroom
- Dependent on cause of distress
  - Feeling worthless
  - Feeling lonely
  - Conflict with family/friends

**(2) The importance of distraction**

- Distraction is idiosyncratic to individuals
  - Enjoyable/soothing activities
  - Immersive activities to divert very strong emotions
  - Activities to help release bottled up emotions
  - Matching self-help to type and strength of emotion
- Help box with a range of options a young person knows helps them (as a reminder; and different things for different times)
  - Easy to forget things in the moment so need it all in one place
  - Sadness box/comfort box with personal things to make you feel good
- Distraction from worry that underlies distress
  - Do something so you can put away the worry and come back to it later

**(3) Connectedness**

- Overcome feelings of isolation
  - Overcoming sense of depersonalization
  - Feel validated/feel like others are also experiencing similar things
  - Gain another perspective
- Assistance with self-soothing
  - Needed someone just to be there; not necessarily to do anything
  - Sense of safety in the presence of someone else
  - Able to acknowledge the issue
  - Someone else knows
  - Limits rumination
- Various modes of connection
  - Online or phone help meant control over who gets your information
  - Face-to-face better for real connection
- Barriers and challenges
  - Forums and chat lines can normalize self-harm
  - Fear of being a burden and impacting on others' well-being
  - Not knowing how to describe feelings/thoughts
  - Difficulties initiating discussion

**(4) Change in the environment**

- Being in public is safer
  - Consequences of being seen to self-harm in public
  - Structure and things to do
- Removing self from trigger
  - Getting away from stressful situations

(Continued)

**TABLE 2 |** Continued

- Getting away to be able to work through emotion and think about problem
- Going and doing an activity like exercise
  - Improved mood
  - Distraction from negative thinking
  - Focusing on something else
  - Social connection
- (5) Mimicking strategies (e.g., snapping elastic band)**
  - Unhelpful in private but useful in public
    - Subtle for when in public
  - Doesn't have same effect
    - Doesn't give same feeling
    - Need real pain
    - Had to keep doing it
    - Didn't stop the self-harm
  - Condescending and invalidating
    - Don't acknowledge the distress
    - Need to work on cause of self-harm

again” (Pt 1), and the scars of others “*Seeing other people's open wounds and new scars [was triggering]*” (Pt 2). Particularly in the online environment, the personal stories of other people who engaged in self-harm could be triggering, particularly those with details about methods: “*That's [method details] probably the worst thing. . . what you use should never be discussed*” (Pt 1).

Relationship difficulties (theme 4) among family, friends, or intimate partners were described as potentially triggering. Failing to meet parental expectations, and a young person's perception that their family was unsupportive and unwilling to talk openly about problems was considered triggering: “*I was triggered a lot by my parents not wanting me to see someone about it [mental illness/self-harm]*” (Pt 3); “*They saw that I had self-harmed and they made fun of me more than supported me and that was really difficult. . . it was the feeling of worthlessness that came from my parents putting me down*” (Pt 4). Cyberbullying was also identified as a trigger: “*It was a continuation from high school, because there was no other way to get to me except Facebook, so bullying continued through that*” (Pt 5). Both unsupportive intimate relationships and breaking up with a partner were described as triggering: “*I had a partner who was very closed off and didn't want to talk about his or my emotions*” (Pt 3); “*My first serious relationship. . . that was a trigger for me, when it all ended. . . I've never been a strong relationship person and the stress of it was getting to me*” (Pt 5).

The theme of social comparison included comparison of self-harm injuries: “*When I saw pictures online it's [my cuts are] too small, it's not like that [the images]*” (Pt 1) and of the self compared to perceived social norms “*Meeting those social criteria. you see things and you know you don't fit into that social norm and feel bad about yourself*” (Pt 2). This in turn increased a sense of isolation (theme 2).

School and work difficulties (theme 6) were often spoken about as triggering, especially pressure at school, as already described, but work pressures were also described as triggering: “*The chefs were not kind to me at all. . . they would call me awful names and swear at me all the time*” (Pt 3).

## Helpful Strategies When Experiencing an Urge to Self-Harm

Five themes arose with regard to helpful strategies that could be used by young people when resisting the urge to self-harm: (1) idiosyncratic nature of self-help, (2) the importance of distraction, (3) connectedness, (4) change in the environment, and (5) mimicking strategies. **Table 2** shows how individual triggers were collated into themes.

The primary theme to emerge was the idiosyncratic nature of self-help strategies that participants used. Participants stated that how helpful a strategy was depended on a range of factors, for example, mood, level of distress, personal interests, whether they were practiced at the strategy or not, and the setting (home alone, school): *“Different things work for different people and at different times/days and in different situations. . . depends on how bad your day is and what the situation is”* (Pt 2), *“First time I hated it but tried it when having a better day. . . and it calms me. So learning about it. . . I read about it”* (Pt 5). Participants noted that it was likely that how helpful a strategy was depended on the nature of the trigger and that it was important to have an understanding of your own triggers: *“About finding out what your triggers are and knowing these and setting boundaries for yourself”* (Pt 5). The remainder of the themes described specific strategies, and within each of these, participants continued to reflect on how their efficacy varied according to context, triggers, and other factors.

A range of distraction techniques (theme 2) were described, and the importance of having a diverse set of strategies, which could be drawn upon at different times, was noted: *“Need a tool box of resources to draw on when you need it at different times. . . A comfort box. . . to put personal things in that make you feel good”* (Pt 1); the importance of matching to the particular emotion or situation was highlighted: *“mine is mostly a build-up of energy, so I would go for a sprint down the street. . . If I had bottled up emotions and just couldn’t get them out. . . I would watch a sad movie and that would help me to cry”* (Pt 6).

Participants described the importance of connecting with others (theme 3) as a self-help strategy, and highlighted the types and purposes of connection. This included overcoming feelings of isolation: *“For me it’s about feeling real. . . and like I am not by myself”* (Pt 3), dealing with negative thoughts: *“we would talk about it for a little while and try to rationalize it”* (Pt 4), and increasing a sense of safety and being cared for: *“So if you can sit with someone. . . not even really talk to them. . . but just sit and be safe.”* (Pt 3). Participants also spoke about how they resisted connection: *“I have spoken to friends who then told my mother, which was the right thing, but at the time I was so angry and it made it worse”* (Pt 1), how hard engaging with others could be: *“Should have a pre written text that you can just automatically have sent out. Some of the barriers is not knowing what to say and being worried about how they will react. . . it’s hard to express myself”* (Pt 6). Participants highlighted the value of helplines and online forums because they could connect with someone else with fewer consequences for being open and honest: *“I called a help line a few times. eheadspace with chats. . . just talking to someone who will actually listen but not tell your parents. It’s weird talking*

*to friends sometimes”* (Pt 1). While participants found online forums helpful, they also cautioned about their use: *“Definitely helpful. . . just need caution when putting people together with the same issues there is a level of support it gets to but then a level of enabling it can get to”* (Pt 7).

Participants reported that getting out (theme 4) into public places, and doing helpful activities such as exercise or going to helpful environments (i.e., friend’s house) was effective when there was an urge to self-harm. Being in a public environment, structured setting, or in the presence of others, meant they were removing themselves from a trigger and were not able to engage in self-harm. *“Was helpful to be places where there was structure and I couldn’t leave. in public I wouldn’t harm myself, because what would happen then? What would people do?”* (Pt 2), *“if I exercise I am in a much better head space”* (Pt 3), *“Because often is triggered by something that isn’t real etc. . . so need to figure out emotion and then back to the actual problem. . . so removing yourself gives you the opportunity to do this.”* (Pt 6).

Mimicking strategies (theme 5) were actions participants described that provided the same sensation as self-harm but without the consequences (e.g., flicking a rubber band around the wrist, holding an ice-cube in the hand). These were mostly seen as unhelpful; however, one participant highlighted their importance for use in public places: *“It doesn’t give you the same feeling but is ok when out”* (Pt 2). Mostly, participants described these mimicking strategies in negative ways: *“These strategies [rubber band and ice] are condescending. . . don’t really communicate how valid my distress is”* (Pt 4); *“Those things [flicking a rubber band] aren’t really the same in terms of they don’t really hurt. . . the blood is important. . . and getting the physical pain to mask the emotional pain is important.”* (Pt 2); *“I tried the elastic band for a while. . . but I got carried away and I did it all the time. But it actually made me self-harm in some ways. . . I kept doing it worse and worse.”* (Pt 6).

## Recommendations for Developing an Online Intervention for Young People at Risk of Self-Harm

An online intervention and particularly an app was described as a potentially useful tool that could be a place to store everything that might be helpful for managing the urge to self-harm. Participants described a range of potentially useful things that could be included in an app, such as pictures and videos that made them feel good, laugh, or express other emotions, online games useful for distraction, reminders of people who love and care for them, and links to other apps to support self-help strategies like mindfulness and meditation. Participants were enthusiastic about a function within a developed intervention that would allow them to share self-help strategies with others, stating that hearing about strategies from other young people with lived experience was preferred: *“It is support from people who actually know what it is like to go through stuff and who have tried stuff suggested and have had success, and also acknowledging that it might not work for everyone but it is worth a try”* (Pt 7). Connecting with people who have similar experiences was also described as potentially helpful, although participants were mindful of the risk: *“There is still hope’ journey stories. Having*



*links to this sort of thing would be useful. . . to have a playlist of stuff exploring mental illness/health. . . but this might be triggering for some people.*" (Pt 5). Participants described the importance of having regular reminders to use these strategies, as well as a prompt for use if they became distressed.

Ways for overcoming barriers to social connection were also discussed as an important function of an intervention: *"like the idea of an option to get the app to send a message to nominated person to say you aren't doing so well. . . so they can contact you and initiate the conversation"* (Pt 2), although participants were keen to maintain control over this type of function: *"mustn't be automatic. . . needs a box that says looks like you're having a bad day do you want this info passed to X."* (Pt 1). Related to this, participants stated that a function that allowed them to send a prewritten message to a nominated support person when they felt distressed would be useful: *"When you are in that space it is too hard to process anything, so you need stuff that is already there and ready to go."* (Pt 3). Participants noted the potential for social networking in terms of facilitating a supportive community to allow positive feedback on achievements and to share helpful strategies but acknowledged the potential for harm and suggested that moderation would be needed to ensure no triggering content was posted.

In addition, participants highlighted the need for customization, for example by applying particular restrictions on available content dependent on an individual's own triggers, the ability to modify when push notifications were sent reminding them to use strategies, and accommodating people at different stages of recovery.

## DISCUSSION

This study is among the first to explore the lived experience of young people who have engaged in self-harm and is unique in its examination of immediate triggers of the urge to self-harm as opposed to generic risk factors for self-harm. This research adds to the literature on self-help strategies that can be used "in the moment" to mitigate the urge to self-harm, by providing strategies that young people have found useful in overcoming emotional distress and feeling more socially connected.

Experiencing distressing emotions and a sense of isolation were key themes, which were considered primary triggers, because other triggers were associated with their induction (i.e., participants reported that exposure to self-harm, relationship difficulties, social comparison, and school/work difficulties lead to distressing emotions and a sense of isolation, which in turn triggered the urge to self-harm). That psychological distress is a trigger for self-harm is consistent with previous research (Landstedt and Gådin, 2011; Townsend et al., 2016), but this study highlights the wide range of distressing emotions reported by young people as triggering, and that these emotions arise from an equally wide range of situations.

A sense of isolation was reported to arise in a range of contexts but commonly young people described feeling isolated when they perceived themselves as different to others (e.g., in terms of sexual orientation, having a diagnosed disorder). This

may go some way to explaining the mechanisms that lead to what we know are higher rates of self-harm in these populations (4). Unfavorably comparing oneself to perceived social norms, either in person or via social media, was reported to lead to a sense of not fitting in. In addition, the young people who reported feeling less supported by, or able to confide in, parents, teachers, or peers, reported that this could leave to an urge to self-harm, which is a finding consistent with previous research (Portzky et al., 2008; Swahn et al., 2012). Previous research has also found an association between parental criticism and self-harm (Yates et al., 2008), and in the current study, young people mentioned that feeling disconnected from or unsupported by family, experiencing relationship difficulties and conflict, was a trigger for self-harm. The reports from young people in the current study suggest that the resulting sense of isolation or distressing emotions act as mediator between relationship difficulties and conflict and self-harm. Thwarted belongingness (in our study "social isolation") is a key component of Joiner (2005) interpersonal theory of suicide, the risk of which is elevated in those who engage in self-harm. Understanding how Joiner's theory might apply to self-harm may be a useful direction for the field (3).

Being exposed to others self-harm was identified as a trigger for self-harm, which is consistent with the literature (McMahon et al., 2013; O'Connor et al., 2014), but the study highlighted significant nuances with regard to how this exposure might trigger a young person to engage in self-harm. Comparing the extent of injury could act as a trigger for young people who felt their injury was not severe enough in comparison; a sense of shame at a perceived sense of their own problems not being as bad as those they were reading about was reported as triggering, and empathizing with others' distressing emotions and negative experiences was also considered triggering. Previous research has shown that graphic images lead to comparison and competitiveness regarding the severity of wounds, and that graphic images can lead to young people believing self-harm is an acceptable coping method (Lewis and Baker, 2011; Baker and Lewis, 2013).

A key theme from this study, perhaps not surprisingly given the findings about the very wide range of situations and emotions that can be triggering, was the idiosyncratic nature of the self-help strategies young people found helpful. Young people were adamant that what might be deemed helpful will vary according to the individual, their environment, the triggering situation, mood, and level of distress. This finding makes sense in the context of research showing that individuals engage in self-harm for a variety of reasons (Rodham et al., 2004; Claes and Vandereycken, 2007). Therefore, an important finding of this study is that strategies to support young people who self-harm must address these complexities. For example, participants highlighted that distraction strategies needed to be matched to the type and intensity of the distressing emotion experienced. Young people highlighted the need to ensure that a range of options is available to choose from and that those using the strategy would need to select what was appropriate to their experience and the particular situation they found themselves in.



Building connections with others was reported by young people in this study as an important strategy for overcoming a sense of isolation, which was identified as an important trigger. However, consistent with previous research (Doyle et al., 2015), many participants described finding communicating with others particularly challenging, especially when they were distressed. Participants wanted channels and templates to support them in making connections when they needed them most and provided a number of useful suggestions for a digital intervention to support social connectedness through messages to significant others and a moderated chat function. In terms of formal therapeutic interventions for young people at risk of self-harm, inclusion of the family and other supports is often emphasized (Fortune et al., 2008; Cox and Hetrick, 2017; Cottrell et al., 2018), and this study extends this to highlight the need for young people to maintain some autonomy and control in terms of with whom and how they share their distress with others. Relevant to building connection, young people also described “changing the environment” as an important strategy for managing urges to self-harm, and this often involved going outside or going out with friends to engage in activities. Changing the environment is a strategy that is particularly well supported by previous research as it not only facilitates engagement with others – reducing feelings of isolation – it also engages behavioral activation, a key component of cognitive behavioral therapy, which involves small achievable tasks that increase positive affect by creating a sense of mastery or change in focus (Hopko et al., 2003).

This study was unique in being able to evaluate young people’s experience of “mimicking strategies,” which are often recommended by clinicians. Participants in this study acknowledged that they can be useful as a discrete method to be used when in public. However, they also noted that mimicking strategies were inadequate in the face of severe distress, and can be perceived as potentially condescending and invalidating.

## Strengths and Limitations

The participants in this study were help-seeking individuals who had sought professional help through secondary and tertiary mental health services as well as through general practice and private psychological services. Given this, these findings may not generalize to young people who engage in self-harm but have not sought help. For example, participants’ responses to mimicking strategies in the current study may reflect the nature of the sample who were help-seeking and in remission for 3 months and that these participants may have learnt more effective emotional-regulation strategies to deal with urges to self-harm than individuals who are yet to seek any help. While participants were all help-seeking, we did not systematically collect information about mental health diagnoses. Specific diagnoses may result in consistent reactions to particular kinds of triggers, but this was not explicitly explored. That our participants represented an array of diagnoses and psychosocial issues may also in part contribute to the finding about the idiosyncratic nature of self-help strategies. Finally, given the retrospective nature of the study, participants may have forgotten or inaccurately recalled details of triggers and helpful strategies.

Strengths included the systematic literature review undertaken to guide the development of the interview schedule to ensure all questions were relevant, and the robust frameworks followed for qualitative analysis.

## IMPLICATIONS AND CONCLUSION

Young people at risk of self-harm require strategies to support them in moments when they are experiencing distressing emotions and have an urge to self-harm. Notwithstanding that young people may require longer term interventions to support their journey to recovery, the insights from this research about “in the moment” or short-term strategies for managing the urge to self-harm are important. The research has highlighted that these strategies need to help young people manage distressing emotions and support them to connect with others. An important aspect of such strategies is helping young people to become aware of their triggers, including the contexts and situations, but also the arising psychological distress that precedes their urge to self-harm. This, for example, might be done by the person who is supporting the young people person via techniques such as functional or “chain analysis” that supports an individual to uncover all the factors that led to the urge to self-harm. Young people in this study identified a large number of potentially helpful strategies to manage self-harm urges, while highlighting that different strategies will work for different people, in different settings and at different times. Therefore, in terms of developing strategies to help them with the “in the moment distress” it is important that young people become aware of what most helps them. Digital interventions appear to offer great potential to support young people who self-harm, especially if they provide opportunities for a young person to think about their own individual triggers, offer a wide range of self-help strategies that they can choose from to manage the urge to self-harm, are customizable to an individual’s own triggers and strategy responsiveness, are moderated by a third party for safety, limit content about methods or scars, and facilitate a range of functions for improving social connections. Through its unique findings relating to the mediating role of distressing emotions and social isolation in prompting the urge to self-harm, the potential inadequacies of mimicking strategies, and alternate activities young people engage in and find helpful when experiencing the urge to self-harm, this research highlights the importance of individual strategies that help a young person to use strategies that assist with emotion regulation and to feel more connected to others.

## DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation, to any qualified researcher.

## ETHICS STATEMENT

This study was carried out in accordance with the recommendations of the National Statement on Ethical Conduct

in Human Research (NHMRC, ARC, UA, 2007) (National Statement) 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 Melbourne Health Human Research Ethics Committee (HREC/15/MH/340).

## AUTHOR CONTRIBUTIONS

SH and JR conceived on this project and developed the methodology. KA and AS undertook the research as part of the requirements of the Honours in Psychology (La Trobe University), and along with SH interviewed all the young people, transcribed the interviews, and took a lead in undertaking the analysis with input from all the authors. SH drafted the manuscript with substantial input from other authors who all approved the manuscript for final submission.

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## SUPPLEMENTARY MATERIAL

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# The Relationship Between Resilience and Mental Health in Chinese College Students: A Longitudinal Cross-Lagged Analysis

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The relationship between resilience and mental health was examined in three phases over 4 years in a sample of 314 college students in China. The present study aimed to gain insight into the reciprocal relationship of higher levels of resilience predicting lower levels of mental ill-being, and higher levels of positive mental health, and vice versa, and track changes in both resilience, mental ill-being and positive mental health over 4 years. We used the Depression Anxiety Stress, the Positive Mental Health, and the Resilience Scales. Results revealed that first-year students and senior year students experienced higher negative mental health levels and lower positive mental health levels than junior year students. Cross-lagged structural equation modeling analyses showed that resilience could significantly predict mental health status in the short term, namely within 1 year from junior to senior year. However, the predicting function of resilience for mental health is not significant in the long term, namely within 2 years from freshman to junior year. Additionally, the significant predicting function of individuals' mental health for resilience is fully verified for both the short and long term. These results indicate that college mental health education and interventions could be tailored based on students' year in college.

**Keywords:** mental ill-being, positive mental health, resilience, cross-lagged analysis, college students

## INTRODUCTION

Resilience refers to the process of adapting well in the face of adversity, trauma, tragedy, threats, or even significant sources of stress (American Psychological Association, 2014). According to many empirical studies, resilience is negatively correlated with indicators of mental ill-being, such as depression, anxiety, and negative emotions, and positively correlated with positive indicators of mental health, such as life satisfaction, subjective well-being, and positive emotions (Hu et al., 2015).

Some studies have shown that resilience is negatively correlated with depression and anxiety (Miller and Chandler, 2002; Nruugham et al., 2010; Wells et al., 2012; Poole et al., 2017; Shapero et al., 2019). Skrove et al. (2012) found that resilience characteristics are associated with lower anxiety and depression symptom levels. Anyan and Hjemdal (2016) indicated that



resilience partially mediated the relationship between stress, and symptoms of anxiety, and depression. Goldstein et al. (2013) argued that internal resilience is both a compensatory and protective factor for depression symptoms in the context of sexual abuse among emerging adults transitioning out of child welfare. Poole et al. (2017) pointed out that resilience independently predicted symptoms of depression and moderated the association between adverse childhood experiences and depression. Shapero et al. (2019) determined that resilience significantly moderated the relationship between emotional reactivity and depressive symptoms. Anderson (2012) demonstrated that, among all aspects of resilience, the equanimity and meaning factors are most related to depression. Building resilience may be one way of preventing adolescent depression.

In addition, resilience showed significant correlation with positive mental health indicators, such as life satisfaction and subjective well-being (Haddadi and Besharat, 2010; Vitale, 2015; Satici, 2016; Tonym and Weinberg, 2016). Tonym and Weinberg (2016) found a moderate, positive correlation between resilience and subject well-being. Satici (2016) showed that resilience positively predicts subjective well-being through the mediating role of hope. Abolghasemi and Varaniyab (2010) found that psychological resilience and perceived stress explained 31 and 49%, respectively, of the variance of life satisfaction based on multiple regression analysis. Vitale (2015) demonstrated that resilience contributed to the positive outcome of life satisfaction in young adults with a history of childhood trauma. Smith (2009) showed that resilience and positive emotions might have a reciprocal influence on each other.

The studies addressing the relationship between resilience and mental health are mostly cross-sectional studies, while data analysis methods are centered on correlation and regression analysis (Abolghasemi and Varaniyab, 2010; Anderson, 2012; Skrove et al., 2012; Goldstein et al., 2013; Vitale, 2015; Tonym and Weinberg, 2016), with some studies using the intermediate effect or regulatory effect analysis (Liu et al., 2012; Satici, 2016; Ding et al., 2017; Poole et al., 2017; Shapero et al., 2019). However, follow-up studies are generally insufficient: the temporal effects relationship between resilience and mental health could not be determined.

Many studies focus on the predictive function of resilience for mental health indicators (Goldstein et al., 2013; Vitale, 2015; Satici, 2016). And correspondingly, most intervention studies pay attention to the influence of resilience training to the improvement of mental health status. For example, in a meta-analysis, Dray et al. (2017) found that resilience-focused interventions were effective relative to a control in reducing depressive and anxiety symptoms for children and adolescents, particularly if a cognitive-behavioral therapy based approach is used. Waugh and Koster (2015) revealed that there was evidence that positivity training interventions aimed at increasing well-being, positive emotions and resilience had beneficial effects on depression. There are few studies that assessed mental health's influence on resilience. Regarding the impact of mental ill-being on resilience, Pollack et al. (2004) found that compared with the general population, individuals with anxiety disorders exhibit less resilience. In terms of the impact of positive mental

health on resilience, Tugade et al. (2005) argued that positive emotions served an important function in the ability of resilient individuals to rebound from stressful encounters. Nevertheless, the bidirectional causality between both sides has not been clearly explored. Thus, the present study—as a follow-up study remedying the shortcomings of existing studies—examines the temporal effects between resilience and mental health status based on a cross-lagged analysis.

Furthermore, previous studies have concentrated on separately analyzing the relationship between resilience and mental ill-being indicators or positive indicators. Based on the double-factor model of mental health (Keyes, 2005; Suldo and Shaffer, 2008), the present study introduces both negative and positive indicators to the mental health evaluation system. On that basis, it further provides support for studying the correlation between resilience and mental health, to contribute to the improvement of college students' resilience and mental health status.

Therefore, the present study aimed to gain insight into the reciprocal relationship of higher levels of resilience predicting lower levels of mental ill-being, and higher levels of positive mental health, and vice versa. The Resilience Scale (RS-11, Schumacher et al., 2005), Depression Anxiety Stress Scale (DASS-21, Lovibond, 1995), and Positive Mental Health Scale (PMHS, Lukat et al., 2016) were applied in a college student sample in China three time over 4-year periods. The RS-11 was used to assess resilience that is associated with healthy development and psychosocial stress-resistance (Schumacher et al., 2005). DASS was a measure that captured three aspects of mental ill-being, including depression, anxiety, and general stress (Lovibond, 1995). And the PMHS was applied as a valid short unidimensional measure of general emotional well-being (Lukat et al., 2016). Furthermore, the survey continued for 4 years in order to track changes in both resilience, mental ill-being and positive mental health overtime.

Based on earlier empirical evidence that resilience, mental ill-being and positive mental health were associated with each other cross-sectionally (Miller and Chandler, 2002; Haddadi and Besharat, 2010; Nruham et al., 2010; Wells et al., 2012; Vitale, 2015; Satici, 2016; Tonym and Weinberg, 2016; Poole et al., 2017; Shapero et al., 2019) and that resilience played a predictive function for mental health indicators (Goldstein et al., 2013; Vitale, 2015; Satici, 2016), we hypothesized that (1) resilience would negatively correlate with DASS score and positively correlate with PMHS score; (2) resilience at T1 would predict DASS at T2 and vice versa; resilience at T2 would predict DASS at T3 and vice versa; (3) resilience at T1 would predict PMHS at T2 and vice versa; resilience at T2 would predict PMHS at T3 and vice versa.

## MATERIALS AND METHODS

### Participants and Procedures

This project was part of the Bochum Optimism and Mental Health (BOOM) research project (Schönfeld et al., 2016). All participants were students at Nanjing University, China. The study was approved by the Ethics Committee of the Faculty



of Psychology of the Ruhr-Universität Bochum and the Academic Ethics Committee of Nanjing University.

Based on the convenience sampling method, participants were recruited at the baseline year in 2012. Surveys were administered on the same participants three times: September 2012 (T1), September 2014 (T2), and September 2015 (T3). With the first survey, the level of resilience, mental ill-being, and positive mental health were evaluated when the participants were college freshmen. With the second and third surveys, the same three variables were evaluated when the participants were college juniors and seniors. The instruments were applied with pencil and paper. The data were collected at the different occasions to explore the different relationships in an extended period (2 years between the first and second measurement wave) and a short period (1 year between the second and third). The voluntary and confidential nature of their involvement in this study was clearly communicated to all students involved. Participants gave their informed consent orally one by one before participation. Informed consent had to be given orally, as no written materials were exchanged. This consent procedure was approved by the Academic Ethics Committee of Nanjing University. Participants received a gift (approximately \$1.50) after completing each survey.

There were overall 1,064, 695, and 497 college students participating in the surveys conducted at T1, T2, and T3, respectively. Participants who completed less than 80% of the three target scales, who were suspected not to respond sincerely (i.e., all the answers were the same), or who missed one or more surveys were excluded. Finally, answers from 314 participants were included for further statistical analyses. Of these participants, there were 167 men and 147 women. The average age (at T1) of the longitudinal sample was  $18.23 \pm 0.76$ , ranging from 17 to 21. According to the result of T-test analysis, no significant differences were found between participants validly responding at all time points ( $n = 314$ ), and dropouts or the ones who did not respond validly at any time ( $n = 750$ ) concerning gender, resilience, depression, anxiety, stress, or positive mental health at T1. And the effect sizes were 0.014, 0.049,  $-0.054$ ,  $-0.003$ ,  $-0.017$ , and 0.034 respectively. According to G\*Power, in order to have a power of 0.80 at an alpha-level of 0.05, the effect size ( $d$ ) need to be more than 0.17, with the two groups of 314 and 750 participants in the T-test analysis. But the effect size here is relatively low to achieve the required power.

## Measures

### Resilience Scale (RS-11)

The Resilience Scale (RS-25), as originally created by Wagnild and Young (1993), has been widely applied in many studies. Schumacher et al. (2005) created a German version of the scale, with fewer items (RS-11). A Chinese version of RS-11 was created through a translation and editing process by Gao et al. (2013). Resilience, in the shorter 11-item version, is conceptualized as a protective personality factor that is associated with healthy development and psychosocial stress-resistance. The RS-11 is a unidimensional scale, using a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). Higher total scores represent higher resilience levels. For our three surveys, the Cronbach's  $\alpha$  coefficient ranged from 0.83 to 0.87. The Compound

Reliability coefficients ranged from 0.82 to 0.96. The Extracted Average Variance coefficients ranged from 0.56 to 0.67. The Omega McDonald's coefficients ranged from 0.84 to 0.88.

### Depression Anxiety Stress Scale (DASS-21)

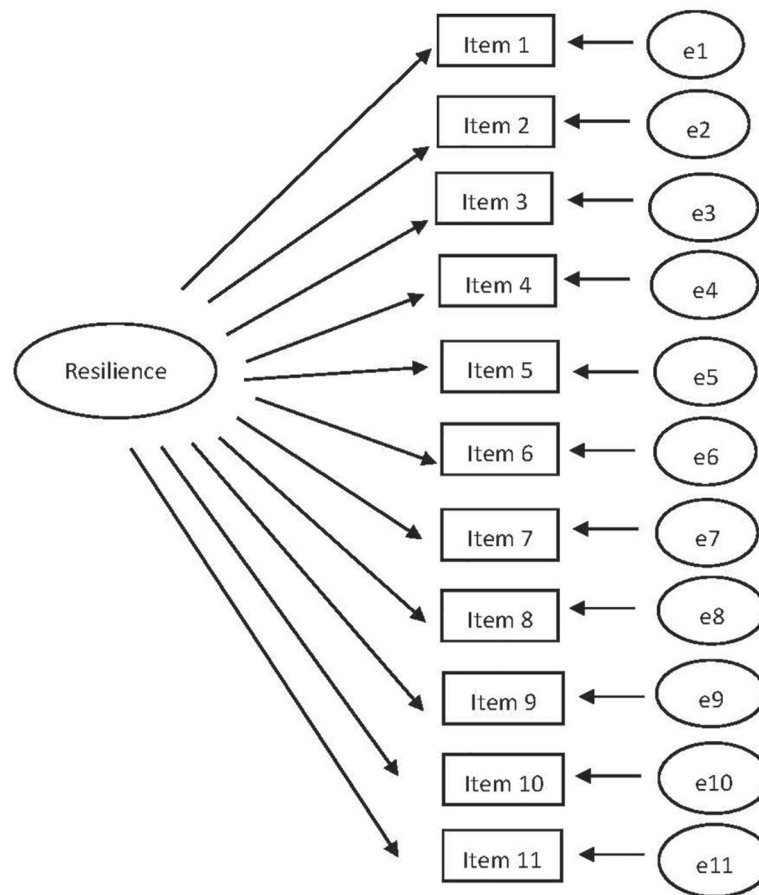
The Depression Anxiety Stress Scale (DASS) was originally created by Lovibond (1995) and was used for assessing symptoms of depression, anxiety, and stress as outcome variables of daily stressors. Henry and Crawford (2005) verified that DASS-21, the short version of DASS, was reliable and valid for ordinary populations. A simplified Chinese version of DASS-21 was created through a translation and editing process by Gong et al. (2010). DASS-21 is composed of three sub-scales, including the depression, anxiety, and stress scale. Each sub-scale has 7 items that use a 4-point Likert scale ranging from 0 (did not apply to me at all) to 3 (applied to me very much or most of the time). This study measures the level of mental ill-being by using DASS-21. For our three surveys, the Cronbach's  $\alpha$  coefficient ranged from 0.87 to 0.89, from 0.84 to 0.85, from 0.84 to 0.87, for the depression, anxiety, and stress sub-scale, respectively. The Compound Reliability coefficients ranged from 0.65 to 0.88, from 0.68 to 0.86, from 0.74 to 0.86, respectively. The Extracted Average Variance coefficients ranged from 0.51 to 0.65, from 0.57 to 0.62, from 0.58 to 0.64, respectively. The Omega McDonald's coefficients ranged from 0.81 to 0.83, from 0.86 to 0.88, from 0.86 to 0.89, respectively.

### Positive Mental Health Scale

The Positive Mental Health Scale (PMHS) was created by Trumpf et al. (2010) and consists of 14 items. The present study applies the short version revised by Lukat et al. (2016), which is composed of 9 items that use a 4-point Likert scale ranging from 0 (do not agree) to 3 (agree). A higher score represents a more healthy and positive mental health status. The scale assesses positive aspects of health and life experiences (e.g., I am often carefree and in good spirits, I enjoy my life, I manage well to fulfill my needs, I am in good physical and emotional condition). Lukat et al. (2016) showed that the short version is a unidimensional scale, with good reliability and validity. Before our study, there was no Chinese version of this scale. Thus, we applied the "Translation-Backtranslation-Revision" method to create the Chinese version for our study. All participating personnel for translating and back-translating are experts in German and Chinese. The Cronbach's  $\alpha$  coefficient ranged from 0.81 to 0.92 over the three surveys. The Compound Reliability coefficients ranged from 0.92 to 0.96. The Extracted Average Variance coefficients ranged from 0.60 to 0.69. The Omega McDonald's coefficients ranged from 0.89 to 0.92.

## Statistical Analysis

SPSS24.0 (IBM Corp, 2010) was used to calculate the descriptive statistics and correlations between resilience and mental health status (including DASS and PMHS). Then, the mean changes in resilience, DASS, and PMHS across the 3 years were tested via repeated-measures multivariate analysis of variance (MANOVA) using SPSS24.0. In addition, JASP (Wagenmakers,



**FIGURE 1 |** The CFA model with the unconstrained factor loadings and intercepts for RS-11.

**TABLE 1 |** The fit indices of unconstrained and measurement weight models for RS-11.

Model	$\chi^2$	df	CFI	TLI	RMSEA
Unconstrained	641.991	132	0.916	0.902	0.064
Measurement weights	667.276	152	0.914	0.908	0.060

2014) was applied to calculate the reliability coefficient Omega McDonalds. And G\*Power 3.1.9.4 (Buchner et al., 2019) was used for the power analysis.

Scores on resilience, DASS, and PMHS at T1, T2, and T3 were included for modeling and examining intra-individual changes over time using a cross-lagged analysis. Amos22.0 (Arbuckle, 2013) was applied for the cross-lagged analysis. The cross-lagged panel model was used to analyze the interactions and reciprocal influences between resilience and mental health over time. Cross-lagged path coefficients (i.e., predictive associations) between T1 and T2 for resilience (measured by RS) and mental health status (indexed by DASS and PMHS) were included, as well as the path coefficients between T2 and T3. The cross-lagged paths denote to what extent the prior scores of one variable relate to subsequent scores of the other variable. The panel model further included stability coefficients

between T1, T2, and T3 for RS, DASS, and PMHS to allow follow-up measurements (T2 and T3) to reflect residual change over time. We further included correlations (non-directional associations) between resilience and mental health status (including DASS and PMHS) at each of the three time-points (for T2 and T3, correlations were between residual errors). To test the model fit, we used the model testing indices including  $\chi^2/\text{df}$ , NFI, RFI, IFI, TLI, CFI, and RMSEA.

## RESULTS

### Measurement Invariance Testing

As the present study is a repeated measure design, measurement invariance (MI) testing was performed to check if the constructs of the three scales were invariant over time.

### Measurement Invariance of RS-11

The RS-11 is a unidimensional scale. The CFA model for RS-11 with the unconstrained factor loadings and intercepts is shown in **Figure 1**. Three CFA's were conducted for T1, T2, and T3, separately. Next, we tested for measurement invariance, see **Table 1** for the fit indices. CHIDIST ( $\Delta\chi^2$ ,  $\Delta df$ ) = 0.19.  $\Delta\chi^2$  is now insignificant, so invariance is established.

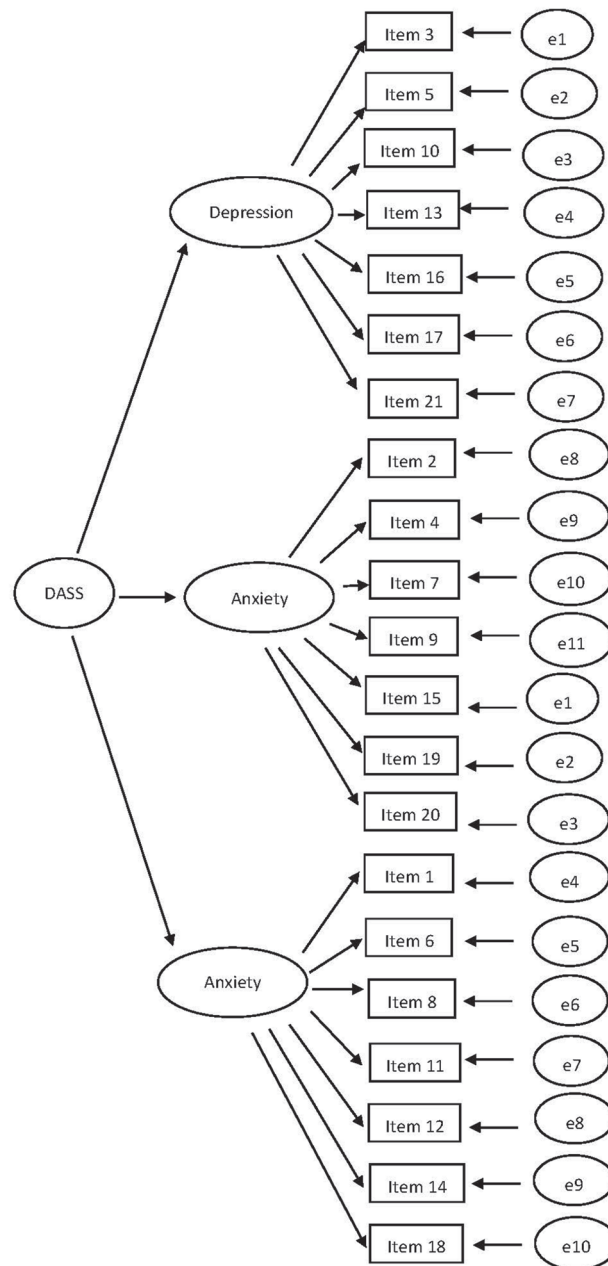
### Measurement Invariance of DASS-21

The DASS-21 is a scale with three dimensions. The CFA model for DASS-21 with the unconstrained factor loadings and

intercepts is shown in **Figure 2**. Three CFA's were conducted for T1, T2, and T3, separately. Next, we tested for measurement invariance, see **Table 2** for the fit indices. CHIDIST ( $\Delta\chi^2$ ,  $\Delta df$ ) = 0.06.  $\Delta\chi^2$  is now insignificant, so invariance is established.

### Measurement Invariance of Positive Mental Health Scale

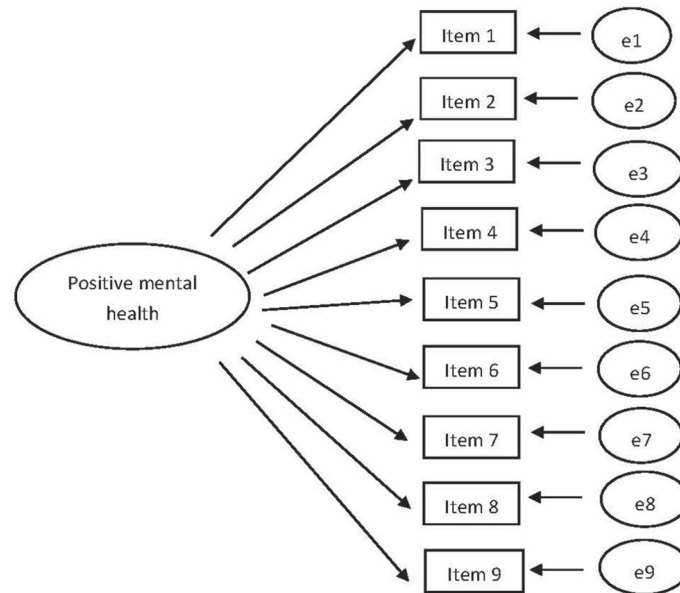
The PMHS is a unidimensional scale. The CFA model for PMHS with the unconstrained factor loadings and intercepts is shown in **Figure 3**. Three CFA's were conducted for T1,



**FIGURE 2 |** The CFA model with the unconstrained factor loadings and intercepts for DASS-21.

**TABLE 2** | The fit indices of unconstrained and measurement weight models for DASS-21.

Model	$\chi^2$	df	CFI	TLI	RMSEA
Unconstrained	2599.91	558	0.894	0.868	0.062
Measurement weights	2649.63	594	0.853	0.856	0.060

**FIGURE 3** | The CFA model with the unconstrained factor loadings and intercepts for PMHS.**TABLE 3** | The fit indices of unconstrained and measurement weight models for PMHS.

Model	$\chi^2$	df	CFI	TLI	RMSEA
Unconstrained	471.52	81	0.925	0.900	0.072
Measurement weights	489.505	97	0.925	0.916	0.066

T2, and T3, separately. Next, we tested for measurement invariance, see **Table 3** for the fit indices. CHIDIST ( $\Delta\chi^2$ ,  $\Delta df$ ) = 0.32.  $\Delta\chi^2$  is now insignificant, so invariance is established.

## Relationship Between Resilience and Mental Health Status

As shown in **Table 4**, in the three surveys, the pairwise simultaneous and successive correlations between depression, anxiety, stress, and resilience were negative and significant, except with resilience in T1 and stress in T2.

As shown in **Table 5**, the pairwise simultaneous and successive correlations were all positive and significant between resilience and positive mental health.

## Changes in Resilience and Mental Health Status Across Time

A repeated-measures MANOVA was conducted with time (T1, T2, and T3) as the within-group independent variable and the scores on resilience, depression, anxiety, stress, and PMHS

as dependent variables. A significant effect of time was observed for depression [ $F(2, 314) = 18.08, p < 0.001, \eta_p^2 = 0.03$ ], anxiety [ $F(2, 314) = 15.20, p < 0.001, \eta_p^2 = 0.02$ ], stress [ $F(2, 314) = 9.54, p < 0.001, \eta_p^2 = 0.01$ ], and PMHS [ $F(2, 314) = 506.84, p < 0.001, \eta_p^2 = 0.32$ ]. The level of depression increased and reached a peak in T3. The level of anxiety and stress decreased first and then increased in a U-type tendency. The level of positive mental health increased first and then decreased in an inverted-U tendency. However, no significant effect of time was observed for resilience ( $\eta_p^2 = 0.003$ ). According to G\*Power, in order to have a power of 0.80 at an alpha-level of 0.05, the effect size ( $f$ ) needs to be more than 0.10, with 314 participants in the MANOVA analysis. But the effect size here is relatively low to achieve the required power, except the effect of time for PMHS.

## Cross-Lagged Analysis for Resilience and Level of Mental Health

Based on the correlation analysis, by establishing a structural equation model and implementing a cross-lagged analysis for



**TABLE 4** | Means and standard deviations (SDs), as well as correlations among depression, anxiety, stress, and resilience at T1, T2, and T3.

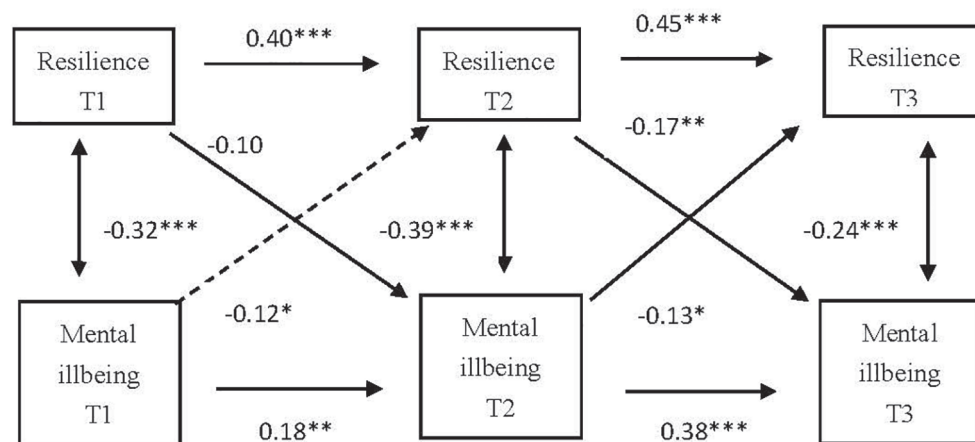
	<i>M</i> ± <i>SD</i>	1	2	3	4	5	6	7	8	9	10	11	12
1. Depression (T1)	1.12 ± 1.49	1											
2. Depression (T2)	1.55 ± 2.92	0.15**	1										
3. Depression (T3)	2.24 ± 3.21	0.18**	0.42**	1									
4. Anxiety (T1)	2.47 ± 2.09	0.58**	0.13*	0.20**	1								
5. Anxiety (T2)	1.62 ± 2.09	0.11	0.84**	0.42**	0.18**	1							
6. Anxiety (T3)	2.46 ± 3.01	0.18**	0.34**	0.82**	0.32**	0.45**	1						
7. Stress (T1)	2.82 ± 2.76	0.50**	0.17**	0.21**	0.65**	0.17**	0.25**	1					
8. Stress (T2)	2.19 ± 3.12	0.15**	0.86**	0.39**	0.21**	0.82**	0.39**	0.23**	1				
9. Stress (T3)	3.01 ± 3.39	0.23**	0.34**	0.81**	0.31**	0.42**	0.83**	0.31**	0.45**	1			
10. Resilience (T1)	59.92 ± 7.30	-0.37***	-0.27***	-0.22***	-0.19***	-0.11*	-0.15**	-0.15**	-0.08	-0.14*	1		
11. Resilience (T2)	59.04 ± 8.44	-0.25***	-0.17**	-0.21***	-0.43***	-0.35***	-0.42***	-0.34***	-0.28***	-0.33***	0.44***	1	
12. Resilience (T3)	59.84 ± 8.26	-0.27***	-0.21**	-0.23***	-0.32***	-0.26***	-0.31***	-0.38***	-0.33***	-0.39***	0.37***	0.51***	1

*M*, mean; *SD*, standard deviation; T1, the first survey; T2, the second survey; T3, the third survey. \**p* < 0.05; \*\**p* < 0.01; \*\*\**p* < 0.001.

**TABLE 5** | Means and standard deviations (SDs), as well as correlations between positive mental health and resilience in T1, T2, and T3.

	<i>M</i> ± <i>SD</i>	1	2	3	4	5	6
1. Positive mental health (T1)	22.25 ± 4.21	1					
2. Positive mental health (T2)	30.35 ± 4.94	0.48***	1				
3. Positive mental health (T3)	29.11 ± 4.51	0.42***	0.60***	1			
4. Resilience (T1)	59.92 ± 7.30	0.60***	0.27***	0.28***	1		
5. Resilience (T2)	59.04 ± 8.44	0.45***	0.57***	0.45***	0.44***	1	
6. Resilience (T3)	59.84 ± 8.26	0.31***	0.41***	0.60***	0.37***	0.51***	1

*M*, mean; *SD*, standard deviation; T1, the first survey; T2, the second survey; T3, the third survey. \*\*\**p* < 0.001.

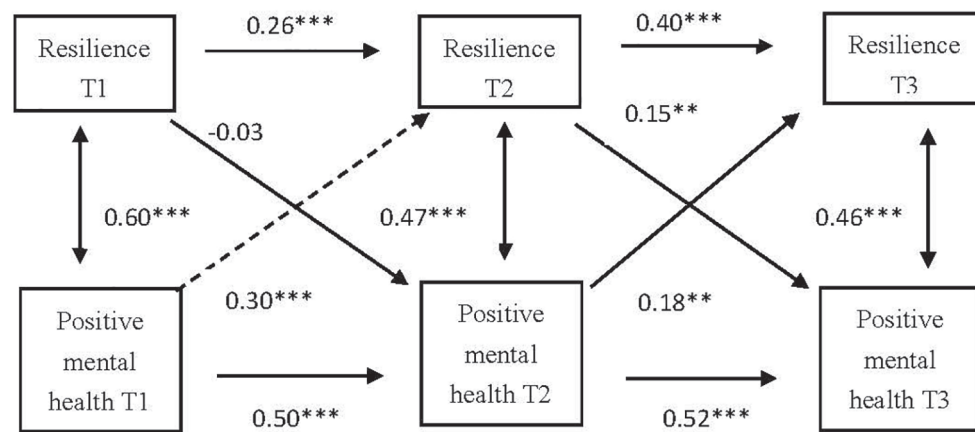
**FIGURE 4** | Cross-lagged analysis of the relationship between resilience and negative mental health. T1, the first survey; T2, the second survey; T3, the third survey; \**p* < 0.05, \*\**p* < 0.01, \*\*\**p* < 0.001.

resilience and mental health level, the present study explored the bidirectional prediction relationship between resilience and negative mental health and between resilience and positive mental health.

We explored the bidirectional prediction relationship between the variable resilience and mental ill-being. The overall fit of this initial measurement model was acceptable ( $\chi^2/df = 3.211$ , NFI = 0.919, RFI = 0.896, IFI = 0.928, TLI = 0.901, CFI = 0.926, and RMSEA = 0.083). As shown in **Figure 4**, the level of mental ill-being at T1 significantly and negatively predicted resilience

at T2. The level of mental ill-being at T2 significantly and negatively predicted resilience at T3. Resilience at T2 significantly and negatively predicted the level of mental ill-being at T3.

Since positive mental health and resilience are both unidimensional variables, the bidirectional prediction relationship was explored between resilience and positive mental health, as two observed variables. The overall fit of this initial measurement model was acceptable ( $\chi^2/df = 4.228$ , NFI = 0.972, RFI = 0.893, IFI = 0.977, TLI = 0.912, CFI = 0.976, and RMSEA = 0.076).



**FIGURE 5 |** Cross-lagged analysis on the relationship between resilience and positive mental health. T1, the first survey; T2, the second survey; T3, the third survey; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .

As shown in **Figure 5**, the level of positive mental health at T1 significantly and positively predicted resilience at T2. The level of positive mental health at T2 significantly and positively predicted resilience at T3. Resilience at T2 significantly and positively predicted the level of positive mental health at T3.

## DISCUSSION

The present study is the first study to examine the bidirectional relationship between resilience and mental health status in three phases over 4 years using cross-lagged panel analysis in a college student sample. As expected, our analyses further revealed a significant reciprocal relationship between resilience and mental health status, indicating that resilience predicted the level of mental health status in short term of 1 year, and vice versa. And in the longer term of 2 years, mental health was found to predict resilience level. These findings broaden the cross-sectional results in earlier studies and extend an understanding of the relationship between resilience and mental health status in younger adults.

The present study is innovative in several ways. First, previous studies verified that resilience could predict mental health status (Goldstein et al., 2013; Vitale, 2015; Satici, 2016). Anderson (2012) indicated that administering screening measures such as the Resilience Scale was an efficient way to identify those students who may be at risk for depressive symptoms. However, according to the result of our study, this prediction was significant considering 1 year, but not 2 years. If the baseline and retest time interval is too long, the predictive effect of resilience on mental health is not significant. Meulen et al. (2018) pointed out that psychological resilience has a declining protective capacity for mental health disturbances over a medium time-span, specifically when corrected for baseline mental health disturbances.

Secondly, this study verified the significant influence of mental health level on resilience. While the majority of previous studies used mental health status only as an outcome measure,

only a few studies have considered positive mental health as predictive factor (Pollack et al., 2004). Our empirical results add to this by showing that improved mental health is associated with increased resilience.

Thus, from the perspective of longitudinal development, the influence of resilience on mental health status has a chain effect: mental health status appears to influence resilience, while resilience further affects mental health status. As a result, individuals with lower baseline mental health levels and who encounter adversity later in their life should receive timely mental health education or intervention to enhance their level of resilience, coping capacity with adversity, and adaptability to the environment. This approach aims to prevent “the Matthew Effect,” which makes the strong stronger and the weak weaker. During this period, a preventive intervention could be offered for college students, to increase their autonomy, self-acceptance, environmental mastery, purpose in life, positive relations, and personal growth. Such interventions could reduce the risk of developing a mental disorder and experiencing other negative consequences by enhancing protective factors (Herrero et al., 2019). Oldfield et al. (2018) found that school connectedness may provide a role in promoting resilience for mental health for adolescents who were at risk due to poor parental attachment. So, it is beneficial to enhance positive relationship between students and teachers to increase students’ sense of belonging, which could improve their self-identity and social skills. Such education and interventions can support students as they adapt to different challenges and allow them to increase their mental health status in their studies and life.

Thirdly, this study included both mental ill-being and positive indicators of mental health, based on the double-factor model of mental health (Keyes, 2005; Suldo and Shaffer, 2008). Results showed a picture of how mental health status fluctuates in college students across time.

Regarding mental ill-being, the depression level was lower in freshmen, higher in juniors, and highest in seniors. The anxiety and stress level was higher in freshmen and seniors and lower

in juniors. College students, when faced with environmental changes and transitional periods in life during freshman and senior years, may experience more negative emotions than during their more stable junior years. These findings are consistent with previous studies about the mental health status of college students in China (Xue, 2001; Li, 2003) and the United States (Soet and Sevig, 2006). When freshmen enter their university, they will face a change in the lives, such as new social relationships and contexts without the support of parents or long-time friends, academic pressure, stress during exams, and social disconnection. And this is considered a stress factor and a heightened risk for psychopathology (Herrero et al., 2019). Beiter et al. (2015) pointed that post-graduation plans is one of the top 10 sources of concern for college students, and finding a job after graduation is one of the first four concerns directly relate to college student life. The seniors appear to have increased levels of depression and anxiety because they will soon be on the job market and face the pressure of finding a job or passing post-graduate entrance examination. These results indicate that college mental health education and interventions could be tailored based on students' year in college. It is necessary to reinforce mental health education for college students during their freshmen and senior years, especially by providing mental health education services for stress management and anxiety relief training for those students. In addition, college mental health educators need to pay attention to seniors' higher levels of depression and strengthen screening for depressive symptoms for students at this stage. It is important to design programs to help freshman settle into college life, as well as to help seniors prepare for jobs or graduate school. In addition, maybe it is also beneficial to prepare juniors for what they will need to accomplish in their senior year and hopefully reduce their stress, anxiety, and depression then (Beiter et al., 2015).

In terms of positive mental health, the present study found that freshmen had a relatively lower level of positive mental health. As they grow older, college students appear to meet the challenges of their studies and life more confidently and steadfastly than before. Their level of positive mental health reached a peak in their junior year but then decreased in their senior year, possibly owing to the increase in stress in multiple areas. The relatively lower level of positive mental health in freshmen leaves room for mental health education. In other words, interventions should be implemented to enhance their positive mental health by recognizing and applying positivity; sensing and appreciating the experiences of positivity, training, and forming positive thinking; and establishing and maintaining positive interpersonal relationships (Duan and Bu, 2018).

There are some limitations to the present study. First, the large drop-out was a potential limitation of the research. There were 1,064 freshmen participants in the surveys conducted at T1. However, only 497 participants finished all three waves of the survey due to difficulties in following up the participants. Second, the result of power analysis for the T-test and MANOVA analysis was not ideal in present study, as the effect size was relatively low. The research design, especially the sampling process, needs to be improved in the future research. For example, participants could be recruited from different universities to

reduce the overlap degree of the two population distribution and improve the effect size. Third, the surveys were applied with pencil and paper. However, an online registration would have been much safer, registering the time, guaranteeing a higher quality of the data and better risk of coding errors of the same ones. Four, the current study only investigated the reciprocal relationship between resilience and mental health status in Chinese college students. In other age periods or population groups, the causal direction need to be explored in the future research. Five, the present study is descriptive research, so the causal direction needs to be explored in future research. Consequently, the casual relationships need to be examined by intervention research in the future. Six, resilience is required in response to different adversities, ranging from ongoing daily hassles to major life events (Fletcher and Sarlcar, 2013). Increased opportunities for exposure to adversity and life experience may be an important factor affecting the relationship between trait resilience and mental health (Hu et al., 2015). So, future studies could recruit participants who experience adversity, such as love, family misfortune, academic difficulties, or employment difficulties, to explore the moderation effect of adversity on the relationship between resilience and mental health status.

## CONCLUSION

In sum, the current study provides preliminary evidence of a mutually reducing relationship between resilience and mental ill-being and the mutually enhancing relationship between resilience and positive mental health in the short term of 1 year. And the significant influence of mental health level on resilience was presented in the long term of 2 years. Future intervention research is warranted to further verify this reciprocal relationship.

## AUTHOR CONTRIBUTIONS

YW designed the study, performed the statistical analyses, and drafted the manuscript. ZS and X-CZ organized the data collection. JM designed the project.

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# Adolescent Suicide Ideation, Depression and Self-Esteem: Relationships to a New Measure of Gender Role Conflict

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Among 15–24 year olds in Ireland, completed suicide was responsible for 4.1 times more male deaths than female deaths in 2014 (World Health Organization [WHO], 2017). Few international research studies have investigated the relationship between masculinity [as assessed by a measure of gender role conflict (GRC)] and suicide ideation, and none have done so with Irish adolescents. Therefore, the purpose of the current study was to investigate the relationships between a new measure of GRC developed specifically for use with Irish adolescents (I-GRCS-A; O'Beaglaioich et al., 2016), and depression, self-esteem, and negative/protective suicide ideation. A sample of 176 adolescent boys ( $M = 16.9$ ,  $SD = 0.94$ ) from a non-clinical population participated in the study. Regression analyses and tests of mediation revealed that depression significantly mediated the relationship between GRC and negative suicide ideation, whilst self-esteem and depression significantly mediated the relationship between GRC and positive suicide ideation. Implications and limitations of the current study are outlined and directions for future research are discussed.

**Keywords:** suicide ideation, boys, masculinity, gender role conflict, Ireland, adolescence

## INTRODUCTION

Official statistics provided by the World Health Organization [WHO] (2014a) indicated that 1.4% of all global deaths (803,900 persons) in 2012 occurred via suicide<sup>1</sup>. While these are global statistics, suicide is categorized as the fifteenth highest cause of death worldwide and approximately 75% of these suicides had occurred in middle and low-income countries (World Health Organization [WHO], 2014b). Cerel et al. (2018) estimated that, for a single suicide, an average of 135 people knew the person in question, resulting in a large circle of people (potentially) needing clinical services or support. Males are almost twice as likely to die by completed suicide compared to females<sup>2</sup> (World Health Organization [WHO], 2014a) and, in western countries, males die by suicide

<sup>1</sup>These statistics do not account for individuals who engaged in self-harm, had unsuccessfully attempted suicide, or experienced persistent suicidal ideation.

<sup>2</sup>National suicide rates in 2012 in Bangladesh, China, Indonesia, Iraq, and Pakistan were slightly higher for females.

three to four times more often than do females (Värnik, 2012), indicating that factors associated with gender relate to increased prevalence of completed suicides.

Adolescent suicide has emerged as a critical public health concern (e.g., Beautrais, 2000; Gould et al., 2003; Bridge et al., 2006; Hinduja and Patchin, 2018; Toomey et al., 2018) and is the second highest cause of death among young adolescents and young adults (15–29 year olds; World Health Organization [WHO], 2014a). The high incidence of adolescent suicide is believed to be precipitated by the myriad societal stressors experienced by young people (Turner et al., 2002). To illustrate: the following variables have been associated with suicide among adolescents: (a) substance use and/or abuse (e.g., Beautrais, 2000; Brennan and McGilloway, 2012); (b) affective mood disorders (e.g., Beautrais, 2000; Balázs et al., 2013); (c) antisocial behavior (e.g., Beautrais, 2000; Linker et al., 2012); (d) lower self-esteem (e.g., Overholser et al., 1995; Garber et al., 1997); (e) medical illnesses such as stroke and chronic illness (e.g., Ferro et al., 2017; Kim and Lee, 2018), and (f) depression (Lee et al., 2006). Other factors that have been associated with adolescent suicide include gender identity (e.g., Skagerberg et al., 2013; Yadegarfar et al., 2014), sexual orientation (e.g., Beautrais, 2000; Baams et al., 2015) and socioeconomic disadvantage (Yildiz et al., 2018).

In Ireland, specifically, data from the Central Statistics Office [CSO] (2014) and World Health Organization [WHO] (2014b) reveal that, from 2000 to 2012, suicide rates have consistently been over three times higher for males compared to females. This difference persists across all age groups. Focusing more narrowly on 15–24 year olds in Ireland, suicide was responsible for 3.7 times more male deaths than female deaths in 2012 (World Health Organization [WHO], 2014c) and 4.1 times more male deaths in 2017 (World Health Organization [WHO], 2017). Suicide also has persisted as the leading cause of death for males in this age range (Lynch et al., 2006). To put this into perspective, suicide was responsible for more deaths in 2012 among 15–24 year old Irish males than cancer, traffic accidents, and heart, liver, and kidney disease combined (World Health Organization [WHO], 2014c).

There is a dearth of research exploring adolescent suicidality within an Irish context; however, reviewing the available literature reveals that gender differences exist among suicide risk factors for Irish adolescents. For example, in 2003/2004, on the basis of cross-sectional survey data ( $N = 3,631$ ) collected from 39 second-level schools in counties Kerry and Cork, and in conjunction with national suicide rates at the time, McMahon et al. (2014) reported that males were more likely than females to engage in *fatal* self-harm (i.e., males who engaged in self-harm possessed an especially high risk of *completing* suicide). This research indicates that Irish males use more lethal methods of suicide (i.e., 90% of adolescent males used hanging as their primary method of suicide) compared to females (i.e., 60% of females used overdose as their primary method of suicide) making completion more likely to occur with less opportunity for last minute intervention.

Using data from the same survey in counties Kerry and Cork, McMahon et al. (2010) examined various factors related to deliberate self-harm (DSH; i.e., a precursor to suicide) for males and females aged 15–17 ( $N = 3,801$ ). Factors such as drug use, smoking, drinking, and knowing a family member or a friend who had engaged in DSH were found to have associations with DSH for both males and females. For females, interpersonal relationship factors (i.e., fights with parents, difficulty making/keeping friends, forced sexual activity, DSH engaged in by a family member, and lower self-esteem) were significantly related to DSH. Conversely, school-related problems (i.e., problems with schoolwork, being bullied) and psychological factors (i.e., anxiety and impulsivity) emerged as significantly associated with DSH for males but not females. Further, concerns regarding sexual orientation and being bullied at school were more strongly associated with DSH for males.

Given these risk factors for young Irish males, it is surprising that the relationship between suicidality and masculinity [in particular, gender role conflict (GRC)] has received little empirical attention.

## Gender Role Conflict

Gender role conflict is defined as “a psychological state in which the socialized male gender role has negative consequences for the person and others” and occurs when “rigid, sexist, or limiting gender roles result in restriction, devaluation, or violation of self and/or others” (O’Neil, 2008, p. 362). With over 250 studies conducted to date, GRC has been shown to be associated with numerous psychological health indicators. O’Neil’s (2008) theory proposes three components that cause GRC: (1) gender role devaluations (i.e., negative assessment of self or others when individuals conform to, or deviate from, the attributes characteristic of traditional or hegemonic masculinity); (2) gender role restrictions (i.e., limiting self or others to stereotypic norms of masculinity); and (3) gender role violations (i.e., when people hurt themselves or others [or are hurt by others] when deviating from or conforming to the norms associated with hegemonic masculinity). There is variation in the degree to which males endorse specific aspects of prescribed masculinity (O’Neil et al., 1986). Further diversity in the variations of experienced GRC is dependent on developmental stages, cultural and cohort specific definitions of masculinity and gender role stereotypes (Kahn, 2009).

The most widely used measure of GRC is the Gender Role Conflict Scale (GRCS; O’Neil et al., 1986), which is regarded as the “most well-known instrument within the traditional counseling literature” focusing on masculinity (Betz and Fitzgerald, 1993, p. 360). Previous research attests to the psychometric soundness of the GRCS (e.g., Thompson and Pleck, 1986; Eisler and Skidmore, 1987; Levant et al., 1992; Fischer and Good, 1997; O’Neil, 2008). The GRCS also has made “an important contribution to men’s health research,” with “11 out of 13 studies reviewed by O’Neil (2008) document[ing] a negative correlation between GRC and self-esteem, 12 out of 15 studies report[ing] a positive correlation between GRC and anxiety, and 24 out of 27 studies [finding] positive correlations between GRC and depression” (O’Beaglaioich et al., 2013, p. 17).

Blazina et al. (2005) created an adolescent permutation of the GRCS (GRCS-A). From the original scale (37-items), 29 items were retained across four equivalent factors although three were renamed to better capture the latent construct captured by the items [i.e., the “Conflict Between Work and Family Relations” subscale was named “Conflict Between Work, School and Family” (CBWSF); “Success, Power and Competition” was relabeled “Need for Success and Achievement” (NSA); and the “Restricted Affectionate Behavior Between Men” subscale was labeled “Restricted Affection Between Men” (RAM)]. Cronbach’s alpha (i.e., scale score reliability coefficients) ranged from 0.70 to 0.82 and test–retest reliability scores varied from 0.60 to 0.95 (O’Neil, 2008). The GRCS-A correlated strongly with the original version of the scale (i.e., the GRCS,  $r = 0.88$ ); however, this correlation may be inflated due to the shared error of items in the short and long versions being correlated twice (Smith et al., 2000). The GRCS-A also correlated with scores on another scale assessing hegemonic masculinity [the Male Role Attitude Scale (MRAS),  $r = 0.37$ ].

O’Beaglaioich et al. (2013) outlined a number of criticisms of both the GRCS and the GCRS-A. O’Beaglaioich et al. (2015a) subsequently tested the psychometric properties of the GRCS-A with a sample of Irish adolescents and found that the measure was not optimal for distribution to this group (e.g., confirmatory factor analyses revealed that various items contributed to model misfit). The researchers posited that their findings “may reflect different constellations of masculinity within an Irish adolescent sample or, possibly, the use of wording that was ill-suited for this group of young boys” (p. 38). Despite supporting the general tenets of GRC theory, qualitative investigations of the items on the GRCS-A, conducted with another sample of Irish adolescents, revealed that numerous items were problematic. For example, the statement, “Verbally expressing my love to another man is hard for me” was regarded as suitable only for girls or gay men (i.e., straight boys don’t “love” other boys). The phrase “hard for me” also triggered laughter as one sample of boys associated the word “hard” with getting an erection. Based on focus groups and personal interviews with Irish boys, O’Beaglaioich et al. (2013) found that nine of the items on the GRCS-A were regarded as unsuitable.

In response to the aforementioned concerns, O’Beaglaioich et al. (2016) published a study detailing a new measure of GRC for use within Ireland (I-GRCS-A). Scale items were generated from four themes identified through qualitative interviews with Irish boys (O’Beaglaioich et al., 2015b). These items were subsequently validated by content and lay experts and exploratory factor analysis identified a unidimensional structure.

As detailed above, the GRC research paradigm has repeatedly shown correlations between scores on the GRCS and a number of indicators of poor physical and psychological wellbeing (e.g., O’Neil, 2008); however, a literature search yielded only two published studies that investigated the association between GRC and suicide in adolescent/young adult populations.

Galligan et al. (2010) explored the relationship between GRC and suicidality in young adult males within a resilience paradigm. Specifically, undergraduate male participants ( $N = 362$ ) were asked to complete a questionnaire package containing items

that measured GRC, resilience, sexual orientation, and basic demographics. Results indicated that participants’ level of restrictive emotionality, which is one facet of GRC and denotes an inability to disclose or anxiety surrounding the disclosure of feelings and emotions, was inversely associated with positive identity asset resilience (i.e., an individual’s positive sense of self). The authors link the absence of this form of resilience with literature suggesting such deficits are indicative of a greater propensity for depression and subsequent suicide.

Among a large sample of American adolescents ( $N = 2,189$ ; 58.3% male; 13–18 years old), Jacobson et al. (2011) found that restrictive emotionality correlated positively with depressive symptoms and suicide ideation/intent. Further, those obtaining higher scores on a measure of restrictive emotionality were 11 times more likely to report elevated depression scores; three times more likely to report suicide ideation (after controlling for depressive symptoms); and more than twice as likely to report attempting suicide (again, after controlling for depressive symptoms). These researchers did not examine the association between the other GRCS-A factors (e.g., NSA) and suicide ideation/intent. Thus, it is unknown how these other facets of GRC link with both depression and indicators of suicidality.

Using a measure of GRC that is appropriate for adolescents outside of a North American context is important. It is equally important, however, that researchers be cognizant of the different ways in which suicide ideation can be assessed.

## Measuring Suicidal Ideation

Osman et al. (2003) note that, traditionally, much suicidality research has focused on negative risk factors (i.e., conditions or attributes that influence an individual to engage in self-harm behaviors). One risk factor that has received considerable attention is depression which has been identified as one of the primary predictors of suicide ideation (Harlow et al., 1986; De Man and Leduc, 1995; Lee et al., 2006). In addition, low self-esteem accounts for variance in suicide ideation beyond that accounted for by depression (Overholser et al., 1995). A limitation common of many indicators of suicide ideation is their tendency to focus on negative risk factors; a focus that precludes these measures from capturing the multifaceted nature of suicide ideation (Osman et al., 2003). For example, harms-based measures overlook the fact that suicide ideation also may involve *protective* factors (i.e., individuals evidencing problematic levels of risk may still possess an innate desire to live which can, ultimately, prevent them from engaging in self-harm behaviors; Osman et al., 2003). Therefore, scales that capture *both* protective and risk factors simultaneously would appear to offer the most comprehensive assessment of suicide ideation.

To fulfill this objective, Osman et al. (1998) developed the Positive and Negative Suicide Ideation Inventory (PANSI). The PANSI is a 14-item self-report scale that consists of two factor-analytically derived subscales: Negative Suicide Ideation (PANSI-NSI; eight items) and Positive Ideation (PANSI-PI; six items). Participants are asked to provide the frequency with which they experienced each item over the course of the past 2 weeks. Since each subscale measures opposing constructs of suicide ideation, separate scores are computed rather than a



total score. Higher scores on the PANSI-NSI indicate greater negative suicide ideation while higher scores on the PANSI-PI represent greater positive ideation (e.g., individuals with higher scores on the PANSI-NSI and lower scores on the PANSI-PI would be deemed as being at greater risk of engaging in self-harm behaviors). Initially validated using an adult population, the PANSI was subsequently found to be psychometrically sound with both inpatient (Osman et al., 2002) and community (Osman et al., 2003) adolescent samples. The PANSI has been used with adolescents in China (e.g., Chang et al., 2009), Thailand (e.g., Yadegarfar et al., 2013), Malaysia (Ling and Yaacob, 2015; Sinniah et al., 2015), and Pakistan (Yasien and Ahmad, 2015). Employing the PANSI provides researchers with more robust data regarding the multifaceted construct of suicide ideation.

## PRESENT STUDY

Within an Irish context, no study has investigated the relationship between GRC and suicide ideation, and no study has investigated the GRC/suicidality relationship among those at greatest risk of committing suicide (i.e., male individuals between the ages of 15–24). The purpose of the current study, therefore, was to address this omission by investigating the relationship between the GRC and suicide ideation among a non-clinical sample of Irish adolescent males.

Depression and self-esteem are well established predictors of suicide ideation and past research within the GRC paradigm has found significant correlations between GRC and self-esteem as well as depression (see O'Neil, 2008 for a review). O'Beaglaioich (2014) and O'Beaglaioich et al. (2016) reported that scores on the GRCS-IA, a measure of GRC designed for use with Irish boys, correlated negatively with a measure of self-esteem, and positively with a measure of depression. Thus, in the current study, it was predicted that similar associations would be observed (i.e., GRC would be inversely correlated with self-esteem [H1] and positively correlated with depression [H2]). Social scientists have not investigated whether the association between GRC and indices of suicide ideation are mediated by depression and self-esteem; thus, no formal hypotheses in terms of mediation were generated.

## MATERIALS AND METHODS

### Participants

A sample of 176 boys aged 15–20 ( $M = 16.9$ ,  $SD = 0.94$ ), from a non-clinical population, situated in six schools in Ireland took part in this study. Participants self-identified as fourth ( $n = 21$ ; 11.9%), fifth ( $n = 64$ ; 36.4%), and sixth ( $n = 91$ ; 51.7%) year students and all attended either a mixed or single-sex secondary school in Ireland. A majority ( $n = 154$ , 87.5%) reported being “Irish,” while 7.4% ( $n = 13$ ) selected “any other white background,” and eight participants (4.5%) reported being of “any other Asian background.” One participant (0.6%) did not report their ethnicity. Approximately 86.9% ( $n = 153$ ) self-identified as “exclusively heterosexual,” followed by 5.7% ( $n = 10$ )

identifying as “more heterosexual than gay,” 2.8% ( $n = 5$ ) as “bisexual,” and 1.7% ( $n = 3$ ) each as “more gay than heterosexual” and “exclusively gay.” Two participants (1.1%) did not report their sexual orientation.

## Measures

### Depression

The Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977) consists of 20 items and has been used extensively in non-clinical samples of adults, adolescents, and children for the screening of depression. Responses are provided using a four point Likert scale ranging from one (Rarely or none of the time) to four (Most or all of the time) to indicate how often each item was experienced in the previous week. Scores can range from 20 to 80, with scores of 36 or higher indicating the possible presence of depression. A sample item reads “I felt that everything I did was an effort.” Previous research has demonstrated that the CES-D possesses sound psychometric properties (e.g., Garrison et al., 1991). For the present sample, Cronbach's alpha was 0.92 (95% CI = 0.90, –0.94), indicating good scale score reliability.

### Socio Economic Status

The Family Affluence Scale II (FAS II; Boyce and Dallago, 2004) is a four item scale designed as an alternative measure of family wealth for adolescent populations. The FAS II employs a mixed response option: (1) a dichotomous (No [1]/Yes [2]) option for one item (i.e., “Do you have your own bedroom for yourself?”); (2) a three point (No [1]/Yes, one [2]/Yes, two or more [3]) option for one item (i.e., “How many vehicles in your family home?”); (3) a four point (Not at all [1]/Once [2]/Twice [3]/More than twice [4]) option for one item (i.e., “During the past 12 months, how many times did you travel away on holiday with your family?”); and (4) a separate four point (None [1]/One [2]/Two [3]/More than two [4]) response format for one item (i.e., “How many computers does your family own?”). Family affluence is calculated using a three point ordinal scale, where scores 4–6 indicate low affluence; 7–9 denote middle affluence, and 10–13 suggest high affluence. Since Boyce et al. (2006) report that scale score reliability is “not a prerequisite for formative indexes such as the FAS” (p. 481), Cronbach's alpha was not calculated. Past suicide research suggests that populations with low and middle socioeconomic status (SES) are at greater risk for suicide than more affluent status groups (Ko et al., 2014).

### Gender Role Conflict

Previous research has called into question the psychometric properties of the original GRCS-A (O'Beaglaioich et al., 2015a,b). As a result, O'Beaglaioich (2014) developed the nine item unidimensional Irish Gender Role Conflict Scale for Adolescents (I-GRCS-A). A five-point Likert scale, ranging from one (Never) to five (Almost Always), is used to indicate the frequency with which a respondent experiences each of the items. Scores can range from 9 to 45, with higher scores indicating greater GRC. A sample item reads “It bothers me that lads expect you to be good craic [fun] even when you're in bad form.” O'Beaglaioich et al. (2016) reported sound psychometric properties for the

I-GRCS-A. For the current sample, Cronbach's alpha was 0.82 (95% CI = 0.78, -0.86) indicating good scale score reliability.

### Suicide Ideation

Suicide ideation was measured using the Positive and Negative Suicide Ideation Scale (PANSI; Osman et al., 1998). As mentioned, the PANSI is a 14-item two-dimensional self-report screening instrument that assesses the frequency of negative risk (PANSI-NSI; 8 items) and protective factors (PANSI-PI; 6 items) related to suicide behavior. The time frame for rating PANSI items is "the past 2 weeks, including today." Each item is rated on a five-point Likert scale ranging from one (None of the time) to five (Most of the time). Scores on the PANSI-PI can range from 6 to 30, with higher scores indicating lower suicidal ideation. For the PANSI-NSI, scores can range from 8 to 40, with higher scores indicating greater suicidal ideation. A sample item from the PANSI-PI is "Felt hopeful about the future because things were working out for you?" and a sample item from the PANSI-NSI is "Seriously considered killing yourself because you could not live up to the expectations of other people?" Previous research has demonstrated the PANSI possesses good psychometric properties (e.g., Osman et al., 2002). For the present sample, Cronbach's alpha coefficients of 0.95 (95% CI = 0.94, -0.96) and 0.82 (95% CI = 0.78, -0.86) were obtained for the PANSI-NSI and PANSI-PI, respectively.

### Self-Esteem

The Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965) is a 10 item trait measure of global self-esteem. Responses are provided using a four-point Likert scale ranging from one (Not at all) to four (Very much so). Total scores range from 10 to 40, with higher scores indicating greater self-esteem. A sample item reads "I take a positive attitude toward myself." Previous research has demonstrated that the RSES possesses sound psychometric properties (e.g., Mullan and NicGabhainn, 2002). For the present sample, Cronbach's alpha was 0.86 (95% CI = 0.82, -0.89) indicating good scale score reliability.

### Procedure

Ethical approval was obtained by the Research Ethics Committee (REC) at the National University of Ireland, Galway. Forty-three schools were contacted at random from a list of schools provided by the Department of Education. Of the 43 schools that were contacted, two schools agreed to take part in the research. Schools were contacted initially by a letter sent to the Principal/Board of Management and then by telephone. Two hundred and fifty consent forms were administered to School A and 197 consent forms to School B. Following approval from the Board of Management of the schools, the guidance counselors in each school co-ordinated and oversaw the distribution and completion of the surveys. Posters for support agencies (i.e., Aware, Spunout.ie and the Samaritans) and specially designed business cards were put up on the schools' noticeboards. Consent forms were distributed to boys during class time and participants were asked to bring the information sheets and consent forms to their parent(s)/guardian(s). In line with REC guidelines, active parental consent was solicited. Participants whose parents wanted

their child to take part in the research were asked to bring the signed consent form to the guidance counselor within a 2 week window. During this period, guidance counselors also reminded potential participants to bring the consent forms home to be signed. The numbers of consent forms returned were: 170 (School A; 68% return) and 41 (School B; 21% return). While speculative, it is possible that the difference in return rates may be attributable to a highly supportive and proactive guidance counselor affiliated with School A.

Due to tragic circumstances (i.e., the suicide of a student attending School A), administration of the questionnaire was canceled at that school. Consequently, 48 additional schools were contacted to partake in the research. Five schools agreed to take part in the study bringing the total number of schools to six.

The response rates were: School B (30 out of 42 students returning the consent forms participated); School C (40 out of 47; 94 forms distributed initially); School D (36 out of 53; 150 forms distributed); School E (18 out of 42; 110 forms distributed); School F (11 out of 22; 80 forms distributed); and, finally, School G (41 out of 47; 100 consent forms distributed).

Two weeks after the consent forms had been distributed, the questionnaire was administered to students. Respondents that did not return signed parental/guardian consent forms were unable to participate. The questionnaire, which was presented to participants in an A4 sealable envelope, consisted of demographic items and the measures of GRC, self-esteem, depression and suicidal ideation. The information sheet and consent form were included as was a business card listing contact details of relevant support agencies. The questionnaire took approximately 10–15 min to complete.

## RESULTS

The data were initially screened for missing values. Little's missing completely at random (MCAR) test was conducted and was found to be statistically significant ( $\chi^2 [1343] = 1528.704$ ,  $p < 0.001$ ) suggesting the data were *not* MCAR. The highest level of "missingness" was determined to be 2.8%; therefore, the expectation maximization (EM) algorithm for imputing missing data was employed (For additional details about EM, see Fish et al., 2013).

After the missing values were replaced using EM, descriptive statistics were computed. Total CES-D scores ranged from 20 to 77. On average, participants scored slightly below the cut-off score of 36 ( $M = 34.73$ ;  $SD = 11.36$ ) suggesting an overall absence of depression among boys in the sample. However, 35.2% ( $n = 62$ ) of participants did meet the depression criterion of a score of 36 or higher. In regards to self-esteem, total scores ranged from 10 to 40; however, the mean score was above the scale midpoint ( $M = 30.99$ ;  $SD = 6.32$ ). Likewise, although GRC scores ranged from 9 to 45, the mean score was 25.98 ( $SD = 7.33$ ), which is slightly below the scale's midpoint. Scores on the FAS II ranged from 5 to 13, with a mean score of 9.85 ( $SD = 1.50$ ), suggesting that participants were fairly affluent. Mean scores on the PANSI-NSI ( $M = 11.02$ ;  $SD = 5.80$ ) and the PANSI-PI ( $M = 22.86$ ;  $SD = 4.71$ ) subscales suggest that

participants had few risk factors for suicide and many protective factors, respectively. To illustrate, 56.8% ( $n = 100$ ) of respondents obtained a score of 8 on the PANSI-NSI subscale, which is the lowest possible score. More detailed information about the distribution of responses on the PANSI subscales can be found in **Table 1**.

In addition to descriptive statistics, intercorrelations among scale scores were examined (see **Table 2**). With the exception of family affluence, all measures were found to significantly correlate with one another at a moderate-to-strong level. Those who evidenced higher depressive scores also had higher levels of GRC ( $r = 0.55$ ,  $p < 0.01$ ), greater suicide risk factors ( $r = 0.70$ ,  $p < 0.01$ ), fewer suicide protective factors ( $r = -0.75$ ,  $p < 0.01$ ), and lower self-esteem ( $r = -0.76$ ,  $p < 0.01$ ). Individuals with greater GRC also had fewer protective ( $r = -0.40$ ,  $p < 0.01$ ) and greater risk factors for suicide ( $r = 0.43$ ,  $p < 0.01$ ), and had lower self-esteem ( $r = -0.49$ ,  $p < 0.01$ ). Greater self-esteem was associated with greater protective ( $r = 0.77$ ,  $p < 0.01$ ) and fewer risk factors for suicide ( $r = -0.62$ ,  $p < 0.01$ ). The two PANSI subscales were negatively correlated, with greater protective factors being associated with fewer risk factors ( $r = -0.67$ ,  $p < 0.01$ ).

To assess whether the relationship between GRC and suicide ideation was mediated by depression and self-esteem, two mediation analyses were conducted: one for the PANSI-NSI subscale and one for the PANSI-PI subscale. The PANSI-PI subscale met the assumptions needed to conduct the regression

**TABLE 2 |** Intercorrelations among scale scores.

Measures	CES-D	FAS II	I-GRCS-A	PANSI-NSI	PANSI-PI	RSES
CES-D	–					
FAS II	–0.069	–				
I-GRCS-A	0.551**	–0.005	–			
PANSI-NSI	0.703**	0.055	0.434**	–		
PANSI-PI	–0.748**	0.115	–0.401**	–0.670**	–	
RSES	–0.756**	0.071	–0.487**	–0.620**	0.769**	–

\*\* $p < 0.01$ . CES-D = The Center for Epidemiologic Studies Depression Scale; FAS II = Family Affluence Scale; I-GRCS-A = The Irish Gender Role Conflict Scale for Adolescents. RSES = Rosenberg Self-Esteem Scale; PANSI-Positive = Positive Suicide Ideation; PANSI-Negative = Negative Suicide Ideation.

analysis; however, due to the significant negative skewness in the PANSI-NSI data, the assumptions of normality and homoscedasticity were violated. The data were then transformed, but as doing so did not yield significant improvements in normality, the untransformed data were employed. To mitigate the effects of the data violations, we used bootstrapping (Preacher and Hayes, 2004), which has been found to be more robust to violations of distributional assumptions (Yuan and MacKinnon, 2014).

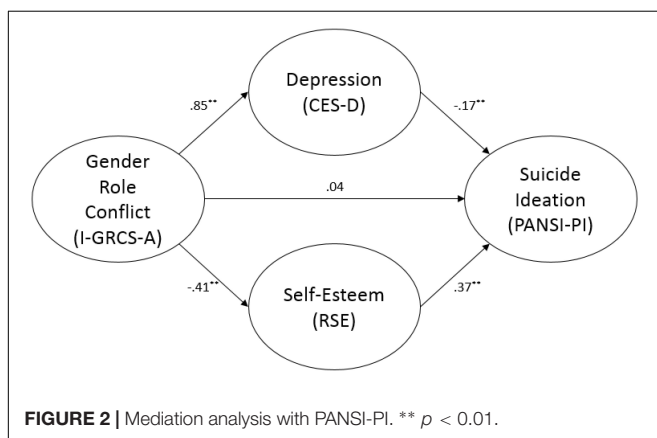
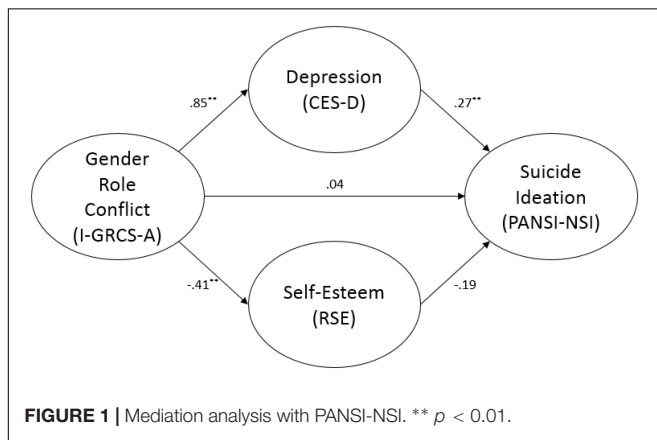
The relationship between GRC and negative suicide ideation was fully mediated by depression scores. As **Figure 1** illustrates, GRC was a significant predictor of both depression ( $b = 0.848$ ,  $SE = 0.126$ ,  $p < 0.001$ ) and self-esteem ( $b = -0.411$ ,  $SE = 0.071$ ,

**TABLE 1 |** Distribution of scores on the PANSI-NSI and PANSI-PI.

Item	Responses options				
	None of the time	Rarely	Sometimes	Often	Most of the time
<b>PANSI-NSI</b>					
Seriously considered killing yourself because you could not live up to the expectations of other people?	76.1% ( $n = 134$ )	14.8% ( $n = 26$ )	6.8% ( $n = 12$ )	0.6% ( $n = 1$ )	1.1% ( $n = 2$ )
Felt hopeless about the future and you wondered if you should kill yourself?	72.2% ( $n = 127$ )	14.2% ( $n = 25$ )	9.7% ( $n = 17$ )	1.7% ( $n = 3$ )	2.3% ( $n = 4$ )
Felt so unhappy about your relationship with someone you wished you were dead?	75.0% ( $n = 132$ )	11.4% ( $n = 20$ )	8.5% ( $n = 15$ )	2.3% ( $n = 4$ )	2.3% ( $n = 4$ )
Thought about killing yourself because you could not accomplish something important in your life?	80.1% ( $n = 141$ )	8.5% ( $n = 15$ )	6.8% ( $n = 12$ )	2.8% ( $n = 5$ )	1.7% ( $n = 3$ )
Thought about killing yourself because you could not find a solution to a personal problem?	79.0% ( $n = 139$ )	11.4% ( $n = 20$ )	7.4% ( $n = 13$ )	1.7% ( $n = 3$ )	0.6% ( $n = 1$ )
Thought about killing yourself because you felt like a failure in life?	77.8% ( $n = 137$ )	13.1% ( $n = 23$ )	4.5% ( $n = 8$ )	2.3% ( $n = 4$ )	2.3% ( $n = 4$ )
Thought that your problems were so overwhelming that suicide was seen as the only option for you?	79.0% ( $n = 139$ )	6.8% ( $n = 12$ )	10.2% ( $n = 18$ )	1.7% ( $n = 3$ )	1.7% ( $n = 3$ )
Felt so lonely or sad you wanted to kill yourself so that you could end your pain?	77.3% ( $n = 136$ )	14.8% ( $n = 26$ )	4.0% ( $n = 7$ )	2.3% ( $n = 4$ )	1.7% ( $n = 3$ )
<b>PANSI-PI</b>					
Felt that you were in control of most situations in your life?	2.3% ( $n = 4$ )	11.4% ( $n = 20$ )	23.3% ( $n = 41$ )	37.5% ( $n = 66$ )	25.6% ( $n = 45$ )
Felt hopeful about the future because things were working out well for you?	4.5% ( $n = 8$ )	7.4% ( $n = 13$ )	19.9% ( $n = 35$ )	31.3% ( $n = 55$ )	36.9% ( $n = 65$ )
Felt excited because you were doing well at school or at work?	5.7% ( $n = 10$ )	8.5% ( $n = 15$ )	36.9% ( $n = 65$ )	35.8% ( $n = 63$ )	13.1% ( $n = 23$ )
Felt confident about your ability to cope with most of the problems in your life?	5.7% ( $n = 10$ )	7.4% ( $n = 13$ )	22.7% ( $n = 40$ )	36.9% ( $n = 65$ )	26.7% ( $n = 47$ )
Felt that life was worth living?	3.4% ( $n = 6$ )	5.1% ( $n = 9$ )	8.5% ( $n = 15$ )	19.3% ( $n = 34$ )	63.6% ( $n = 112$ )
Felt confident about your plans for the future?	3.4% ( $n = 6$ )	11.4% ( $n = 20$ )	22.7% ( $n = 40$ )	31.8% ( $n = 56$ )	30.7% ( $n = 54$ )

$p < 0.001$ ). However, only depression significantly predicted negative suicide ideation ( $b = 0.274$ ,  $SE = 0.067$ ,  $p < 0.001$ ). On its own, GRC was not significantly associated with negative suicide ideation ( $b = 0.038$ ,  $SE = 0.046$ ,  $ns$ ). Approximately 72% of the variance in negative suicide ideation was accounted for by the predictors ( $R^2 = 0.717$ ). The indirect effect was tested using a bootstrap estimation approach with 5000 samples. The results revealed the indirect coefficient for GRC was statistically significant,  $b = 0.232$ ,  $SE = 0.072$ ,  $p < 0.001$ , 95% CI = 0.114, 0.403.

The second mediation analysis indicated that the relationship between GRC and positive suicide ideation was fully mediated by both depression and self-esteem (see **Figure 2**). Depression ( $b = -0.174$ ,  $SE = 0.030$ ,  $p < 0.001$ ) and self-esteem ( $b = 0.371$ ,  $SE = 0.057$ ,  $p < 0.001$ ) significantly predicted positive suicide ideation. Approximately 81% of the variance in positive suicide ideation was accounted for by the predictors ( $R^2 = 0.812$ ). Again, the indirect effect was tested using a bootstrap estimation approach with 5000 samples. The results showed that the indirect coefficients of GRC for both depression,  $b = -0.148$ ,  $SE = 0.033$ ,  $p < 0.001$ , 95% CI =  $-0.218$ ,  $-0.091$ , as well as self-esteem,  $b = -0.152$ ,  $SE = 0.034$ ,  $p < 0.001$ , 95% CI =  $-0.223$ ,  $-0.093$ , were statistically significant.



## DISCUSSION

In the first study to examine the direct and indirect relationships between GRC and negative suicide and protective suicide ideation among a large sample from a non-clinical population of Irish adolescent boys, the results indicated that, while GRC correlates significantly with both factors protecting against and contributing to suicide ideation, these associations become statistically non-significant when depression and self-esteem are taken into consideration. Consistent with previous research, the mediation models revealed that depression correlated in the anticipated directions with both indices of suicide ideation whereas self-esteem correlated significantly with positive suicide ideation only. Boys who reported greater degrees of GRC were more likely to experience depression which, in turn, increased their likelihood of reporting negative suicide ideation. In contrast, boys who reported lower levels of GRC were less likely to experience depression and more likely to experience greater levels of self-esteem both of which appeared to increase boys' reporting of protective factors that mitigated against suicide ideation, as determined by scores on the PANSI-PI.

Our findings support Houle et al.'s (2008) study with adult males which concluded that GRC is associated with variables that, in turn, may play a role in suicidality. Specifically, we found that scores on the I-GRCS-A correlated moderately with depression, a variable which – in turn – was linked with negative suicide ideation (i.e., depression fully mediated the association between GRC and scores on the PANSI-NSI). It is important to note that the current study goes beyond Houle et al.'s work by investigating the relationship between self-esteem, depression and suicidal ideation with a non-clinical population of adolescent boys. Using a “normal” sample of adolescent males, we obtained tentative support for a key tenet of GRC theory; namely, that restrictive gender roles can have negative health consequences for males.

Approximately 72% of the variance in negative suicide ideation was accounted for by depression, self-esteem ( $ns$ ) and GRC and the indirect effect of GRC on negative suicide ideation was statistically significant (i.e.,  $b = 0.232$ ,  $SE = 0.072$ ,  $p < 0.001$ , 95% CI = 0.114, 0.403). This finding highlights that some boys are negatively affected by societal expectations and pressures placed on males in Irish society and these boys have an increased likelihood of experiencing depression which, in turn, is associated with an increased likelihood of experiencing negative suicide ideation. The finding that GRC role conflict correlated significantly with depression is consistent with studies conducted with adult men [e.g., 24 out of 27 studies found positive correlations between GRC and depression (O'Neil, 2008)].

As discussed previously, suicide appears to be a gendered problem with researchers identifying myriad contributing biological, psychological and societal factors that place males at greater risk. From a biological/hormonal stance, the hormone oxytocin, which seems to function as a facilitator for the affective empathic system, tends to be more present in females (Rueckert and Naybar, 2008). Lower levels of oxytocin in males may relate to why men, on average, experience more alexithymia (i.e., an inability to identify and describe emotions in the self; Levant et al., 2009). Further, males are more likely to respond to negative



emotional states by externalizing depressive behaviors (Rice et al., 2013) and, on average, are more likely than women to: (a) use, misuse, or abuse alcohol or substances, especially as they relate to decreased inhibition (Russell et al., 2004); (b) engage in aggressive behavior (Hyde, 2005); (c) take risks; (d) be impulsive (Chapple and Johnson, 2007); and (e) isolate themselves from the support available from the greater social network (Eckersley and Dear, 2002). Additionally, some boys expressed that a general negative societal opinion of boys exists and is a cause of stress for them (i.e., an expectation that boys will misbehave; O'Beaglaioich et al., 2015b).

The externalizing symptoms above, combined with a lack of coping skills (or dysfunctional coping skills) exhibited by a proportion of males (Tamres et al., 2002), are hypothesized to occur in those who are unable and/or reluctant to seek assistance for personal problems (e.g., Russell et al., 2004) out of fear of being viewed as weak, inferior or vulnerable (e.g., Rochlen et al., 2010; Rice et al., 2013). These factors are shared correlates of both GRC (O'Neil, 2008; i.e., in particular the restrictive emotionality subscale of the GRCS) and suicide ideation. One explanation for the results of this study could be that young boys, who are less biologically predisposed (e.g., alexithymia and impulsivity) to cope with the expectations placed upon them as boys and who also have fewer relational and coping skills are more likely to express externalizing behaviors (e.g., depression indicators) and, in extreme cases, may be more likely to experience suicide ideation.

The I-GRCS-A was significantly related to self-esteem and depression, variables that were – in turn – significantly related to the PANSI-Positive subscale. Thus, the linkage between GRC and protective suicide ideation was fully mediated by both self-esteem and depression. Specifically, the “effects” of GRC on PANSI-Positive subscale scores appeared to be minimal when self-esteem and depression were taken into consideration. I-GRCS-A's relationship with self-esteem is consistent with past research with Irish samples [e.g.,  $r = -0.49$  in this study;  $r = -0.45$  (O'Beaglaioich et al., 2016)] and with past research using the adult version of the GRC scale (i.e., 11 out of 13 studies reviewed by O'Neil (2008) documented a negative correlation between GRC and self-esteem). Taken together, these correlations, which are congruent with O'Neil's (2015) summary of the literature, underscore the important role that GRC seems to play in adolescent boys' psychological well-being, as determined by self-esteem and depression.

Importantly, tests of mediation revealed that, while self-esteem did not significantly mediate the relationship between GRC and negative suicide ideation, it did serve as a mediator for the linkage between GRC and positive suicide ideation. These findings suggest that boys with lower levels of GRC may, in turn, have greater levels of self-esteem, with the latter construct potentially bolstering use of positive suicide ideation. This relationship is in line with past research; namely, that higher self-esteem appears to serve a protective function against suicidal ideation/attempts (De Man and Gutiérrez, 2002). Further research is needed to clarify why self-esteem only mediated the relationship between GRC and positive suicidality. However, one possible explanation resides in our use of the

RSES to measure self-esteem. Mannarini (2010), for example, found that items on the RSES were differentially associated with measures of attachment as well as empathic and social self-efficacy. These forms of efficacy reflect (in order) one's ability to “understand other people's thoughts, feelings, and needs” (p. 231) and one's skill at interpersonal relationships (e.g., making friends and performing in public). Specifically, using a sample of 435 Italian university students, Mannarini noted that items three and nine of the RSES were negatively related to empathic and social self-efficacy whereas item 1 was positively related to both types of self-efficacy. This differential pattern suggests that: (a) the wording of the items might affect participants' responses; and (b) the wording of the items also might influence the omnibus sign of the association between global self-esteem, as measured by the total score on the RSES, and other variables. Thus, future tests of mediation using the RSES to assess self-esteem may benefit from examining each item on the RSES individually.

It should be noted that this sample was highly affluent. Past suicide research suggests that populations from low and middle SES are at greater risk for suicide than more affluent status groups; therefore, given the possibility of ceiling effects, it is not too surprising that family affluence did not correlate significantly with suicide ideation in this study. GRC and SES has only been examined in one study to date (Stillson et al., 1990) and the results indicated that men classified as low SES reported significantly more GRC role conflict than their higher SES counterparts. Also, as educational/occupational status increased, men's GRC decreased (O'Neil, 2008). In relation to research on GRC, social scientists have proposed investigating the relationship between this construct and SES in adult samples (Liu et al., 2004; O'Neil, 2008); however, no empirical studies have been carried out to investigate the relationship and interactions between these variables for adolescents.

We recommend that researchers examine and build upon the theoretical explanations of the process by which GRC is related to depression and self-esteem. GRC theory offers explanations through a combination of biological, psychological and sociocultural factors; however, O'Neil (2015) states that men's depression is “not fully understood or defined in gendered ways that enable clinicians to make effective interventions” (p. 16). Akin to what was noted for depression, no theoretical explanation has been offered which particularizes *how* GRC is related to or causes variations in self-esteem (O'Neil, 2008). Thus, we believe that refining theoretical propositions pertaining to GRC, ultimately, may assist in reducing the degree to which men strive to adhere to expectations surrounding hegemonic masculinity. Further, such reductions may play a role in efforts to enhance psychological wellbeing in boys.

Researchers could, in future, deconstruct known elements of GRC scales to see which constituent parts account for the greatest proportions of variance in depression as well as self-esteem. GRC is theorized to be experienced in three contexts: (a) within the self; (b) induced by others; and (c) expressed toward others (O'Neil, 1990). Thus, we recommend that specific measures be developed for each of these contexts as they relate to known

components of GRC (e.g., restrictive emotionality). Developing measures that take these different contexts into account would enable researchers to determine whether certain instigators of GRC (e.g., self vs. others) account for more (or less) variance in measures of psychological wellbeing (O'Beaglaioich, 2014).

## LIMITATIONS

One limitation that is worth noting concerns the recruitment of participants. Finding schools that were willing to become involved in this research emerged as our biggest obstacle. Due to schools being over-burdened with workloads and the sensitive nature of the research topic, many of the institutions we targeted did not respond to our request or refused to take part. Three of the four schools had actively participated in government suicide prevention and educational strategies. Therefore, it is possible that, due to the fact that they attended “proactive” schools, the students participating in this research were better informed about suicide and/or were more likely to avail themselves of mental health supports in comparison to students from schools that did not participate. Further, an estimate of the boys whose parents refused to allow their children to take part was not recorded; thus, we were unable to perform demographic comparisons between boys that completed the survey and those that did not. One additional limitation is that, despite the unequivocal importance of using self-report measures to assess suicide ideation, there will always remain a proportion of ideations that are unexpressed due to lack of insight or reluctance (Wolk-Wasserman, 1986; Hennig et al., 1998; Palmieri et al., 2019).

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## CONCLUSION

In conclusion, our findings suggest that, through its linkage with depression and self-esteem, GRC plays a significant role in the lives of adolescent boys' mental health. Greater attention should be directed at understanding the ways in which boys navigate the demands of hegemonic masculinity and how their methods of navigation (potentially) impact their psychological health.

## ETHICS STATEMENT

This study was carried out in accordance with the recommendations of Ethical Guidelines at the National University of Ireland, Galway, with written informed consent from all subjects. All subjects gave written informed consent in accordance with American Psychological Association guidelines. The protocol was approved by the Ethics Committee at the National University of Ireland, Galway.

## AUTHOR CONTRIBUTIONS

CO'B designed the study, applied for research ethics, collected and inputted the data, and analyzed and wrote portions of the manuscript. PC and JH wrote portions of the manuscript and provided feedback on all manuscript drafts. JM assisted with analyzing the data and provided feedback on all manuscript drafts. TM assisted with the design of the study, wrote portions of the manuscript, and provided feedback on all manuscript drafts.

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# Toward a New Model of Understanding, Preventing, and Treating Adolescent Depression Focusing on Exhaustion and Stress

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**Objective:** Adolescent depression is a heterogeneous disorder, with a wide variety of symptoms and inconsistent treatment response, and is not completely understood. A dysregulated stress system is a consistent finding, however, and exhaustion is a consistent trait in adolescent patients. The aim of this paper is to critically assess current hypotheses in adolescent depression research and reframe causes and treatment approaches.

**Methods:** A mixed-method approach involved a review based on publications from PubMed, Embase and PsycInfo, and two exemplary adolescent cases.

**Results:** Both cases show a spiral of stress and exhaustion, but with a different profile of symptoms and coping mechanisms. Reframing both cases from the perspective of coping behavior, searching for the sources of experienced stress and exhaustion, showed coping similarities. This proved essential in the successful personalized treatment and recovery process. In combination with recent evidence, both cases support the functional reframing of depression as the outcome of a stress- and exhaustion-related spiralling mechanism.

**Conclusions:** We propose to open up a symptom-based, mood-centered view to a model in which adolescent depression is framed as a consecutive failure of stress coping mechanisms and chronic exhaustion. Addressing exhaustion and coping primarily as a treatment strategy in adolescents and young adults might work in synergy with existing treatments and improve overall outcomes. This perspective warrants further investigation.

**Keywords:** depression, adolescents, stress, exhaustion, treatment

## INTRODUCTION

Major depressive disorder (MDD) is the leading cause of disability worldwide (1), with 10 to 15% of patients proceeding to suicide (2, 3), and a substantive disease burden for adolescents and young adults (4–6). Depression is a heterogeneous group of brain disorders with varied contextualized origins, complex genetics and a neurobiology that is not completely understood. The etiology is not elucidated, and particularly for adolescents there is an evidence gap (4, 7, 8). The serendipitous discovery of first the tri- and tetracyclic antidepressants (TCAs) and later the stress-modulating serotonin reuptake inhibitors (SSRIs) led successively to the catecholamine and monoamine hypotheses of depression (9). In later years, reduced adult neurogenesis and changes in structural and functional neuronal plasticity have been linked to the onset and treatment opportunities of major depression (10, 11). Genetic research has shown that there is not a single genetic cause for depression, and all known genetic factors combined only explain a limited percentage of the variance in clinical outcomes (12, 13). The estimated heritability of depression is 35%–40%, indicating 60%–65% is explained by other factors, such as adverse life experiences (11, 14). Researchers have turned to epigenetics to develop new forms of genetic and pharmacological modeling, in an effort to describe the etiology of depression better (15). Despite many years of research by numerous investigators both in academia and industry, psychoactive targeted therapeutics with controllable and specific effects on the brain microcircuitry and chemistry did not and probably will not materialize due to the complex nature of mental disorders (16). In order to open up our thinking about MDD we take up the challenge to reframe depression, specifically focusing on adolescents.

### Symptom-Based Approach

We note that within the current framework depression is diagnosed based on the presence of a series of mood-related symptoms and their effect on daily functioning. The seven most commonly used interviews and self-report questionnaires together describe a heterogeneous group of 52 symptoms, such as either high or low appetite, more or less sleep than usual, and a feeling of sadness (17). This causes differences in diagnosis based on which scale is used (18). The widely varying patterns in which these symptoms often present themselves (19, 20), and the high occurrence of several comorbidities, such as anxiety, psychosis, and autism spectrum disorder, indicate that depression is not a homogenous disease, but a continuous, heterogeneous group of disorders associated with a wide variety of different risk factors (4, 8, 21–24).

### Aim

Combined with the lack of understanding of the etiology of adolescent depression, the large variation of presentation and treatment approaches is the main driver for us to try to reframe the concept of MDD in adolescent patients. We also aim to explain why responses to treatment vary substantially and why older age is a consistent and important risk factor for a poorer MDD course (25–28). We will take a new perspective toward

MDD by focusing on stress and the depressive mood related to development in adolescence. This yields a promise for novel therapeutic approaches and potential breakthroughs in depression research, treatment and prevention.

## METHODS

A mixed method approach was used involving clinical investigation of adolescent case reports and a narrative review. PubMed, Embase, and PsychInfo were searched for relevant publications, with select additions of recent findings based on collective suggestions of the authors. To make sure the patient perspective is not lost when critically assessing the current framework and new possibilities, two case reports were included. Written informed consent was obtained from both subjects for the case reports.

## DEPRESSION AND STRESS

### Etiology

Many findings in depression research have failed the scientific test of replication. For example, the volume of the amygdala of depressed patients has been found to be increased (29) in some studies, and decreased in others (30). Patients with melancholic depression, a subtype based on symptoms, were thought to respond better to TCAs than atypical patients (hence the name) (20, 27, 31, 32), but other researchers could not replicate this finding (33–36). Plasma levels of leptin, which reduces appetite, has been found higher in melancholic patients (37), or higher in atypical patients (38). Finally, childhood trauma and/or abuse is more common in melancholic than in atypical patients (39), or *vice versa* (40).

### Stress System

One consistent finding, however, is a dysregulated stress system in depressed patients (41–44). In approximately 70% of depressed patients a dysfunction of the hypothalamic–pituitary–adrenal (HPA) axis is detected, mainly hyperactivity (38, 45). Also a disruption of the diurnal variation of cortisol is commonly seen (46, 47). Unfortunately, after decades of research efforts this finding has not resulted in a stress-targeted treatment option or a clinical test to predict treatment response (48, 49), and it remains debated whether HPA-axis dysregulation is a cause or a consequence of depression.

This does provide an important insight: depression is at least partially the result of stress and a differential dysregulation in the stress system is an important trait (38). The stressor may be in the past (e.g. childhood maltreatment or trauma) (4, 50), or acutely (e.g. dealing with new life events). The initial response of people to stress is typically a coping mechanism aimed at exerting control over the stressor either by avoiding, reducing or predicting its occurrence. Examples of such efforts are the canceling of obligations or disengagement from social interaction (51). The HPA axis exerts a fundamental role regulating both internal as external stimuli,

integrating the physiopathological and behavioral dimensions of stress. We postulate that depression is the result of a failure of coping mechanisms to control the stressors and a differential dysregulation in the stress system.

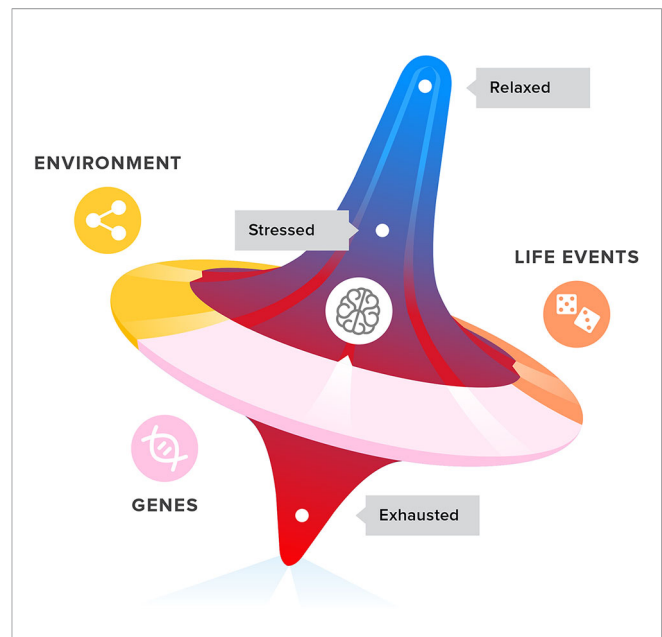
## Coping Mechanisms and Exhaustion

The accumulation of stressful events, and the eventual failure of coping mechanisms to deal with the stress, can lead to exhaustion and depressive behavior. Preclinical experiments already hinted at a relation between the effectiveness of coping behavior, the effort involved and feedback on the development of gastric ulcers. Although coping efforts were effective, ulcers still developed when coping took more effort and less feedback was offered (52, 53). Preclinical evidence indicated that chronic exposure to relatively mild stressors which rats can adapt to relatively easily (e.g. tilting the cage at a slight angle, emptying a water bottle in the cage, introducing new bedding material), ultimately resulted in the development of anhedonia (50). The chronic character of having to cope with mild stressful events over and over again, and the lack of control over stressors, was sufficient for depressive symptoms to develop (54). In a forced swimming test, rats who were dosed with psilocybin developed the coping technique of floating faster than other rats, indicating a window of behavioral flexibility (55). Ketamine displayed the opposite effect, with more mobility (56). We hypothesize that depressive behavior, specifically anhedonia and withdrawal, and the consequent loss of interest and enjoyment in usual activities, is an evolutionary mechanism to guard the organism against the exhaustion that may result from excessive or chronic coping behavior. As such, depressive behavior is both an expression of psychological pressure and a physiological precaution. This substantiates the entanglement of psychological and physiological factors in MDD.

Stress response mechanisms can change the allocation of metabolic resources in a stressful situation, where that is needed. Similarly, depression could be the expression of a forced change in allocation of attention. Depressed patients are known to ruminate, or continually analyze their problems and relive their memories (24). Anhedonia can be interpreted as a way to secure mental resources, by reducing the interest in distractions (20, 57). Depression can be seen as an exaggerated social navigating coping mechanism, caused by an accumulation of stress and a spiral of unsuccessful adaptive behaviors which leads to exhaustion. By entering a depressive mode, the organism aims to guard itself from exhaustion. The challenge is to interfere with this mood-affecting spiralling mechanism (see **Figure 1**) to prevent depression from developing. Dealing with stress and potential exhaustion, as opposed to dealing with the symptoms of depression, could prove to be an effective treatment approach.

## Treatment

There is currently only limited evidence-based rationale for choosing one treatment over another for an individual patient (31, 58–60), with no differentiated approach for adolescents or adults (6, 61). Even defining depression subtypes based on symptoms has not helped (62). Despite guidelines and evidence-



**FIGURE 1 |** Life events, genetics, and environment all have an impact on the development of stress, coping with stress, and ultimately exhaustion and depression symptoms in adolescents and young adults.

based interventions, treatment is still primarily based on trial and error (63, 64), and primarily aimed at improving mood. Yet, between one third (65) to half (20, 66) of adult patients show no response to weeks of first line treatment with antidepressant drugs, and are advised to try a different antidepressant. Further, one third of all patients never reach a response after four lines of antidepressant treatment (65). The current therapeutic shortcomings are the consequences of our lack of knowledge of causes, the underlying neurobiology and chemistry (67), and risk factors that contribute to the onset and maintenance of depression. As a consequence, the treatment paradigms are oversimplified with little attention for preventive measures (68).

## Psychedelics

When Albert Hofmann, who first synthesized lysergic acid diethylamide (LSD), came in contact with it himself in 1943, he noted the hallucinogenic properties. In 1947 it was first marketed as a therapeutic drug. In the 1960s, Timothy Leary was the first to start experimenting with psilocybin combined with psychotherapy (69). In the 1950s and 1960s, LSD and psilocybin were tested in several small-scale clinical trials for anxiety, depression and addiction (70, 71). In response to increased recreational use, international legislation was introduced as part of the “war on drugs,” which brought an abrupt end to clinical research with these and similar substances in the 1970s (67, 69, 70, 72). In the last two decades, clinical trials with psychedelics have started to take place again (71). A brief overview of the indications these psychedelics have been investigated for post-2000 is indicated in **Table 1** (69, 70, 72).

New insights in the complex etiology of depression might be offered by findings with the use of psychedelics for treatment-

**TABLE 1 |** Overview of psychedelics and the indications they have been used for in trials since 2000.

Substance	Indication in trials
Classic psychedelics (serotonin 5-HT <sub>2A</sub> and 5-HT <sub>2C</sub> agonists)	
LSD + PT	Treatment-resistant depression, anxiety associated with life-threatening diseases
Psilocybin + PT	Treatment-resistant depression, anxiety associated with advanced-stage cancer, nicotine addiction, alcohol addiction, obsessive-compulsive disorder
Ayahuasca + PT	Treatment-resistant depression
Entactogens (mixed serotonin and dopamine reuptake inhibitors and releasers)	
MDMA + PT	Treatment-resistant depression, posttraumatic stress disorder
Dissociative anesthetics (NMDA antagonist)	
Ketamine ± PT	Treatment-resistant depression

*LSD, lysergic acid diethylamide; PT, psychotherapy; MDMA, 3,4-methylenedioxymethamphetamine.*

resistant depression (73, 74). Several psychedelics have shown to help depressive patients in a limited number of studies with small number of patients. The classic psychedelics, compounds such as LSD, psilocybin, and Ayahuasca, have diverse pharmacological profiles, including robust effects on the serotonergic system (67, 69, 72, 75). A psychedelic not acting on the serotonergic system is the dissociative anesthetic ketamine, which in subanesthetic doses acts as an antagonist on the N-methyl-D-aspartate (NMDA) receptor, a type of glutamate receptor (56, 69, 76, 77). Esketamine, the S-enantiomer of ketamine, has been approved by the Food and Drug Administration (FDA) for treatment-resistant depression (78), but ketamine has been and continues to be used off-label to treat depression too (79). This highlights that serotonergic activity, or even a mono-aminergic activity, is not required for the antidepressant effect of a psychedelic compound, further stressing the need for abandoning the old hypotheses. These hallucinogens, and the chemically related entactogen 3,4-methylenedioxymethamphetamine (MDMA) may have a place in offering a positive experience to break the self-sustaining depressive state and allowing for introspection during psychotherapy to process stressful life-time experiences as a form of reverse medical engineering (80).

From a psychological point of view, psychedelics work through a different mechanism than classic antidepressants. Instead of the elevation of mood and the reduction of anxiety, psychedelic drugs induce a profound temporary positive experience (e.g. a mystical or religious sensation). This positive experience allows for the temporary disintegration of existing networks, which in turn facilitates reprocessing of past emotions and introspection (67). In turn, this improves the capacity to cope with stress (71). Also, the use of a psychedelic in combination with a psychotherapeutic process could have long-term effects, counteracting the effect of a negative experience and disrupting the negative and “downward spiralling” compulsive thinking (72).

## Developmental Aspects

In this article we move away from mood improvement as a primary target (81, 82). We offer an alternative integrated

approach for the treatment of adolescent and young adult depression by focusing on stress factors and exhaustion reduction, seeing anhedonia and withdrawal as an evolutionary coping mechanism. This integrates approaches such as the social navigation hypothesis of Watson and Andrews (83) with cognitive bias (84) and Selye's biological stress (85, 86). With this approach we take a functional perspective, and focus on the function the depressive state provides to the adolescent patient and how it develops. This perspective is instrumental for tailor-made treatment strategies.

We will discuss these insights on the basis of two adolescent patient reports. Mood disorders have been shown to be progressive, with patients developing more complex psychopathologies over time (87, 88). Approximately 50% of patients retrospectively state that their first depressive episode occurred before the age of 20 (88, 89); another report states 50% experience that before the age of 14 (90). This further highlights the progressive nature of depression and the need for early intervention.

## CASE REPORTS

### Case 1

A 17-year-old Caucasian woman was referred by her own general practitioner to the department of adolescent psychiatry and addiction prevention for binge drinking and daily use of marijuana. The intake together with her parents showed that the patient already had a history of moderate depression and an eating disorder, anorectic of the purging type with moderate severity. No abnormalities were reported regarding appearance, behavior, eye contact, and rapport orientation and cognition [intelligence quotient (IQ) of 127]. However, she regularly suffered from suicidal thoughts and a low ability to experience pleasure. Though she had no concrete suicide plans, in gloomy periods she showed risky behavior, like crossing a busy road without looking. She usually performed well in school, despite occasional lags in attendance, which were compensated with short periods of active study. Her mother had a history of MDD.

At the department of adolescent psychiatry and addiction prevention, we classified the addiction behavior as mild. But we also established a comorbid psychiatric and substance-use disorder profile. Thus, we chose for an integrated treatment for comorbidity that has been found to be consistently superior (91). Effective treatment for comorbid conditions combines different therapeutic modalities, i.e. psychotherapy [e.g. motivational interviewing (MI), cognitive behavioral therapy (CBT)], pharmacotherapy (e.g. antidepressants), and family therapy. Using combinations of different modalities typically increases therapeutic effect by exerting a synergistic impact on symptoms (6).

With MI, the patient was motivated to choose a first education-related treatment goal. This was to prevent school dropout at all cost. We started CBT to control her marijuana and alcohol abuse and prevent school dropout. We added medication in order to try to stabilize her mood with fluoxetine, an SSRI, which might also modulate stress. The medication initially seemed to have some effect but after two months there was a sharp mood drop, increased



suicidality and aggravation of eating disorder symptoms. Eventually she had a body mass index of 16 kg/m<sup>2</sup>. The eating problems were mapped and analysed by an eating disorder specialist. The latter used a problem-solving approach and focused on both directive counseling and emotional support. The eating disorder specialist also advised to choose a medication with low risks of weight gain. The psychiatrist changed the medication to citalopram.

Subsequently, the treatment team focused on teaching the patient how to cope with stressful situations and the associated anxiety. The stress appeared to be mainly caused by a feeling of lack of control. The patient turned out to have a high intelligence and learning ability, but also felt that she had no control over her learning process. She had not sufficiently developed social learning strategies in her early school years. In addition, there appeared to be an issue of individuation and separation problems. These problems got worse because it was almost impossible for her parents to let her develop in her own way due to the stress they had over her suicidal thoughts, drug use, and worsening physical condition due to bad eating habits. We decided on an additional family counseling approach to address these issues.

The integrated treatment modality approach proved effective. She developed a realistic idea of what caused her stress, how she reacted situationally and improved her awareness that she tends to have control over everything. Her parents were involved in helping her developing control coping skills and checking on achievements. Because of this insight, she succeeded in maintaining her diet less strictly and experimenting with behaving differently without alcohol or drugs. Her parents saw that she was doing better and were able to release her a bit more. This increased her sense of control and provided enough space to further discover what goals she wanted to achieve. In the process her mood and her ability to experience pleasure improved significantly. She successfully passed her school exams and proceeded to university.

## Case 2

A 15-year old Caucasian girl was referred by her own general practitioner after a suicide attempt with symptoms of sadness, anxiety, and obsessive–compulsive behavior. The intake was together with her parents. She was struggling in school, despite her very supportive family. No drug abuse or other psychiatric symptoms were found. She told the counselor she tried hard, but felt that she could not keep up in school; it was never good enough, no matter how hard she tried. The counselor estimated that the school level was appropriate for the level of intelligence of the patient.

She had periods when her self-esteem was very low. During these periods she spent hours on her appearance, focusing on her hair and makeup. Her hair fell out as a result of these sessions. She could not stop herself, and always ended with self-harm. This in turn lowered her self-esteem and increased the experienced stress. She was locked in a downward spiral. Gradually her mood disorder worsened and made her passive. She no longer wanted to go to school and meet friends, but passed hours in front of the mirror. She attempted to end her life.

We hypothesized on the basis of the girl's stress complaints that she felt school, parents, and friends expected too much of her. After a neuropsychological assessment the testing showed

that she had a disharmonic intelligence profile with an IQ of approximately 80 (using the Wechsler Intelligence Scale For Children-III (92)), inconsistent at all factor levels. We classified a mild intellectual developmental disorder in the conceptual and practical domain, which explained the structural struggle with the standard school curriculum instructions. We educated parents and school on how instructions might fit in better with her learning abilities and style. Her preferred method of learning new things was being shown how to do it, as opposed to having it explained to her. This led to significant stress reduction and positive school experiences. In the process her self-esteem improved, the experienced stress decreased, and her mood improved. CBT was adjusted to her learning style and was used to reduce her obsessive–compulsive behavior.

## DISCUSSION

### Cases

Though both case reports show a different profile of symptoms and coping mechanisms, in both cases a downward spiral of stress, coping behavior, and exhaustion are central. Both patients described themselves as rarely feeling relaxed and as struggling to fulfill their daily tasks. After several years of chronic stress, a period followed in which they felt constantly exhausted.

The first patient coped with stressful situations through aberrant food intake behavior, suicidal thoughts, and mood swings. She overcompensated this restrictive behavior with recreational drug abuse. The second patient developed compulsory behavior, stress, and suicidal thoughts and overcompensated leading to self-harm. In the current framework both cases would be viewed as different and based on their symptomatology ask for different treatments. Reframing both cases, from the perspective of coping behavior, searching for the origin and sources of the experienced stress and exhaustion and coping with stressful situations, showed stress coping similarities between the two cases and proved an essential part of the personalized treatment and recovery process. Both cases support the added clinical value of the functional reframing of depression as the outcome of a mood-affecting stress and exhaustion related spiralling mechanism.

The adolescent cases presented here are good examples of how depression can be managed by relearning effective coping behavior. This prevents patients from reverting to a depressive state in order to cope with the life stressors. In more severe and chronic cases, patients suffering from difficult-to-treat or treatment resistant MDD, patients are in a deep depressive state and are not capable of learning new coping behaviors. We envision that in such situations more radical medical interventions are needed to first elevate patients from the depressive state into a state where learning new and effective coping strategies can take place. In these situations, psychedelics (e.g. ketamine) have proven to be effective to temporarily draw people out of a deep depressive state. With the support of follow-up medication and adequate psychological guidance, the patients may then develop effective coping strategies.

## Methodological Notes

As this is a narrative review, and not a formal systematic review, caution needs to be used when interpreting this data. Select literature sources have been added based on informal searches, so contradicting studies may have been missed. Similarly, the two cases were selected for their exemplary stories, not because they are typical. As such, this paper aims to provide new insights and direction for future treatments, not a definitive answer on how to improve treatment.

## Possible Implications for the Post-CoViD-19 Pandemic Period

After the Spanish flu of 1918, many infected patients developed post-viral fatigue in the following months and years. On top of that, the randomness of who was infected and who died as a result led to learned helplessness, which caused anhedonia and other depressive symptoms (93). The recent pandemic of the novel coronavirus, severe acute respiratory syndrome coronavirus 2 [SARS-CoV-2, previously known as 2019-nCoV (94)], has overwhelmed healthcare facilities with the high need for acute care. This puts a large psychological toll on the entire population, with high levels of stress (95). Next to the risk of the many life events that can be expected in these situations, coping behavior—such as avoiding conflict, or searching social support—is often limited due to confinements that are put in place to prevent further spread. Furthermore, the lockdown situation and mass isolation at home in many countries may increase the risk of domestic violence and divorces. This could all lead to a rise in trauma-related stress disorders in the months and years to come. Breaking a vicious cycle of stress, inadequate coping behavior and exhaustion with a holistic view, and possibly with psychedelic-supported psychotherapy, might help treat the many psychiatric patients that can be expected.

## CONCLUSION

Reframing depression and shifting clinical practice to a more comprehensive and integrated look at the individual experience of a patient, including all causes for stress, pressure, and exhaustion, might be more helpful in developing promising treatment strategies. Also, treatment practices that take into account preventive mental health interventions, and that focus on stress, exhaustion, and coping strategies, could have a significant and lasting impact on many patients struggling with depression. The perspective of stress, coping, and exhaustion provides the therapist with another treatment approach that can work in synergy with the existing arsenal of therapeutic approaches, making the therapist more effective.

Increased focus is needed on support programs to help individuals develop functional coping mechanisms to deal with pressure, before more serious coping mechanisms develop in the form of withdrawal from stressful situations, compulsory behavior, or frequently occasional use of recreational drugs (96). Our intuition is that during successful treatment patients experience small successes of effective coping and re-live the rewarding properties

of such experiences. Reliving experiences could repair the damaged reward mechanisms and diminishes the experienced anxiety and stress which then might subsequently drive and sustain further recovery (97). Psychedelics may offer help in breaking free from the existing cognitive bias, by facilitating introspection, re-living of past experiences, and development of new coping mechanisms.

Effective treatment strategies for adolescent and young adult depression should combine different therapeutic modalities and focus on exhaustion and sources of stress. Using a combination of treatment modalities could increase therapeutic effectiveness by improving the pace of learning new coping behaviors, exerting a synergistic impact on the developmental perspective, and breaking the downward spiral of stress and exhaustion, which eventually leads to a reduction of the depression symptoms. This might also help for other related mental disorders in adolescents and young adults where exhaustion and stress are central, such as burnout syndrome (98). But similarly, post-traumatic stress disorder, autism spectrum disorder, and generalized anxiety disorder are related to stress (24, 99–101). These disorders could also benefit from the reframing of the concept of mood and stress. We would like to offer this integrated and multidisciplinary perspective as a consideration for the development of new multimodal treatment approaches for MDD and other related psychiatric disorders.

## DATA AVAILABILITY STATEMENT

All datasets generated for this study are included in the article/supplementary material.

## ETHICS STATEMENT

Written informed consent was obtained from both subjects for the case reports.

## AUTHOR CONTRIBUTIONS

Conception or design of the work: TP, TG, LL, RO, AH, RZ. Data collection cases: LL. Data analysis and interpretation: TP, TG, LL, AH. Drafting the manuscript: TG. Critical revision of the article: TP, LL, TG, RO, AH, RZ. Final approval of the version to be published: TP, LL, TG, RO, AH, RZ

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# Plasma microRNA Array Analysis Identifies Overexpressed miR-19b-3p as a Biomarker of Bipolar Depression Distinguishing From Unipolar Depression

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**Objectives:** The clinical characteristics of bipolar disorder (current major depressive episode) (BD) overlap with unipolar depressive disorder (UD), which makes it difficult to perform an accurate diagnosis. We identified plasma microRNAs (miRNAs) that distinguished BD from UD and explored the relationship between miRNA expression levels and clinical characteristics.

**Methods:** Total miRNAs from blood plasma from seven UD patients, seven BD patients, and six controls were analyzed. The identified miRNAs were validated in a separate population group. Depression severity and early life adversities were assessed. Bioinformatic analysis was conducted to investigate the target genes that were identified and the pathways associated with the altered miRNAs.

**Results:** Compared to controls, 42 miRNAs were differentially expressed in patients. miR-19b-3p, miR-3921, and miR-1180-3p were selected to validate the microarray results. Only miR-19b-3p was validated as down-regulated in patients. The primary predicted genes associated with miR-19b-3p were MAPK1, PTEN, and PRKAA1. The most relevant KEGG pathways included mTOR, FoxO, and the PI3-K/Akt signaling pathway. BD patients were more likely to have higher expression levels of miR-19b-3p and more severe childhood trauma experience compared to UD patients.

**Conclusions:** Plasma miR-19b-3p is a potential non-invasive biomarker that might be useful in distinguishing UD from BD. miR-19b3p was predicted to be involved in the pathway of inflammatory dysregulation associated with experiencing early childhood trauma.

**Keywords:** bipolar disorder, unipolar depression, peripheral miRNAs, biomarker, gene expression

## INTRODUCTION

The clinical manifestations of bipolar disorder (current depressive episode) (BD) and unipolar depressive disorder (UD) have a number of similar characteristics. Both disorders present a substantial public health burden due to their high prevalence, recurrence, and degree of disability. Although the theoretical basis of clinical psychiatry has been developed for more than half a century from Kraepelin's conceptual foundations of mental illness to descriptive symptomatological conception, it still is not easy to clearly distinguish BD from UD. An episode of major depression may occur in the early stage of BD such that the patient is misdiagnosed with UD due to the lack of any history of hypomanic or manic episodes. It is possible for clinicians to change a diagnosis over time when evidence of hypomanic or manic episodes appears. The time-delay gap between the onset and the accurate diagnosis of BD, on average, is approximately five to ten years (1). Delayed diagnosis of BD may lead to a deleterious outcome through the use of antidepressant monotherapy, which would increase the risk of 'switching' into hypomanic or manic episodes (2, 3). Approximately 40% to 70% of BD patients have to confront the problem of receiving an appropriate diagnosis as early as possible (4, 5). It is imperative for clinicians to make a precise diagnosis to discern BD from UD. A series of clinical assessments have been administered, including sub-threshold hypomania, atypical depressive symptoms, and other clinical characteristics (6–8). Nonetheless, it is not enough to effectively distinguish the disorders using only these clinical symptoms.

Given the significant heritability of UD and BD, candidate genes for both diseases have been identified (9–11). One genome-wide association study (GWAS) that focused on major depression and included over 135,000 individuals identified 44 loci with genome-wide significance (12). Another GWAS that included over 20,000 BD patients found 30 significant genomic loci (13). However, these GWAS presented poor replication and failed to find shared or distinct genetic markers of affective disorder. One reason for this failure is that psychiatric diseases result from environmental causes as well as predisposing genetic factors. Epigenetic mechanisms indicate the interaction of genetic and environmental factors (G\*E interaction). Given the role of non-coding RNAs as post-transcriptional regulators of gene expression, microRNAs are considered to be one of the G\*E pathological features of affective disorders. Thus, the use of microRNA expression is of considerable interest to detect and distinguish UD from BD (14–17).

MicroRNAs (miRNAs) are small, endogenously-expressed, non-coding RNAs (~22 nucleotides) that can repress translation to inhibit protein synthesis or promote degradation of target mRNAs with complementary sequences (18). One miRNA can target hundreds of different mRNAs, and multiple miRNAs may regulate a single mRNA. Nearly 70% of mammalian miRNAs are expressed in the brain that generally negatively regulate target gene expression. Emerging studies have demonstrated that miRNAs, which are regarded as "neural communication sculptors," play an essential role in the proliferation, differentiation, and migration of

neurons and participate in the regulation of neuropsychiatric disorders (19, 20). Zhao et al. reported that sevoflurane-induced upregulation of miR-19-3p in neonatal rats post-transcriptionally inhibited protein translation of CCNA2, which contributed to the impairment of learning and memory (21). Clinical studies have reported altered miRNA expression in different brain regions of patients with schizophrenia, bipolar disorders, and major depressive disorder (22, 23).

MiRNAs are also released and circulating in the serum, plasma, and other body fluids. The signatures of circulating miRNAs may be potentially useful non-invasive biomarkers for disease, such as psychiatric disorders. For example, circulating miRNAs were shown to be changed by electroconvulsive shock therapy in psychotic depression (24). Walker et al. identified differential miRNAs (miR-15b, miR-132, and miR-652) in whole-blood samples of bipolar disorder comparing to healthy controls (25). Another study found a set of circulating miRNAs (let-7a-5p, let-7d-5p, let-7f-5p, miR-24-3p, and miR-425-3p) that were specifically altered in major depressive patients, five miRNA transcripts (miR-140-3p, miR-30d-5p, miR-330-5p, miR-378-5p, and miR-21-3p) were specifically altered in bipolar disorder patients, and two miRNAs (miR-330-3p and miR-345-5p) were altered in both diseases (26). Though the potential use of circulating miRNAs for psychiatric disorders screening has emerged, whether circulating miRNAs can be used as biomarkers for distinguishing bipolar depression from unipolar depression is still unclear.

Among the numerous adverse environmental conditions that exist, early childhood trauma, such as emotional abuse or neglect, physical abuse or neglect, and sexual abuse, is the greatest risk factor for the onset and development of depression (27). Patients diagnosed with UD or BD experienced more childhood trauma than healthy subjects (28, 29). Neuroimaging studies have shown that early life adversities were associated with structural and functional abnormalities in specific brain regions that are involved in cognitive processing and emotional regulation (30). Growing evidence supports a direct association between exposure to childhood trauma and elevated levels of inflammatory biomarkers, such as C-reactive protein, interleukin-6, and white blood cell counts (31). The impact of early life adversity and a dysregulated inflammatory profile would persist into adulthood, leading to greater vulnerability to depression (32, 33). It is hypothesized that the activation of immunological processes might be the mediator between childhood trauma and psychopathological outcomes (34).

During the process of adaptation to environmental perturbations by the individual, gene expression is modulated dynamically to optimize responses to stress. Emerging evidence indicates that miRNAs are ideally positioned to coordinate the genomic response to stress (35). Stress-induced alterations in miRNA expression affect multiple biological processes, including neurotransmission, cytokine production, and inflammation. Understanding the role of miRNAs in regulating stress-induced gene expression could have diagnostic benefits in mood disorders. To date, no studies have been conducted that compare the interactions between alterations in miRNA expression and early life adversities in UD and BD patients.

The present study used an array to assess genome-wide plasma miRNA expression in UD and BD patients in combination with the assessment of the environmental risk factor of childhood trauma. The results of this study present a novel and comprehensive molecular signature that can contribute to the differential pathogenesis of UD and BD.

## MATERIALS AND METHODS

### Participants

Patients who were experiencing a major depressive episode were recruited from the Department of Psychiatry of the Affiliated Nanjing Brain Hospital of Nanjing Medical University from 2015 to 2016. The inclusion criteria for patients were as follows. (i) The patients received a diagnosis from a senior psychiatrist of major depressive disorder (unipolar depression, UD) or bipolar disorder (type I or type II) (BD) according to the Structured Clinical Interview for DSM-IV (SCID-IV). (ii) The patients received a 24-item Hamilton Depression Rating Scale (HAMD-24) score equal to or greater than 20. (iii) The age of the patients was between 18 and 55 years. (iv) The patients did not receive any psychotropic medications (including antipsychotics, antidepressants, mood stabilizers, and benzodiazepines) for at least four weeks. The exclusion criteria included the following. (i) The patients were diagnosed with other DSM-IV psychiatric disorders. (ii) The patients had a history of severe head injury. (iii) The patients were diagnosed with any neurological diseases or severe physical diseases, as evaluated by laboratory tests or personal history. (iv) The patients had a history of alcohol or substance dependence or abuse. (v) The patients were pregnant or lactating. All patients who were included in the study were followed up every six months until December 2018. The different types of early life stress were assessed among all patients when they entered the study using the Childhood Trauma Questionnaire (CTQ) (36). At every follow-up time point, the UD patients were administered the 32-item hypomania checklist (HCL-32) to screen for hypomania symptoms (37). If the HCL-32 score was greater than 14 points, the patient's diagnosis was switched to BD, and the patient was excluded from the study.

The healthy control group included individuals who were matched to the patients with respect to age, gender, and education. The control subjects were recruited from communities in Nanjing from 2015 to 2016 and were screened using the Mini International Neuropsychiatric Interview (MINI) (38). Healthy controls were excluded if they had any history of psychiatric disorders or had any family history of mental disorders in their first-degree relatives.

All subjects were genetically unrelated, ethnic Han Chinese, with at least six years of education. Each subject donated 5 ml of venous blood at the time of their recruitment. A two-phase study was designed. First, in the screening phase, we performed peripheral miRNA profiling using Affymetrix chips for UD patients, BD patients, and healthy controls who were randomly selected from the sample set. In the second, independent validation phase, we examined the expression levels of

identified miRNAs in all participants and analyzed the results of the miRNA arrays using the Gene Ontology and KEGG Pathway assays. Finally, we assessed the shared and distinct correlations between the expression of selected miRNAs and childhood traumatic experiences in UD and BD patients.

This study was approved by the institutional review board of the Affiliated Nanjing Brain Hospital of Nanjing Medical University, and written informed consent was obtained from each participant.

### Plasma Preparation and RNA Isolation

The plasma was separated from venous blood within 24h after collection by centrifugation at 12,000 r.p.m. for 15 min. The supernatant from the plasma samples was stored in 300  $\mu$ l aliquots at  $-80^{\circ}\text{C}$  in RNase-free microtubes until it was used for miRNA extraction. A modified method was utilized to isolate total RNA. Briefly, Trizol reagent (Invitrogen, Carlsbad, CA, USA) was used to break down cells and cellular components in the plasma, and total RNA was extracted and purified using a miRNeasy Serum/Plasma Kit (Qiagen, Valencia, CA, USA) according to the manufacturer's instructions. RNA quality and quantity were evaluated using a NanoDrop ND-1000 spectrophotometer (Thermo Fisher Scientific, Waltham, MA, USA).

### miRNA Array

During the screening phase, a volume corresponding to 500 ng of total RNA from each blood sample was processed using a FlashTag Biotin HSR RNA Labeling kit (Affymetrix, Santa Clara, CA, USA), following the manufacturer's protocol. The RNA was subsequently hybridized onto Affymetrix GeneChip miRNA 4.0 Arrays that each contained 2,578 human miRNA sequences (Affymetrix, Santa Clara, CA, USA). The GeneChip miRNA 4.0 Arrays were washed and stained using a Fluidics station 450 and a GeneChip Scanner 3000 7G (Affymetrix, Santa Clara, CA, USA), respectively.

### qRT-PCR Validation

At the validation phase, quantitative real-time PCR (qRT-PCR) was performed using Taqman microRNA probes (Applied Biosystems Inc, CA, USA) to confirm the candidate miRNAs identified on the microarrays. Total RNA was reverse transcribed to complementary DNA using a miRNA 1st Strand cDNA Synthesis Kit, stem-loop RT primers (Vazyme, Nanjing, China), and the GeneAmp 9700 PCR System (Thermo Scientific, MA, USA). The reactions began in a 384-well optical plate at  $95^{\circ}\text{C}$  for 5 minutes, followed by 40 cycles of  $95^{\circ}\text{C}$  for 10 seconds and  $60^{\circ}\text{C}$  for 30 seconds. The quantitative detection of the miRNAs was performed using the miRNA Universal SYBR qPCR Master Mix (Vazyme, Nanjing, China) and implemented on the Agilent AriaMx platform (Agilent Technologies, Palo Alto, CA, USA). All reactions, including no-template controls, were performed in triplicate. To calculate the relative expression levels of the target miRNAs, U6 was used as the control miRNA for plasma samples (the sequences of the primers listed in **Supplemental data 1**).



## Data Analysis

All statistical analyses were performed using R (version 3.5.0) and SPSS (version 24.0). Demographic and clinical characteristics among the three groups were compared using  $\chi^2$  tests, the Student's *t*-test, or one-way ANOVA.

CEL-files of raw data were produced using Affymetrix GeneChip Command Console Software, Version 4.0 (Affymetrix, Santa Clara, CA, USA). Arrays were normalized using quantile normalization, and the probe values were log<sub>2</sub> transformed. All data have been submitted to the GEO repository (code number: GSE152267).

We utilized one-way ANOVA to detect differentially expressed miRNAs among all three groups, and miRNAs were chosen as candidates for further confirmation by individual qRT-PCR according to the following three criteria: (i) *p*-value < 0.05 for the ANOVA; (ii) assessed using Fisher's Least Significant Difference test as the Post Hoc test for multiple comparisons; (iii) fold changes (FCs)  $\geq 3/2$  or  $\leq 2/3$  between every two groups (BD vs. controls, UD vs. controls, and BD vs. UD).

Concerning qRT-PCR validation, the Ct values were normalized according to the delta Ct ( $\Delta$ Ct) method based on the internal reference, U6. The relative expression levels of target miRNAs were calculated using  $2^{-\Delta\Delta Ct}$ , which were analyzed using the Student's *t*-test for independent samples (39). Binary logistic regression was applied to determine correlations between miRNA expression levels and childhood traumatic variables. A *p*-value < 0.05 was statistically significant for all analyses.

## Target Gene Prediction and Pathway Analysis

Bioinformatic analysis (Genminix Informatics Ltd., Shanghai, China) was performed for the miRNAs expressed in significant amounts. TargetScan (<http://www.targetscan.org/>) and miRanda (<http://www.microrna.org/microrna/hom.do>) were used to predict target genes for the validated candidate miRNAs, and only genes predicted by both databases were retained. To identify the potential biological mechanism of differentially expressed miRNAs among the BD, UD, and healthy controls, we performed gene ontology (GO, <http://www.geneontology.org/>) and Kyoto Encyclopedia of Genes and Genomes (KEGG, <http://www.genome.jp/kegg/>) pathway enrichment analysis with the David web application (<https://david.ncifcrf.gov>). Fisher's exact test was employed to determine whether a gene set was enriched for a specific gene using GO terms or KEGG pathways compared to the background information. The *p*-value was corrected for false discovery rates (FDR). GO terms with a *p*-value < 0.01 and a KEGG pathway with a *p*-value < 0.05 were considered significant. The miRNA-mRNA-gene network of miR-19b-3p was obtained by using Cytoscape (Version 2.8.2).

## RESULTS

### Demographic and Clinical Characteristics of the Subjects

All subjects were followed up every six months to confirm whether they experienced any hypomania or mania episodes

until December 2018. During three years of follow up, six UD patients (two males and four females, with a mean age of  $26.2 \pm 10.0$  years) experienced a manic episode that lasted more than seven days. These six patients were excluded from the study since their diagnosis was switched from UD to BD. Thus, 32 UD patients and 27 BD patients were included in the final analysis (see **Table 1**). There was no statistical difference between these two groups regarding age, gender, education, or family history (*p* > 0.05). The UD group recruited more first-episode patients compared to the BD group, while patients in the BD group had a longer duration of illness than the UD group. Clinical assessments showed that there were no significant differences in the total scores for HAMD between the two diagnostic groups. At the same time, the UD patients had higher anxiety or somatization scores (*p* < 0.05) and sleep disturbance scores (*p* < 0.01) compared to BD patients.

### miRNA Expression Profiles

Seven UD patients, seven BD patients, and six healthy controls were randomly selected from the total sample to undergo microarray chip inspection. There were no differences in the subjects' demographic characteristics, the overall severity of depression, or childhood traumatic experiences (see **Supplementary data 2**). Total RNA extracted from peripheral venous blood was analyzed using Affymetrix miRNA 4.0 Arrays. The altered miRNA expression in UD and BD patients compared to healthy controls are listed in **Supplementary data 3**. Seventeen miRNAs were down-regulated, and 25 miRNAs were up-regulated (*p* < 0.05).

Hierarchical clustering was carried out for all covered human mature miRNAs and pre-miRNAs, and significant differences in expression values were observed between the patients diagnosed with UD and BD and healthy controls. (**Figure 1**). Following hierarchical clustering, the array results were narrowed down to dysregulated miRNAs with a *p*-value < 0.05 from one-way ANOVA analysis of the three groups and a fold change  $\geq 3/2$  or  $\leq 2/3$  for all the two-group comparisons. Based on these criteria, three representative miRNAs (miR-19b-3p, miR-3921, and miR-1180-3p) were selected for PCR to validate the microarray results.

### Verification Using Quantitative Real-Time PCR

Quantitative real-time PCR (qRT-PCR) was performed to verify the differentially expressed miRNAs in an expanded sample comprised of 32 UD patients and 27 BD patients. Only miRNAs with a fold change  $\geq 3/2$  or  $\leq 2/3$  and a *p*-value < 0.05 from Student's *t*-tests for each two-group comparison were validated. Of these, miR-19b-3p was verified to be down-regulated (see **Figure 2**).

### Microarray-Based Gene Ontology and Signal Pathway Analysis

Based on the GO and KEGG signal pathway analyses, we first predicted mRNAs that could be regulated by miR-19b-3p. Then we performed an enrichment analysis to infer the putative

**TABLE 1** | Demographic and clinical characteristics of unipolar depression, bipolar depression, and healthy controls.

Variables	Total participants			Significance	
	UD (n = 32) Mean (SD)	BD (n = 27) Mean (SD)	HC (n = 18) Mean (SD)	p (UD vs. BD)	p (three groups)
Age (years)	35.06 ± 8.20	31.06 ± 9.97	32.56 ± 6.64	0.114	0.192
Age range (years)	19~51	18~54	21~46		
Female (n(%))	21 (66.7%)	19 (70.4%)	8 (44.4%)	0.698	0.188
Education (years)	13.53 ± 3.39	13.74 ± 2.64	13.67 ± 3.07	0.957	0.965
Duration of illness (months)	17.44 ± 17.37	36.15 ± 42.37		0.026*	
Family history (n(%))	8 (25.0%)	8 (29.6%)		0.690	
Depression for first episode (n(%))	29 (90.6%)	15(80.0%)		0.002**	
Clinical assessment					
Total score of HAM-D <sub>24</sub>	31.38 ± 6.04	28.63 ± 5.20		0.069	
Subscore of HAM-D <sub>24</sub>					
Anxiety/somatization	8.22 ± 3.20	6.33 ± 2.48		0.016*	
Cognitive disturbance	3.97 ± 1.98	4.37 ± 1.76		0.417	
Retardation	7.84 ± 1.55	8.26 ± 1.89		0.357	
Hopelessness	5.22 ± 1.95	5.00 ± 2.11		0.681	
Sleep disturbance	4.63 ± 1.29	3.67 ± 1.71		0.007**	
Weight loss	1.19 ± 0.93	0.52 ± 0.89		0.719	
Circadian fluctuation	0.31 ± 0.59	0.26 ± 0.53		0.603	
Total score of CTQ	50.75 ± 11.7	54.85 ± 14.11	44.67 ± 3.76	0.018*	
Subtypes of CTQ					
Emotional abuse	8.94 ± 3.88	10.30 ± 5.53	6.78 ± 1.11	0.025*	
Physical abuse	6.47 ± 2.26	6.89 ± 2.93	4.94 ± 0.24	0.019*	
Sexual abuse	5.72 ± 1.87	5.81 ± 1.67	5.00 ± 0.00	0.195	
Emotional neglect	13.38 ± 4.69	15.48 ± 5.32	10.89 ± 2.42	0.005**	
Physical neglect	9.19 ± 3.73	9.41 ± 4.12	7.22 ± 2.39	0.110	

UD, unipolar depression; BD, bipolar depression; HC, healthy control; HAM-D<sub>24</sub>, 24-item Hamilton Depression Scale; CTQ, Childhood Trauma Questionnaire. \* $p < 0.05$ , \*\* $p < 0.01$ .

biological pathways that might be involved in the miRNA regulation. We detected 288 mRNAs regulated by miR-19b-3p (see **Supplementary Data 4**). Significant gene functions and pathways putatively altered in UD and BD patients were selected based on the standards of  $p < 0.01$  (GO) and  $p < 0.05$  (KEGG). GO results revealed that most functions associated with miR-19b-3p regulation were related to signal transduction, neuron growth, cell differentiation, and apoptosis (**Figure 3A**). The most relevant KEGG signal pathways were involved in enrichment of biological processes, which included mTOR, autophagy, FoxO, prolactin, p53, and the PI3-K/Akt signaling pathway (**Figure 3B**). A more intuitive miRNA-mRNA-gene network diagram was produced to investigate the potential role of miR-19b-3p in the pathogenesis of depression (**Figure 3C**). The most relevant target genes were MAPK1, PTEN, TGFBR2, PRKAA1, PIK3R3, and RAF1, which were involved in multiple pathways.

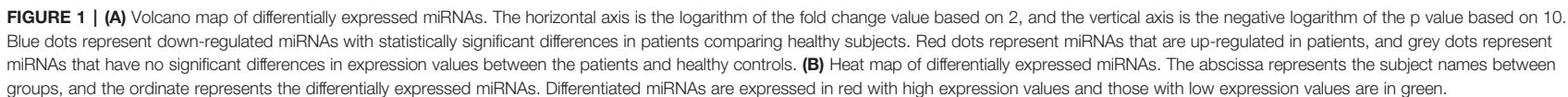
## Correlation Between miRNA Expression and Stress-Related Psychological Variables

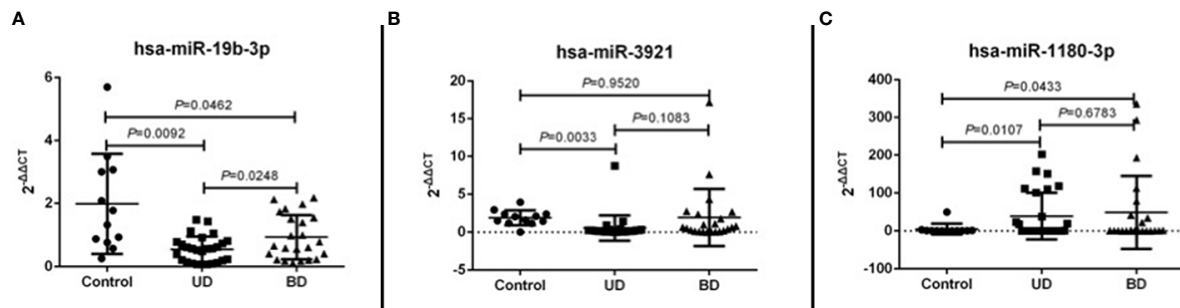
A binary logistic regression model was produced to examine the correlation between miR-19b-3p expression and exposure to childhood trauma in patients with UD and BD, with adjustments for demographic variables. The results showed that the expression level of miR-19b-3p (OR=5.717, 95% CI:1.497–21.835,  $p=0.011$ ) and the overall severity of childhood trauma (OR=1.099, 95% CI:1.012–1.192,  $p=0.025$ ) were

significantly associated with greater risk of BD. Among the sub-types of childhood trauma (emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect), there was a weak association between physical neglect and UD (OR=0.773, 95% CI:0.598–0.999,  $p=0.049$ ) (**Table 2**). The other specific types of childhood trauma were not significantly correlated with any morbid status.

## DISCUSSION

In the present study, we systematically investigated the genome-wide miRNA expression profile in plasma from patients with UD and BD as compared to healthy subjects. Among 42 differentially expressed miRNAs, three miRNAs (miR-19b-3p, miR-3921, and miR-1180-3p) were selected to validate the microarray chip results. The novel miR-3921 was significantly up-regulated in the UD group but was not verified. miR-1180-3p was up-regulated in UD and BD patients but also was not verified. To date, no published reports have associated these two miRNAs with psychiatric disorders. However, miR-19b-3p was significantly down-regulated in the patient group, which indicates that peripheral miRNAs are possible non-invasive biomarkers with the necessary diagnostic accuracy. Furthermore, a specific miRNA related to psychological factors might help differentiate BD from UD. The BD patients were more likely to exhibit the combination of over-expressed miR-19b-3p and more severe childhood trauma when UD and BD patients were compared.





**FIGURE 2 |** Scatter plot figures show qRT-PCR validation of the differential expression of three miRNAs among three groups (unipolar patients (UD), bipolar patients (BD), and healthy controls (HC) (A) miR-19b-3p, (B) miR-3921, (C) miR-1180-3p). The values of  $2^{-\Delta\Delta CT}$  represent the expressed level of filtered miRNAs. A  $p$ -value of  $< 0.05$  means statistically significant.

## miR-19b-3p and Its Pathology in Psychiatric Diseases

MiR-19b-3p belongs to the miR-17/92 cluster, which exerts powerful effects on lymphocyte development, proliferation, activation, differentiation, and cytokine production (40, 41). Gantier et al. first reported that miR-19b regulated the activity of nuclear factor- $\kappa$ B (NF- $\kappa$ B) signaling in inflammation (42). Over-expression of miR-19b-3p inhibited the production of IL-6 and IL-8, and the interaction of miR-19b-3p with its direct target gene, G protein-coupled receptor kinase 6 (GRK6), was discovered to affect inflammation (43).

TNFAIP3, which is negatively regulated by miR-19b-3p, is widely recognized as an important regulator of inflammation (44). An intriguing role for miR-19b-3p is to regulate the neuroinflammatory response induced by the Japanese encephalitis virus (JEV) *via* enhancement of NF- $\kappa$ B signaling (45). Dwivedi et al. reported that miR-19b was over-expressed in the prefrontal cortex of rats with stress-induced depression with chronic administration of exogenous corticosterone (46). Although the epigenetic mechanisms of miR-19b-3p in psychiatric disorders remain unclear, various studies point to the effects of this miRNA in the communication between the immune system and the brain, which is known as a new area in psychiatry, specifically, immunopsychiatry.

## The Target Genes of miR-19b-3p in Unipolar Depression and Bipolar Disorder

Our *in silico* results predicted a series of target genes and biological pathways for miR-19b-3p. Since patients with major depression who experienced childhood trauma were susceptible to immune dysregulation, we first check the biological processes associated with miR-19b-3p in immunomodulation between UD patients and BD patients. GO analysis predicted that the target gene function of miR-19b-3p, was enriched in the Wnt signaling pathway. It is consistent with a previous study that dysregulated expression of Wnt-related genes was shown in BD (47). Numerous studies have shown that suppression of Wnt signaling could induce both manic and depressive behaviors and exacerbate a proinflammatory state leading to increased neuronal apoptosis (48). In our study, the Wnt pathway was the

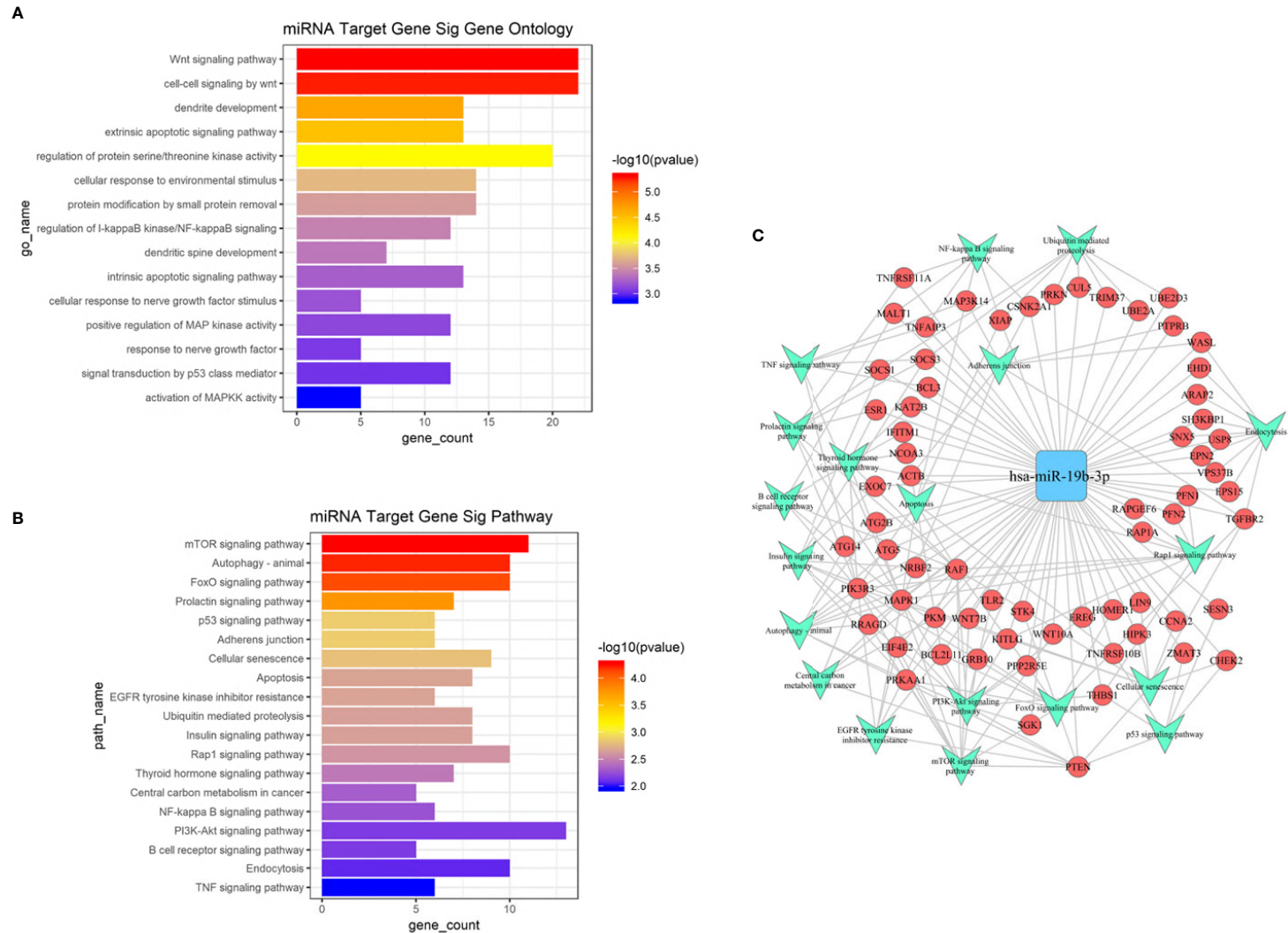
most significantly enriched biological function, indicating its potential role in identifying UD and BD patients.

KEGG enrichment analyses predicted that the most significant target gene pathway was the mammalian rapamycin (mTOR) signaling pathway. Accumulating evidences suggested that mTOR signaling was dysregulated in depression (49). Activated mTOR signaling might be related to antidepressant-like effects in the hippocampus by modulating inflammatory cytokines such as interleukin-1 $\beta$  (IL-1 $\beta$ ), interleukin-6 (IL-6), and tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ) (50). Autophagy signaling was the second, richest pathway regulated by miR-19b-3p. Dysregulation of autophagy leads to various disease manifestations, such as inflammation, metabolic alterations, and neurodegeneration (51). Some antidepressants induce inflammatory suppression through decreased serum levels of IL-1 $\beta$  and IL-18 and decreased NLRP3 protein expression *via* the autophagy pathway (52). Recent findings indicated that the forkhead box O (FoxO) signaling pathway is involved in the development of major depression and constitutes a potential therapeutic target in the treatment of depression (53). Although there is no evidence for FoxO involvement in BD, our results suggested that this pathway played an important role *via* miR-19b-3p in both UD and BD.

The prolactin pathway was identified in the differentiation between UD and BD. Hyperprolactinemia is reported commonly in subjects with a psychotic disorder which could due to stress, while information regarding mood disorder patients was particularly lacking (54). The p53 signaling, identified differently between UD and BD patients in our study, has not been reported to be associated with psychiatric disorders previously. Although the phosphatidylinositol 3-kinase (PI3K)-Akt signaling pathway was less strongly associated with miR-19b-3p expression, it contains the largest number of target genes. PI3K-Akt signaling is involved in the inhibition of the inflammatory response of lipoteichoic acid-stimulated macrophages (55). Reports indicate that some antidepressants used in clinical practice exert therapeutic efficacy *via* the promotion of the hippocampal PI3K-Akt-mTOR signaling pathway (56).

Mitogen-activated protein kinase 1 (MAPK1) had the highest predictive value among all the target genes of miR-19b-3p.





**FIGURE 3 | (A)** GO analysis of target genes predicted by miR-19b-3p. The ordinate is the name of the target gene function, and the abscissa is the negative logarithm of  $p$  value ( $-L_{gp}$ ). The larger the  $-L_{gp}$  value, the smaller the  $p$  value and the higher the significance level of the target gene function. **(B)** KEGG signal pathway of target genes predicted by miR-19b-3p. The ordinate is the name of the target gene signal pathway, and the abscissa is the negative logarithm of  $p$  value ( $-L_{gp}$ ). The larger the  $-L_{gp}$  value, the smaller the  $p$  value and the higher the significance level of the target gene signal pathway. **(C)** MicroRNA-Target Gene network diagram of miR-19b-3p. The blue square in the figure refers to miR-19b-3p, the red circle refers to target genes, and the green arrow refers to the signal pathways involved in the target gene. Lines represent the regulatory relationship between miR-19b-3p and target genes.

**TABLE 2 |** The logistic regression of miR-19b-3p and childhood trauma characteristics between the patients with UD and BD.

	B	p value	OR	95%CI	
miR-19b-3p	1.743	0.011*	5.717	1.497	21.835
Total score of CTQ	0.094	0.025*	1.099	1.012	1.192
Physical neglect	-0.258	0.049*	0.773	0.598	0.999

UD, unipolar depression; BD, bipolar depression; CTQ, childhood trauma questionnaire. Physical neglect: a subtype of childhood trauma. \* $p < 0.05$

Emerging evidence has revealed that alteration of MAPK1 is associated with psychiatric disorders, such as major depressive disorders, bipolar disorder and schizophrenia (57, 58). MAPK1 is highly expressed in the prefrontal cortex and hippocampus, and can modulate neuronal growth and differentiation, synaptic plasticity, and inflammatory processes *via* mTOR, FoxO, and other signaling pathways (59, 60).

Phosphatase and tensin homolog (PTEN) is a significant target of miR-19b-3p, and it directly regulates the PI3-K-Akt-mTOR signaling pathway, which is regarded as the most critical pathway for many neurobiological functions in the brain. PTEN regulates neuron cell size and affects dendritic growth, and it also acts as a significant tumor suppressor gene through the modulation of the inflammatory process (61, 62). Altered expression of PTEN in the blood is considered a biomarker for suicidal tendencies (63), as well as in the prefrontal cortex and hippocampus of suicide victims (64). The possibility of using miR-19b-3p and its target genes, such as PTEN to identify stress-related neuropathology in mood disorders, is encouraging. An upstream molecule in the mTOR pathway (PRKAA1) was down-regulated by miR-181a and facilitated hippocampal fear memory consolidation (65). Fear inhibition is related to trauma events (66). Therefore, PRKAA1 is one of significant target genes of miR-19b-3p that could be associated with stress-induced bipolar patients *via* activation of the mTOR pathway.

## Childhood Traumatic Exposure and miRNA Alterations in Depressive Patients

Early life adversities, such as emotional, physical, and sexual abuse or neglect in childhood, are associated with poor psychological health outcomes in adults. Childhood traumatic experiences play an important role in developing BD, induction of more severe clinical symptoms, impairing emotion regulation and cognitive function, and lead to a much higher risk for suicide (28). Recent studies have explored the epigenetic mechanisms between childhood trauma and major depression, as well as schizophrenia (14). Our findings provide a significant association between childhood traumatic experiences and altered expression of miR-19b-3p in BD. Based on our bioanalysis results, plasma miR-19b-3p might be a biomarker associated with the impact of childhood trauma on UD and BD through the involvement of inflammatory processes.

Increased inflammation has been described in healthy individuals exposed to childhood trauma, suggesting a potentially causal role in the future onset of depression (67, 68). The Dwivedi group focused on epigenetic mechanisms of depression and suicide

and recently reported that proinflammatory cytokines (e.g., TNF- $\alpha$ ) and miR-19a-3b were up-regulated in the dorsolateral prefrontal cortex (DLPFC) in suicide victims, and both molecules were increased in the peripheral blood mononuclear cells of depressed patients with severe suicidal ideation (69).

Another important finding showed that unipolar patients with the lowest expression of peripheral miR-19p-3b among the three groups experienced more physical neglect, which has not been reported previously. The effects of neglect can be as traumatic as or even more traumatic than the effects of abuse, and the traumatic effects persist into adulthood (70). Neglect has several forms. Physical neglect could prompt the individual to develop psychological unavailability, which impacts the development of depressive symptoms. Further research is needed on possible epigenetic mechanisms of neglect associated with miRNAs.

## Strengths and Limitations

This study has some strengths. First, we stringently recruited subjects in the screening phase. There were nearly identical clinical manifestations of the unipolar and bipolar patients, which could exclude possible confounding caused by distinct profiling between the two groups. Second, the differentiated miRNAs were systematically screened through the whole miRNome profiling on unipolar and bipolar depressive patients and healthy controls and was validated in a larger independent sample to increase the reliability of the results. Third, we provided an in-depth discussion of the possible miRNA targets and the integration of potential molecular mechanisms with environmental factors. We explored the possible use of peripheral miRNAs as non-invasive diagnostic biomarkers of mood disorders from an immune-psychiatry perspective and prompted further research on the role of miR-19p-3b in depression.

Nevertheless, the relationship of miRNA expression in plasma and the brain is not clear, since we only observed alterations in peripheral miRNAs. It is a concern that there were two selected miRNAs eliminated in the validation phase, which might be due to the limited sample size. A miRNA panel would be a more robust method of diagnosis of UD or BD. We did not examine any circulating inflammatory factors that were potentially related to the disorders. Therefore, the association between miRNA expression and immunological regulation remains unclear. A well-designed study would need to be conducted to develop a psychoneuroimmunology network of childhood trauma, immunological indices, altered miRNAs, and the disorder.

## CONCLUSIONS

This study showed that the expression profiling of plasma miRNAs was altered both in UD and BD. miR-19b-3p was down-regulated in patients with depression and was validated to be over-expressed in BD but not UD. The target genes for miR-19b-3p were primarily enriched in the Wnt signaling and mTOR pathways. These miRNA gene targets elucidate the

pathways and mechanisms involved in neuroimmunology pathways and depression pathogenesis.

## DATA AVAILABILITY STATEMENT

All data have been submitted to the GEO repository (code number: GSE152267).

## ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Affiliated Brain Hospital of Nanjing Medical University ethics committee. The patients/participants provided their written informed consent to participate in this study.

## AUTHOR CONTRIBUTIONS

YC: collected data, conducted the statistical analysis, drafted the manuscript, edited, and submitted the manuscript. JS, HL, QW, XC, HT, RY: collected data, reviewed, and revised the manuscript. QL: statistical analysis, critically reviewed, edited, and revised the manuscript. ZY: conceptualized and designed the study, critically reviewed, and revised the manuscript.

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## SUPPLEMENTARY MATERIAL

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# Prevention of Mental Health Difficulties for Children Aged 0–3 Years: A Review

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The period of infancy and early childhood is a critical time for interventions to prevent future mental health problems. The first signs of mental health difficulties can be manifest in infancy, emphasizing the importance of understanding and identifying both protective and risk factors in pregnancy and the early postnatal period. Parents are at a higher risk of developing mental health problems during the perinatal period. An understanding of the evidence around prevention and intervention for parental anxiety and depression is vital to the process of prevention of early mental health disorders in infants and young children. Here we review the existing prevention and treatment interventions in the early years focusing on the period from conception to 3 years – the majority targeting parents in order to improve their mental health, and that of their infants. Elements of successful programs for parents include psychoeducation and practical skills training, as well as work on the co-parenting relationship, developing secure attachment, and enhancing parental reflective functioning. While both targeted and universal programs have produced strong effect sizes, universal programs have the added benefit of reaching people who may otherwise not have sought treatment. In synthesizing this information, our goal is to inform the development of integrated models for prevention and novel early intervention programs as early in life as possible.

**Keywords:** early intervention, parent mental health, early childhood mental health, infants and toddlers, intervention and prevention, parenting programs, zero to three

## INTRODUCTION

Across the world, 10–20% of children and adolescents suffer from mental health disorders (Kessler et al., 2007). If not treated, mental health disorders of childhood have a severe, negative impact on children's development and their long-term capacity to live healthy, productive and fulfilling lives (Lyons-Ruth et al., 2017). Mental health disorders have a profound impact on all aspects of health, happiness and productivity. The personal, social and economic costs of mental health difficulties are high, including clinical and education services, sick-leave and unemployment, and the criminal justice system (Bor et al., 2004). The direct and indirect economic cost of mental illness in Australia has been estimated at \$20 billion per year, which includes the cost of lost productivity and labor force participation (Department of Health and Ageing, 2007). The burden of illness from mental health disorders accounts for approximately 12% of the total disability-adjusted

life years associated with all illnesses, the third highest after cancer and cardiovascular diseases (Australian Institute of Health and Welfare, 2016).

As mental health difficulties early in life have a significant impact on the future health trajectory of an individual, it is essential to build the foundations of good mental health during this critical period (Lewis et al., 2014; Moore et al., 2017). In this review, we consider interventions offered at the earliest opportunity spanning from the perinatal period to 3 years of age aimed at preventing mental health difficulties in childhood. We begin with a description of mental health in infancy and early childhood and go on to present the current prevalence statistics within the population. We then consider the factors that contribute to, or detract from, good mental health during infancy and early childhood, including parent-child attachment, parental reflective functioning, parental mental health, co-parenting and the couple relationship as well as childhood experiences – recognizing that these factors can be used to inform prevention and early intervention efforts (Bayer et al., 2008). Interventions that aim to improve parent mental health during this period are also considered, given that parental mental health has been found to be a risk factor for poor outcomes in infants and children, including emotional and conduct problems later in life (Bauer et al., 2016). Finally, we explore the current approaches to prevent mental health problems during infancy, and how these might be extended.

## MENTAL HEALTH PROBLEMS IN INFANCY AND EARLY CHILDHOOD

The current statistics indicate an alarming rate of mental health problems in children and adolescents. As noted above, 10–20% of children and adolescents experience mental health problems worldwide (World Health Organization, 2003). While it is widely accepted that we are in the midst of a mental health crisis for young people, what is often missed is that the precursors of mental health problems can begin as early as the perinatal period and early infancy (Robinson et al., 2008). This makes the perinatal, infant and early childhood period a crucial window for intervention, with the goal of promoting good mental health for infants and young children (Robinson et al., 2008).

Good mental health in infancy and early childhood refers to healthy social and emotional development. It includes an infant's ability to experience, regulate and express emotions, to develop close and secure interpersonal relationships, and to explore the environment and learn (Clinton et al., 2016). All of these capacities develop best within the context of a caregiving environment that includes family, community, and cultural expectations for young children (Parlakian and Seibel, 2002).

Research has established that infants and toddlers can suffer from mental health disorders that require treatment in their own right (Warner and Pottick, 2006; Zero to Three, 2012). Difficulties in infancy include regulatory disturbances such as excessive crying, sleeping or feeding difficulties and attachment difficulties (Postert et al., 2012; ZERO TO THREE, 2016). Early childhood mental health problems include externalizing problems such as

aggression and oppositional defiance (Egger and Angold, 2006; Loeber et al., 2009), and internalizing problems such as anxiety and depression (Costello et al., 2005; Rapee et al., 2009; Bayer et al., 2011).

Several epidemiological studies have determined the prevalence of mental health disorders in infants and young children, indicating a 16–18% prevalence of mental health disorders amongst children aged 1–5 years, with approximately half of these children being severely impacted (von Klitzing et al., 2015). One birth cohort study found that almost 35% of infants aged 12–18 months scored high on the Problem Scale of the Brief Infant Toddler Social Emotional Assessment (BITSEA) (Horwitz et al., 2013), while another study found that by 18 months of age, 16–18% of children met criteria for one or more diagnoses of a mental health or developmental disorder (Skovgaard et al., 2007). Similar results were reported by an Australian study, which found that by 2 years of age, 12% of children had clinically significant emotional, behavioral, or social problems in the context of parent-child relationship disturbance (Bayer et al., 2011). In addition to this, a Western Australian study found that by age five, 20% of the children studied had clinically significant behavioral problems (Robinson et al., 2008). As noted by Lyons-Ruth et al. (2017), most recent epidemiological studies have been conducted in developed, economically stable, peaceful countries. However, evidence suggests that rates of mental health difficulties may be much higher in countries where extreme poverty, war, family displacement and trauma exist (Tomlinson et al., 2014).

Mental health problems in infants and toddlers are strongly predictive of poor mental, physical, cognitive, and social outcomes during childhood, adolescence and adulthood. Regulatory problems in infancy are associated with later motor, language and cognitive delays, behavioral problems and ongoing parent-child relationship difficulties (DeGangi et al., 2000; Hemmi et al., 2011; Cook et al., 2019). In one longitudinal study, when children were followed up to their early schooling, two-thirds of the infants and toddlers (aged 12 to 40 months) who had earlier emotional and behavioral difficulties continued to have ongoing difficulties with persistent psychopathology (Briggs-Gowan et al., 2006). Another study found difficult temperament, non-compliance and aggression in infancy and toddlerhood (age one to three years) was associated with internalizing and externalizing psychiatric disorders at five years of age (Keenan et al., 1998).

If not treated, mental health difficulties that begin early in life can become more serious over time (Lavigne et al., 1998; Shaw et al., 2003; Briggs-Gowan et al., 2006; Suveg et al., 2007; Slemming et al., 2010; Clinton et al., 2016), and can persist into adolescence and adulthood (Bor et al., 2004; National Scientific Council on the Developing Child, 2008; Bayer et al., 2011). Children with mental health problems are at higher risk for difficulties at school, difficulties with peers, difficulty participating in employment, drug and alcohol problems, relationship breakdown, family violence, criminal activity, juvenile delinquency and suicide (Bayer et al., 2008; National Scientific Council on the Developing Child, 2008). Consequently it is vital to provide interventions that aim to prevent mental health difficulties from developing at this early age.

## RISK FACTORS FOR INFANT AND EARLY CHILDHOOD MENTAL HEALTH PROBLEMS

There is international consensus that the first 1,000 days of life – the period of development from conception to age two – represent a crucial period of rapid physical, psychological and neurological growth (Moore et al., 2017). During this time there is an increased likelihood that detrimental experiences such as early trauma or deprivation will be especially harmful and greatly impact future development, with adverse effects potentially going on to develop into lifelong consequences (Shonkoff et al., 2012; Lyons-Ruth et al., 2017; Moore et al., 2017).

Researchers have identified several risk factors for poor mental health in infants, taking into account the interaction between the individual child's genetics, temperament and environment (McLuckie et al., 2019). Risks in the child include the presence of physical health difficulties, a difficult temperament, and insecure and disorganised attachment patterns (Bosquet and Egeland, 2006; Van Zeijl et al., 2006; Miner and Clarke-Stewart, 2008; Edwards et al., 2010; Wlodarczyk et al., 2017). Family based risk factors include parenting interactions that are insensitive, lack warmth, or are controlling, as well as parental interactions that are over involved or over protective. Other factors include overly harsh discipline, parental mental health difficulties or stress, parental substance abuse, family violence, limited parental education, and parental conflict or separation/divorce (Dwyer et al., 2003; McCarty et al., 2005; Bayer et al., 2006, 2011; Pike et al., 2006; Van Zeijl et al., 2006; Ashford et al., 2008; Miner and Clarke-Stewart, 2008; Edwards et al., 2010; Wlodarczyk et al., 2017).

The experience of trauma during infancy, including maltreatment, exposure to domestic violence, and disruption of attachment relationships are significant developmental risk factors that lead to vulnerabilities to later mental health difficulties (Newman et al., 2016). The Adverse Childhood Experiences (ACE) study found that trauma that occurs early in development is associated with an increased risk of mental health problems and chronic diseases later in life including depression, suicide attempts, substance use, teen pregnancy, heart disease, cancer, lung disease and liver disease (Felitti et al., 1998; Campbell et al., 2014). Furthermore, this level of risk increases exponentially with increased adverse childhood experiences. Researchers have found that individuals with four or more adverse childhood experiences are at significantly higher risk of developing a mental health problem than individuals with none (Felitti et al., 1998). Epigenetic studies have found that early childhood maltreatment is linked to higher methylation of key genes related to the stress response. These methylation changes place children at risk of cancers, cardiovascular disease, autoimmune disorders, and psychiatric disorders (Perry, 2004; Cicchetti et al., 2016). Environmental stressors such as war, natural disasters and family dislocation also place infants and young children at risk of mental health difficulties, especially if the primary caregiver is rendered less emotionally available by the same stressor (Lyons-Ruth et al., 2017).

## PARENT DEPRESSION AND ANXIETY DURING THE PERINATAL AND INFANCY PERIODS

The perinatal period is a vulnerable time for parent stress and mental health difficulties (Jones et al., 2014). Perinatal depression affects approximately 11.9% of pregnant women worldwide (Woody et al., 2017). This value is from a study of pooled prevalence analyzing 96 prevalence studies from across the globe (Woody et al., 2017). Postnatal depression is associated with a disruption in the parent-infant attachment relationship which can place the infant at increased risk of mental health difficulties (Lyons-Ruth et al., 2017), it is also related to poor outcomes in cognitive and emotional development of children, and increased risk of psychopathology (Kingston et al., 2012). Anxiety related disorders are also prevalent during the perinatal period, with approximately 15% of women experiencing anxiety (Fairbrother et al., 2016). Perinatal anxiety is also related to poor outcomes in children, with increased incidence of internalizing disorders, somatic problems and behavioral inhibition found in children whose mothers experienced anxiety related disorders in the perinatal period (Bauer et al., 2016). Another meta-analysis focused on comorbid depression and anxiety during the perinatal period (Falah-Hassani et al., 2017). This is noteworthy as comorbid disorders tend to present a higher risk than single disorders. The prevalence of comorbid depression and anxiety symptoms during the perinatal period was 8.1%, and the prevalence of a diagnosed comorbid disorder was 7.9% (Falah-Hassani et al., 2017). These results indicate that comorbid depression and anxiety impact one in ten women during pregnancy and one in twelve women during the postnatal period (Falah-Hassani et al., 2017).

Perinatal depression in fathers has been less researched but is being increasingly recognized as important for ongoing child wellbeing (Philpott and Corcoran, 2018). A meta-analysis found that rates varied across studies, but the average prevalence of depression in fathers across the perinatal period was 8.4%, with similar rates in the prenatal and postnatal periods (Cameron et al., 2016). This is higher than the rate of depression in the general population (Philpott and Corcoran, 2018). It is important to note that the prevalence of perinatal depression in fathers was not much lower than the average prevalence for mothers (Woody et al., 2017). There is also a positive correlation between maternal and paternal depression (Cameron et al., 2016; Philpott and Corcoran, 2018).

There are a number of risk and protective factors that have been identified for perinatal depression and anxiety in parents. Risk factors include a history of depression and anxiety, lack of support and difficulty bonding with the new baby (PANDA, 2017). Mothers who have difficulty soothing their baby and getting them to sleep have a higher risk of mental health problems. Parents whose partners are depressed are also at higher risk of developing perinatal depression (Cameron et al., 2016). Parental anxiety and depression pose significant risks to the developing infant's mental health (Bauer et al., 2016). Poor parental mental health during the transition to parenthood can



have long lasting consequences for the infant, impacting their developmental trajectory and future mental health and wellbeing (Bauer et al., 2016). Consequently, programs aimed at enhancing mental health in infancy and early childhood should focus on parent mental health, as parent wellbeing during this time plays an important role in ensuring the positive mental health of their children.

Cognitive-behavioral therapy and interpersonal psychotherapy have been identified in a review as effective treatment approaches for pregnant women with major depressive disorder, suggesting that interventions should be based on these approaches (Van Ravesteyn et al., 2017).

A review of prevention programs for postnatal depression found that those using interpersonal therapy were the most consistent in delivering effective results (Werner et al., 2016). Mixed results were seen for cognitive behavioral programs, although individual interventions appeared more effective than group-based interventions (Werner et al., 2016).

Cognitive Behavioral interventions in the perinatal period have been found to be an effective intervention treatment for depression (Gloaguen et al., 1998; Barkham et al., 1999; Sockol, 2015; Ziemeng et al., 2020; Holt et al., 2021). These interventions have typically targeted evaluating potentially problematic styles such as catastrophic thinking and including behavioral strategies such as relaxation to assist in coping with stressful situations.

## ATTACHMENT AND MENTALIZATION

Attachment theory asserts that the relationship between the infant and their primary carers has an important influence on the development of the capacity for emotional and behavioral regulation (Bowlby, 1969; Ainsworth et al., 1978). A large body of evidence has identified that an infant's developing brain is shaped by the quality of the caregiving environment provided by their primary caregivers (Kerns and Brumariu, 2014; Lally and Mangione, 2017). Secure primary attachment relationships, although not a guarantee against future mental health difficulties, are influential protective factors for infant and young children's mental health. A secure attachment relationship allows the infant's developing brain to develop capacities in building and maintaining relationships, emotional regulation, attention and self-control and sets a strong foundation for the later development of resilience, confidence and adaptability (Benoit, 2004; Balbernie, 2013). Researchers have consistently found that securely attached children experience stronger relationships with their parents as well as enhanced problem solving abilities, improved peer relationships and longer lasting friendships (Schneider et al., 2001; Abraham and Kerns, 2013; Guild et al., 2017). These children may also have better sibling relationships, more positive self-esteem, an increased sense of hopefulness, greater trust in people and relationships, and heightened optimism about their future compared to children with insecure attachment styles. In contrast, insecure and disorganised attachment styles in infancy have been associated with elevated rates of emotional, social and behavioral disturbances in infancy, toddlerhood, preschool and beyond (Van

Ijzendoorn et al., 1999; Granot and Mayseless, 2001; Sroufe, 2005; Berlin, 2008; Fearon et al., 2010; Madigan et al., 2013). A 30-year prospective study of infants with insecure attachment styles at 8 months of age, found insecure attachment to be associated with a higher risk of mental health concerns at 30 years of age (Fan et al., 2014). Disorganised attachment in infancy is associated with the highest risk of later social and cognitive difficulties and psychopathology with an association found between disorganised infant attachment and childhood behavior problems (Van Ijzendoorn et al., 1999), externalizing and internalizing problems in early school years, aggression and oppositional defiant disorder (Green and Goldwyn, 2002; Fearon et al., 2010), and personality disorder (Steele and Siever, 2010). Studies have found disorganised attachment is significantly correlated with psychopathology in adolescence (Carlson et al., 1998), borderline personality disorder symptoms in adulthood (Carlson et al., 2009), dissociation (Lyons-Ruth, 2003); and post-traumatic stress disorder (PTSD) (Macdonald et al., 2008).

Ideally, parents and caregivers are able to tune into their baby's cues, interpret their meaning, and respond to them in a contingent, consistent and competent way, which has been termed sensitive parenting (Petch et al., 2012; Ensink et al., 2016). Parents who provide care in this way allow their infant to develop optimal early social-emotional skills, secure infant-parent relationships and cognitive ability (The National Health and Medical Research Council, 2017). One way to understand the connection between sensitive parenting, attachment and later functioning is through the concept of mentalization. Fonagy and colleagues drew on the fields of psychoanalytic theory, attachment theory, theory of mind and developmental psychology to develop the concepts of mentalization theory (Fonagy et al., 1991, 2002; Fonagy and Target, 1997). They defined mentalizing capacity as the ability to understand that that one's own behavior and the behavior of others is driven by internal states, such as intentions, thoughts, desires, feelings, beliefs, goals and motivations. They proposed that mentalizing capacity develops within the context of a secure attachment relationship (Fonagy et al., 2002), and is key to understanding the association between insecure attachment and psychopathology. Parental mentalizing has been operationalized as parental Reflective Functioning (PRF), and refers to the quality of mentalizing in the context of attachment relationships, and the parent's capacity to think about mental states in relation to their own and their child's behavior. Parental RF is considered to play an important role in parenting, and therefore the development of children's attachment security (Stacks et al., 2014; Ensink et al., 2016; Camoirano, 2017; Barlow et al., 2021). Parents with higher PRF display more sensitivity in their interactions with their infants, and are more likely to have securely attached infants (Grienberger et al., 2005; Slade et al., 2005a; Rosenblum et al., 2008). Parents with low PRF are more likely to display insensitive parenting and to have to have children with insecure or disorganized attachment styles (Grienberger et al., 2005; Slade et al., 2005a; Suchman et al., 2010; Stacks et al., 2014; Ensink et al., 2015, 2019).

Only a few studies have been conducted to investigate the connection between parental RF and early childhood

psychopathology. These studies have investigated the role of parental RF on the development of child emotional regulation and anxiety symptoms (Camoirano, 2017). Esbjørn et al. (2013) found that low maternal RF predicted higher levels of anxiety amongst clinically anxious school aged children. Heron-Delaney et al. (2016) found that preterm infants with mothers with high RF demonstrated the most negative effects and better self-soothing behavior during the still face procedure compared to infants with mothers with low RF. They surmised that high maternal RF promotes emotional regulation in the infant when distressed, and higher trust in maternal responsiveness. Smaling et al. (2016) found that high risk young pregnant women with higher RF reported significantly lower aggressive behaviors in their children when they were 6, 2, and 20 months old. Ensink et al. (2016) found that maternal RF was found to correlate with child reflective functioning, and negatively with child externalizing behaviors. These findings suggest that maternal mentalizing capacity plays an important role in promoting infant and child emotional regulation, especially in the context of difficult early childhood experiences (Camoirano, 2017). Consequently, enhancing parental mentalizing capacity and parent child attachment security will promote positive mental health in infants and young children, and may work toward preventing mental health difficulties.

To date, most research in this field has focused mainly on the role of mothers. Evidence suggests that mothers and fathers play different and unique roles as attachment figures and in socialization and emotion regulation (Benbassat and Priel, 2015; Buttitta et al., 2019). Research is expanding to consider the impact of paternal reflective functioning on child development (Sarkadi et al., 2008; Benbassat and Priel, 2015; Cooke et al., 2017).

## CO-PARENTING AND THE COUPLE RELATIONSHIP

In addition to the development of mental health difficulties, many couples also experience a sharp decline in their couple relationship during the transition to parenthood (Lawrence et al., 2008; Doss et al., 2009). In fact, a decline in relationship satisfaction can act as a risk factor for the development of mental health difficulties (Lancaster et al., 2010; Whisman et al., 2011; Giallo et al., 2013; Bayrampour et al., 2015). Meanwhile the inverse may also be true, wherein mental health difficulties may act as a contributing factor for relationship decline (Whisman et al., 2011; Trillingsgaard et al., 2014). Furthermore, researchers have shown that a strong couple relationship can act as a protective factor against the development of perinatal depression and anxiety in both parents (Banker and LaCoursiere, 2014; Pilkington et al., 2015). The couple relationship also has strong links to child outcomes (Cowan and Cowan, 2002; Harold and Leve, 2012). For example, relationship discord in parents has been associated with, poor child adjustment (Hanington et al., 2012), anxiety and depression (Yap et al., 2014), aggression (Cowan and Cowan, 2002), poor academic attainment (Harold et al., 2007) and behavioral issues (Linville et al., 2010). Having a positive couple relationship has also been linked to

more responsive parenting (Ponnet et al., 2013). These findings reinforce the importance of the couple relationship during the transition to parenthood.

However, another body of research has gone on to highlight the importance of an additional related, but distinct aspect of the parental relationship, known as coparenting (Feinberg, 2002). Coparenting is defined as the degree to which parents are able to work together harmoniously for the wellbeing of their children (Le et al., 2016). As with relationship satisfaction, coparenting has been linked to a variety of child outcomes (Le et al., 2016), including psychological adjustment (Teubert and Pinquart, 2010), attention and educational achievement (Dopkins Stright and Neitzel, 2003) along with the development of receptive language and social relationships (Cheng et al., 2009). Coparenting has also been related to parenting practices including sensitivity and warmth within parent-child interactions (Cabrera et al., 2009). In fact, some research suggests that coparenting may act as a mediating factor in the link between relationship satisfaction and positive parenting practices (Bonds and Gondoli, 2007; Pedro et al., 2012). In line with this, a large body of research has found a link between relationship satisfaction and positive coparenting (Christopher et al., 2015; Le et al., 2016; Durtschi et al., 2017). Furthermore, in addition to links between coparenting, relationship satisfaction and child outcomes, Feinberg and colleagues have also shown that targeting the coparenting relationship can have a positive impact on parental mental health (Feinberg and Kan, 2008; Feinberg et al., 2016). This research overall demonstrates the importance of coparenting and the couple relationship for both parent and child wellbeing during the transition to parenthood.

## NEED FOR PREVENTION AND EARLY INTERVENTION

This body of literature highlights the importance of childhood experiences across the lifespan, starting in the perinatal period, emphasizing the importance of addressing risk factors early in life (Felitti et al., 1998; Jones et al., 2018b). The cost of mental health disorders on individuals and society demands a response that focuses on early investment, health promotion and early intervention in an effort to positively impact future health (Jenkins et al., 2002). The World Health Organization has asserted that prevention is the only sustainable approach for reducing the burden of illness associated with mental disorders (World Health Organization, 2004). It is well established that early detection, assessment and intervention of mental health problems in infancy and early childhood is more successful and cost effective than treatment when symptoms become more severe (Davis et al., 2010; Huberty, 2012; The National Health and Medical Research Council, 2017).

This shift in focus toward the prevention of mental illness means that we must consider the mental health and wellbeing of infants and young children, as well as their parents (Guy et al., 2016). While the period of infancy and early childhood is a time when mental health difficulties can develop, it is

also an enormously influential developmental stage with the potential to modify or prevent the development of dysfunctional pathways (Karevold et al., 2009; Lewis et al., 2014; Moore et al., 2017). Because many disorders can be prevented through developmentally appropriate, high quality programs and services, it is becoming increasingly acknowledged that it is not enough to merely treat mental health disorders as they emerge (Andrews and Wilkinson, 2002; Waddell et al., 2007). Instead, research suggests that efforts should focus on the prevention of mental health difficulties before they arise, particularly during the earliest stages of life when there is the greatest capacity to effect change (Maldonado-Duran et al., 2000; Bayer et al., 2010b; The National Health and Medical Research Council, 2017).

Focused interventions early in life are one effective method to address these risk factors and reduce and prevent poor outcomes in infants and young children before they emerge, allowing for better outcomes later in life. An increased emphasis on the importance of the perinatal and infancy period has contributed to the development of programs that aim to either prevent the emergence of mental health disorders or intervene early if they do develop (Van Ravesteyn et al., 2017). Prevention refers to any approach that is applied in an effort to prevent later difficulties and to enhance the cognitive, behavioral, emotional, social and physical development of young children during the period from pregnancy to 6 years of age (Zero to Three, 2012; Dunst et al., 2014). Prevention programs are often offered on a community wide basis, especially in high-risk communities; they serve to intervene early and support parents and caregivers to provide sensitive, warm and secure relationships and detect emotional problems before they become more resistant to change (Mihelic et al., 2017).

Early intervention refers to interventions offered once an infant/child or their parents are identified as significantly at risk or the child is already showing some type of difficulty that is seen as placing their development at risk (Dunst et al., 2014). Over the past decade, several perinatal and infancy prevention/early intervention programs have been developed and evaluated, with some designed for universal implementation and others designed to be implemented in communities who are at increased risk of poor social and emotional development. These programs aim to improve mental health in both parents and children, and are a window of opportunity through which to enhance the social and emotional development of infants and young children (Watson et al., 2005). In this article, we look at the existing programs that have been developed as interventions during the early years of life. This is important to identify which programs and approaches are most effective, and to build on the research that has been conducted over the past years.

## METHOD

This review aimed to look at (1) the existing programs targeting mental health in children aged 0–3 and their parents (2) the components and efficacy of these programs.

A search was conducted across multiple online databases, including PsychInfo, Informit, Scopus, ProQuest, Wiley Online

Library, Science Direct, PubMed and Google Scholar. Reference tracking of relevant articles was also used, and websites of specific programs were searched for reference lists. The search terms used in the databases included: perinatal mental health, infant mental health, early life programs, parenting interventions, prevention, anxiety, depression, coparenting, reflective functioning, mentalization, attachment. An initial search using these terms generated 10,809 peer reviewed articles. These were further narrowed down according to inclusion and exclusion criteria, through specification of search terms and visual inspections of titles and abstracts.

Articles were included if they were: written in English, detailed an intervention or program for children aged 0–3 years, and were focused on the mental health of parents or children. Articles were excluded if they were: not in English, did not contain an intervention or program, involved programs directed at older children, or involved programs solely focused on medical or physical aspects of infant health, e.g., premature birth. The search was concluded on the 20th March, 2020, resulting in 60 articles reporting 27 interventions that were relevant to the current review. Of the 60 articles, 9 were descriptive only, leaving 51 articles that reported original data and results of programs.

In this review, we have included effect sizes for programs where they were reported or where there was enough information reported to calculate them manually (Lakens, 2013). Instead of providing descriptions of effect sizes throughout the review, they are detailed below (see **Table 1**). Details of the included articles are outlined briefly (see **Table 2**) and then described more extensively.

## RESULTS

Due to the young age of the children concerned in this review, the majority of the programs (24) found in our search were designed to be presented to parents, addressing parental factors that would impact their infants and toddlers. Only a few (3) of the programs were designed to be presented specifically to children (*Relationships for Growth and Learning*, *Early Head Start*, and *Responsive Early Childhood Curriculum*).

The highest proportion of existing programs were targeted interventions for at-risk mothers (*PREPP*, *ROSE Program*, *PEEP*, *Reflective Parenting Program*, *Lighthouse Parenting Program*, *Minding the Baby*, *Mindful Motherhood*, *AMPLE*, *CAPEDP*, *Mom Power*, *Playing and Learning Strategies*, *HUGS* and an unnamed antenatal group program). Across programs, a number of different maternal risk factors were used as inclusion criteria

**TABLE 1 |** Effect sizes.

Effect size	Small	Medium	Large
<i>d</i>	0.20	0.50	0.80
<i>r</i>	0.10	0.30	0.50
$\eta_p^2$ (partial eta squared)	0.01	0.06	0.14
<i>g</i>	0.20	0.50	0.80
ES (effect size for one group design)	0.20	0.50	0.80

**TABLE 2 |** Articles in review.

Program and author	Participants	Control group	Significant effects and size (S = small, M = medium, L = large, ? = not provided)
<b>Interventions that target maternal mental health</b>			
Mindful Motherhood			
Vieten and Astin, 2008	31 mothers, targeted	Waitlist control	Anxiety (L), negative affect (L)
ROSE Program			
Zlotnick et al., 2001	37 mothers, targeted	Treatment as usual	Depressive symptoms (?), risk of developing PND (?)
Zlotnick et al., 2006	99 mothers, targeted	Standard antenatal care	Risk of developing PND (?)
Johnson et al., 2018	N/A	N/A	N/A
<b>Interventions that target maternal mental health and parenting skills</b>			
Toward Parenthood			
Milgrom et al., 2011	143 mothers, universal	Routine care	Depression (M), anxiety (M), stress (M), parenting dysfunction (M)
PREPP			
Werner et al., 2016	54 mothers, targeted	Enhanced treatment as usual	Depressive symptoms (L), anxiety symptoms (M)
Mothers and Babies			
Munoz et al., 2007	41 mothers, targeted	Usual medical care	No significant effects
Tandon et al., 2011	61 mothers, targeted	Standard visits plus information	Depressive symptoms (S)
Le et al., 2011	217 mothers, targeted	Usual care	No significant effects
Mendelson et al., 2013	78 mothers, targeted	Standard visits plus information	Mood regulation (?)
Tandon et al., 2014	78 mothers, targeted	Home visiting as usual	Depressive symptoms (L)
Leis et al., 2015	15 mothers, targeted	No control group	Depressive symptoms (L), mood regulation (L)
McFarlane et al., 2017	95 mothers, targeted	Home visiting as usual	Depressive symptoms (S, stress (S)
Tandon et al., 2018	120 mothers, universal	Home visiting as usual	Depression (M), anxiety (S)
CAPEDP			
Saias et al., 2013	N/A	N/A	N/A
Dugravie et al., 2013	440 mothers, targeted	Usual care	Depression for low-risk mothers (?)
Antenatal group program			
Thomas et al., 2014	48 mothers, targeted	No control group	Depression (L), anxiety (L), maternal attachment (M)
<b>Interventions that target fathers</b>			
Boot Camp for New Dads			
Capuozzo et al., 2010	N/A	N/A	N/A
Miller, 2012	2301 fathers, universal	No control group	Parenting confidence (?)
<b>Interventions that target the couple relationship</b>			
Couple CARE for Parents			
Halford et al., 2010	71 couples, universal	Maternal parenting program	Couple conflict (L), invalidation (L), negative affect (L), women's relationship adjustment (M), self-regulation (L)
Petch et al., 2012	250 couples, targeted	Maternal parenting program	Conflict for women (M), invalidation for women (L)
Heyman et al., 2019	368 couples, targeted	Waitlist control	No significant effects
<b>Interventions that target the mother-infant relationship</b>			
AMPLE			
Nicolson et al., 2013	97 mothers, targeted	Usual care	Maternal non-intrusiveness (L), maternal non-hostility (M)

(Continued)



TABLE 2 | Continued

Program and author	Participants	Control group	Significant effects and size (S = small, M = medium, L = large, ? = not provided)
<b>Mom Power</b>			
Muzik et al., 2015	99 mothers, targeted	No control group	Depressive symptoms (?), PTSD symptoms (?), caregiving helplessness (?), parenting reflectivity (?)
Muzik et al., 2016	49 mothers, targeted	No control group	Depressive symptoms (?), PTSD symptoms (?)
Rosenblum et al., 2017	122 mothers, targeted	Mailout information	PTSD symptoms (S), parenting stress (S), depressive symptoms [iatrogenic] (S), depressive symptoms in women with IPV history (M), PTSD symptoms in women with IPV history (M)
Rosenblum et al., 2018	75 mothers, targeted	Mailout information	Reflective parenting (S)
<b>Playing and Learning Strategies</b>			
Landry et al., 2006	242 mothers, targeted	Developmental assessment sessions	Contingent responsiveness (L), support of infant foci of attention (M), verbal scaffolding (L), object labeling (L), smiling and laughing [iatrogenic] (M)
Landry et al., 2008	166 mothers, targeted	Developmental assessment sessions	Verbal encouragement (S), child cooperation (S), social engagement (S), contingent responsiveness (M), negative behavior (S)
<b>Attachment skills program</b>			
Akbarzadeh et al., 2016	190 mothers, universal	Routine care	Anxiety (?), infant crying (?)
<b>HUGS</b>			
Milgrom et al., 2006	22 mothers, targeted	No control group	Parenting stress (?)
Milgrom and Holt, 2014	100 mothers, targeted	Attention placebo	N/A
Holt et al., 2021	77 mothers, targeted	Attention placebo	Affection involvement and verbalisation (L), bonding (M)
<b>Parental Reflective Functioning based interventions</b>			
<b>Families First</b>			
Kalland et al., 2016	N/A	N/A	N/A
<b>PEEP Reflective Parenting Program</b>			
Maskell-Graham, 2014	10 mothers, targeted	No control group	Reflective functioning (?), mother-baby interaction (?)
<b>Lighthouse Parenting Program</b>			
Byrne et al., 2018	16 parents, targeted	No control group	Parental self-efficacy (L)
<b>Circle of Security</b>			
Hoffman et al., 2006	65 mother-infant dyads, universal	No control group	Attachment style (?)
Cassidy et al., 2010	20 mother-infant dyads, targeted	No control group	Depressive symptoms (L)
Cassidy et al., 2011	220 mother-infant dyads, targeted	Psychoeducation sessions	Attachment style among highly irritable infants (?)
Kohlhoff et al., 2016	15 mother-infant dyads, universal	No control group	Reflective functioning (M), caregiving helplessness (L), maternal rejection and anger (M), maternal stress (M)
Yaholkoski et al., 2016	10 studies, universal and targeted	Meta-analysis, various control groups	Child attachment security (M), caregiving quality (M)
Rose et al., 2018	9 parents, universal	No control group	Self-efficacy (M)
Mothander et al., 2018	52 parent-infant dyads, targeted	Treatment as usual	Caregiver perceptions (?), emotionally available interactions (?)
<b>Minding the Baby</b>			
Slade et al., 2005b	N/A	N/A	N/A
Sadler et al., 2013	105 mothers, targeted	Routine care	Infant attachment (?)
Slade et al., 2020	164 mothers, targeted	Treatment as usual	Maternal reflective functioning (?), infant attachment (?)

(Continued)

TABLE 2 | Continued

Program and author	Participants	Control group	Significant effects and size (S = small, M = medium, L = large, ? = not provided)
<b>Interventions targeting child wellbeing</b>			
Families in Mind			
Bayer et al., 2010a	733 families, universal	Usual primary care	Maternal unreasonable expectations (?)
Hiscock et al., 2012	N/A	N/A	N/A
Tuning in to Toddlers			
Lauw et al., 2014	34 mother-toddler dyads, universal	No control group	Emotion coaching beliefs (M), emotion coaching behaviors (L), observed emotion coaching (L), emotion labels (L), emotion exploration (L), emotion-dismissing beliefs (L), emotion-dismissing behaviors (L), observed emotion dismissing (M), toddler behavior problems (S)
Havighurst et al., 2019	N/A	N/A	N/A
Relationships for Growth and Learning			
Bekar et al., 2017	47 children, targeted	No control group	Social competence (?), behavioral problems (?)
Early Head Start			
Administration for Children, Youth and Families, 2001	3000 families, targeted	Access to other services	Cognitive and language development (?), problem behaviors (?), parent support (?), family support (?), parenting stress (?)
Raikes and Love, 2002	N/A	N/A	N/A
Love et al., 2005	3001 families, targeted	Access to other services	Cognitive and language functioning (S), aggressive behaviors (S), emotional engagement (S), sustained attention (S), parent-child interactions (S)
Responsive Early Childhood Curriculum			
Landry et al., 2014	542 children, targeted	Business as usual	Expressive emotion understanding (M), receptive emotion understanding (S), situational emotions task (M), social competence (M), anger and aggression (M)
<b>Interventions targeting parent mental health, the couple relationship and child wellbeing</b>			
Family Foundations			
Feinberg and Kan, 2008	169 couples, universal	No-treatment control	Coparental support (M), parenting-based closeness (M), maternal depression (M), maternal anxiety (M), parent-child dysfunctional interaction (L), infant duration of orienting (S)
Feinberg et al., 2014	169 couples, universal	Sent information in post	Child internalizing problems (M), internalizing problems for boys (L)
Jones et al., 2018a	399 couples, universal	Sent information in post	Triadic relationship quality (M), negative coparenting (M), negative parenting (M), child internalizing problems (S), child night wakings (S)
Baby Triple P			
Tsivos et al., 2015	27 mothers, targeted	Treatment as usual	No significant effects
Popp et al., 2019	49 couples, universal	Care as usual	Infants awake and content (L), inconsolable crying (L)
What Were We Thinking			
Fisher et al., 2010	399 couples, universal	Usual primary health care	Risk of depression, anxiety or adjustment disorder for mothers with a psychiatric history (?)
Fisher et al., 2016	400 couples, universal	Usual care	Self-rated health (?)

for participation in the interventions, which included: symptoms of anxiety and depression, low income or socioeconomic status, risk of intimate partner violence, a history of trauma, being in a psychologically vulnerable situation, being an adolescent or young mother, being in jail and having relationship problems.

The existing interventions also included universal programs (*Family Foundations*, *Towards Parenthood*, *What Were We Thinking*, *Families First*, *Boot Camp for New Dads*, *Families in Mind*, *Tuning into Toddlers* and an unnamed attachment skills program) and programs that could be delivered as either targeted or universal (*Baby Triple P*, *Couple CARE for Parents*, *Mothers and Babies* and *Circle of Security*). Some of the programs were specifically designed for use with couples (*Family Foundations*, *What Were We Thinking* and *Couple CARE for Parents*) while only one of the programs was developed especially for fathers (*Boot Camp for New Dads*). Many of the programs enabled partners to be involved, but did not have this as a main focus of the intervention. We present an overview of each of the programs below.

## EXISTING EARLY LIFE INTERVENTIONS FOR PARENTS

### Interventions That Target Maternal Mental Health

The *Mindful Motherhood* intervention uses aspects of mindfulness based cognitive therapy and acceptance and commitment therapy, with the goal of reducing the risk of adverse maternal mental health outcomes during the perinatal period (Vieten and Astin, 2008). The program is targeted for women who have had low mood during pregnancy. The content is presented in group settings; a clinical psychologist and yoga instructor jointly facilitate these 2 h sessions once weekly for 8 weeks. The sessions include discussions, provision of information and activities, such as body scan exercises and mindful movement. The mothers are also given guided meditations that they can do every day at home (Vieten and Astin, 2008).

The intervention women showed significant decreases in anxiety ( $d = 0.89$ ) and negative affect ( $d = 0.83$ ) compared to control group women. Improvements were also observed in depression, positive affect, mindfulness, affect regulation and stress; however, these changes were not significant (Vieten and Astin, 2008).

The *ROSE Program* (Zlotnick et al., 2001) is targeted for women who are on public assistance and at risk of postnatal depression. It uses interpersonal therapy to support the transition to motherhood and build support networks. The program includes content on managing the role transition to becoming a mother, goal setting, interpersonal conflict resolution and developing social supports. The content is presented through four 1-h long group sessions, run weekly.

A pilot study of the program found that intervention group women displayed a significantly greater improvement in depression symptoms as well as being at lower risk of developing postnatal depression (Zlotnick et al., 2001). A larger study found

that women who participated in the program were significantly less likely to develop postnatal depression compared to those who did not (Zlotnick et al., 2006). Effect sizes were not provided in these papers. An additional study is currently underway (Johnson et al., 2018).

### Interventions That Target Maternal Mental Health and Parenting Skills

*Towards Parenthood* is a program for new mothers that targets risk and protective factors for postnatal depression, anxiety and parenting difficulties (Milgrom et al., 2011). There are two parts to the program: a nine unit self-help workbook with telephone support and a community networking component. Eight of the units are antenatal and one is postnatal. The units include: cognitive behavioral strategies, problem solving, reflecting on own life events, building self-esteem, parenting skills and infant bonding. The program addresses partner communication and finding a wider support network. Partners were also able to be involved in the units.

The efficacy of the program has been tested, indicating that the intervention was associated with lower levels of depression ( $d = 0.6$ ), anxiety ( $d = 0.58$ ) and stress ( $d = 0.59$ ) symptoms for mothers. Parenting dysfunction was also lower in the intervention group ( $d = 0.46$ ). Partners in the intervention group also scored lower in depression and anxiety, however, the significance could not be determined due to low numbers of partners who completed the measures.

*Practical Resources for Effective Postpartum Parenting (PREPP)* is a targeted intervention for women at risk of postnatal depression; it is also focused on optimizing infant behavioral outcomes (Werner et al., 2016). The intervention uses traditional psychotherapy, psychoeducation and mindfulness techniques. It also builds caregiving skills, teaching mothers how to soothe their babies and increase infant sleep using five specific behavioral techniques. The intervention focuses on the mother-infant dyad. Mothers receive three individual sessions with a psychologist, two before birth and one after.

A study found that the intervention resulted in significant reductions in symptoms of depression ( $d = 0.815$ ) and anxiety ( $d = 0.664$ ), as well as fewer fussing and crying behaviors for babies at 6-weeks postpartum. However, these effects were not sustained at 10 and 16 weeks.

*Mothers and Babies* is a home visit program targeted for pregnant women who meet low income or other at-risk criteria (Tandon et al., 2018). There are 12 sessions in the program that can be delivered as part of an existing home visit schedule. *Mothers and Babies* is based on cognitive behavioral therapy and attachment theory. The main cognitive behavioral topics in the program are pleasant activities, thoughts and contact with others. The content is presented through interactive activities. The program has been widely used and tested in a number of studies, displaying efficacy in improving mental health.

The initial study of the program found a small ( $h = 0.28$ ) but insignificant difference in depressive symptoms favoring the intervention group (Munoz et al., 2007). Other studies have found improvements in depressive symptoms at 3-months

(partial eta squared = 0.01) and 6-months ( $d = 0.73$ ) follow-up (Tandon et al., 2011, 2014). Another study found significant improvements in mood regulation as a result of the program (Mendelson et al., 2013).

A study targeting low income mothers found a post intervention decrease in depressive symptoms ( $d = 0.38$ ) and stress ( $d = 0.35$ ) that was greater than that of the control group; however, this was not maintained at 6-months follow up (McFarlane et al., 2017). The most recent study testing an adapted version of the program (Tandon et al., 2018) found significant effects on depression ( $d = 0.444$ ) and anxiety ( $d = 0.175$ ) at 6-months follow-up for intervention group mothers. Effect sizes were not included but were calculated from the information provided.

The program has also been run in a clinic as opposed to a home visiting format (Leis et al., 2015). A pilot study using this format with an intervention only group found significant improvements in depressive symptoms ( $ES = 0.78$ ) and mood regulation ( $ES = 0.84$ ) after the intervention. Another study using the group clinic format found that levels of depression did not differ between the intervention and control groups (Le et al., 2011).

The *CAPEDP* intervention is a home visiting program that targets the mental health of infants within families living in vulnerable situations (Saías et al., 2013). Other target outcomes include reduced maternal depression and improved family environment. The program is extensive, involving 44 home visits beginning in the third trimester and ending around the child's second birthday. Trained psychologists conduct the visits, which are all manualised. The intervention uses video footage of the mother and her baby, which is discussed with the psychologist. Other features include short films on maternity topics, information on community support services, and assistance in developing parenting skills (Dugravier et al., 2013; Saías et al., 2013).

A randomized controlled trial of the program did not find an overall effect on maternal depressive symptoms, but did find effects on subgroups within the study (Dugravier et al., 2013). The intervention was able to reduce depression for women who had lower baseline levels of depression, were planning to bring up their child with the child's father and who had completed more than 9 years of education. There was not enough data reported to calculate effect sizes.

An *antenatal group program* was developed focusing on behavioral self-care strategies, psychoeducation for managing mental health, interpersonal therapy and the parent-infant relationship (Thomas et al., 2014). It is targeted for women who have current symptoms of depression or anxiety or are at-risk due to other factors. Women attend six sessions of the program, with a 2-h session each fortnight. Partners are able to attend two of these sessions. The delivery of the program is based on elements of cognitive-behavioral therapy and parent-infant interventions. Mothers and their partners are provided with information and strategies, covering topics such as bonding with infants, responsive parenting, engaging in self-care, contingency planning for emerging mental health problems, and recognizing mental health warning signs in each other (Thomas et al., 2014).

In a targeted pilot study, women who completed the program displayed significant decreases in depression ( $d = 1.1$ ) and anxiety ( $d = 0.7$ ), as well as increases in maternal attachment ( $d = 0.5$ ). Of partners who attended the sessions, 81% indicated that their understanding of mental health issues had improved (Thomas et al., 2014).

## Interventions That Target Fathers

*Boot Camp for New Dads* (Capuozzo et al., 2010) appears to be one of the only interventions targeted specifically for new fathers. Fathers learn how to prepare for their baby, support their partner and bond with their baby. The program is run in groups, with both "rookie" fathers and "veteran" fathers, as well as a group coach. "Rookie" fathers attend one session before birth and are invited back after birth to share their new experiences as "veteran" fathers.

The majority of fathers who participated in the program reported increased confidence across multiple areas (Miller, 2012), such as: caring for their baby (92%), dealing with crying (90%), bonding (78%), understanding their partner's emotions (89%), supporting their partner (89%), protecting their family from negative outside influences (84%), creating a safe environment for their baby (77%), developing their own style with the baby (82%) and forming a parenting team with their partner (89%). Qualitative research has also been conducted; however, no randomized controlled trials have been run to test the program's outcomes (Miller, 2012).

## Interventions That Target the Couple Relationship Only

*Couple CARE for Parents* (Petch et al., 2012) focuses on preparing couples for the transition to parenthood by enhancing their couple relationship and building mutual support. It aims to promote communication between parents, especially with regards to parenting. The program includes content on mental health and self-care, such as: education about how to prevent, detect and seek help for perinatal depression and anxiety, mindfulness, breaking the spiral of depression, CBT and self-monitoring. The program is delivered over six units – one group session, two home visits and three phone calls. Trained facilitators walk through the program with couples and guide them through the various topics.

The program has been able to decrease negative couple communication at post-test, specifically conflict (females,  $r = 0.84$ ; males,  $r = 0.92$ ), invalidation (females,  $r = 0.82$ ; males,  $r = 0.86$ ) and negative affect (females,  $r = 0.84$ ; males,  $r = 0.92$ ), these being large effects (Halford et al., 2010). Smaller effects were found for women's relationship adjustment ( $r = 0.32$ ) and self-regulation ( $r = 0.46$ ) at 12-months postpartum. Effects were not found for parenting stress. In another study, the program reduced conflict ( $d = 0.38$ ) and invalidation ( $d = 0.44$ ) in women (Petch et al., 2012). It also prevented deterioration in relationship satisfaction for high risk women but displayed no effects for men. The program did not appear to have an impact on intimate partner violence or relationship problems (Heyman et al., 2019).



## Interventions That Target the Mother-Infant Relationship

The *Adolescent Mothers' Program: Let's meet your baby as a person* is a targeted program for adolescents mothers (AMPLE; Nicolson et al., 2013). The intervention focuses on the mother-infant relationship and is run across two sessions, in addition to regular maternity care. The first of these is a group session where mothers watch and discuss video clips about connecting with their newborn. The second session is individual, and each mother talks through getting to know her own baby. Although the main focus is building attachment between the mother and baby, partners are also able to attend.

A study found significant effects on some aspects of emotional availability, including maternal non-intrusiveness ( $d = 1.06$ ) and maternal non-hostility ( $d = 0.66$ ) in a play only task and maternal non-intrusiveness ( $d = 0.85$ ) and maternal non-hostility ( $d = 0.66$ ) in a play plus separation-reunion task (Nicolson et al., 2013). Effects were non-significant for maternal sensitivity and structuring, or child responsiveness and involvement.

The *Mom Power* program aims to build secure attachment between mothers and their babies, using a delivery method of psychoeducation and skills training (Muzik et al., 2016). The program is particularly designed for mothers who have previously experienced or are currently experiencing trauma (Rosenblum et al., 2018). A major goal of the intervention is to encourage sensitive parenting through skills practice and reflection. Mothers are also provided with opportunities to acquire self-care skills and social support. The intervention consists of 10 group sessions and 3 individual sessions, led by two trained facilitators. Each group session, to which mothers can bring all of their children less than 6 years old, begins with a shared meal. During the rest of the session, mothers work through the manualised program, while children take part in a separate play-based session (Muzik et al., 2015). To complete the session, mothers and children take part in a fun activity together.

Intervention only studies have been conducted, comparing completers and non-completers of the program (Muzik et al., 2015, 2016). Results indicate that the program is able to contribute to decreases in depressive symptoms, PTSD symptoms, maternal helplessness and clinical diagnoses (Muzik et al., 2015, 2016). As these studies did not have control groups, subsequent studies used randomized controlled trials to test for efficacy.

A study involving high-risk mothers (Rosenblum et al., 2017) found that women in the intervention group decreased significantly in PTSD symptoms ( $d = 0.342$ ) and parenting stress ( $d = 0.334$ ); however, the opposite effect was seen in that control group women decreased significantly in depressive symptoms, while the intervention group did not ( $d = 0.233$ ). Among women with a history of intimate partner violence, strong effects were found for the intervention group in decreased symptoms of depression ( $d = 0.462$ ) and PTSD ( $d = 0.401$ ). Another study found an increase in reflective parenting ( $d = 0.296$ ) for the intervention but not the control group (Rosenblum et al., 2018).

*Playing and Learning Strategies (PALS)* is a ten-week home visiting program that targets maternal responsiveness in order to enhance infant outcomes (Landry et al., 2006). It is targeted especially for mothers from a low income background or for infants with low birth weight, and emphasizes taking the family context into account. Reflecting on videotaped mother-baby interactions is a major component of the intervention. Each week, the facilitator coaches the mother through a new target behavior, and films the mother interacting with her baby. They also spend time discussing the videotaped interaction from the previous week, and plan how to incorporate the target behaviors into daily life. Mothers learn how to observe the responses of their infants. The toddler program (Landry et al., 2008) builds upon the infant program, continuing to teach mothers responsive behaviors through coaching and reflection on videotaped interactions.

The program has demonstrated increases in aspects of maternal responsive behaviors (Landry et al., 2006), including contingent responsiveness ( $d = 0.85$ ), support of infant foci of attention ( $d = 0.65$ ), verbal scaffolding ( $d = 0.79$ ) and object labeling ( $d = 0.71$ ). However, an iatrogenic effect was found among high-risk mothers, with the control group mothers displaying higher levels of smiling and laughing than intervention group mothers ( $d = 0.55$ ). Effects were also seen in infants, including significantly increased early communication ( $d = 0.75$ ) and social cooperation ( $d = 0.50$ ) with their mothers. A subsequent study (Landry et al., 2008) examined the effects of further intervention at the toddler stage. Intervention at the toddler stage was linked to significant effects on verbal encouragement ( $d = 0.25$ ), child cooperation ( $d = 0.30$ ) and child social engagement ( $d = 0.32$ ). Mothers and toddlers who participated in the intervention at both stages had higher levels of contingent responsiveness ( $d = 0.51$ ) and more decreases in negative behavior ( $d = 0.16$ ).

A *universal attachment skills program* was developed to target infant mental health through building mother-infant attachment (Akbarzadeh et al., 2016). The program consists of four sessions, run once weekly for 60–90 min, with session content delivered through discussions, time for questions, lecture-style provision of information, videos and role-plays. The sessions have a large focus on attachment behaviors, with mothers also learning about the physiology of pregnancy, awareness of their embryo's feelings, and maintaining good health during pregnancy.

At the time of birth, mothers in the control group scored significantly higher in anxiety, while babies in the intervention group had significantly less crying. However, baseline data for mothers was not collected prior to the intervention being run (Akbarzadeh et al., 2016).

*HUGS* (Milgrom and Holt, 2014) is an intervention targeted for women with a diagnosis of postnatal depression. The four week program includes education and activities that address mother-infant interaction; mothers are given opportunities to interact with their infants while learning practical skills such as recognizing infant cues. The HUGS program is designed to be run in conjunction with cognitive behavioral therapy for postnatal depression.

A pilot study of a previous three week version of the program found a decrease in parenting stress among women

who participated. However, there was no control group. A subsequent study combining the HUGS intervention with a nine week cognitive behavioral program explored the effects on the mother-infant relationship, maternal mood and infant wellbeing (Milgrom and Holt, 2014). Preliminary results indicate improvements in affective involvement and verbalisation (partial eta squared = 0.10) and bonding (partial eta squared = 0.09) for the intervention group mothers. Results were not found for parenting stress or infant outcomes (Holt et al., 2021).

## Mentalization Based Interventions That Target Parental Reflective Functioning

*Families First* is a parenting group program that has a unique focus on parental reflective functioning (Kalland et al., 2016). It aims to improve parent-child attachment through building mentalization capacity. It focuses on the whole family and also teaches parents to develop a wider social support network. The program was designed to reduce parenting stress and depression. The groups are offered for first time parents whose babies are 3–4 months old. There are twelve sessions in the program, with each running for approximately 2 h. To date, there have been no results published on the efficacy of the program.

The *PEEP Reflective Parenting Program* is designed for expectant parents and is delivered during the perinatal period (Maskell-Graham, 2014). The program aims to build parental reflective functioning capacity and develop secure attachments between parents and babies. Parents are encouraged to view their babies as individuals with their own internal thoughts and feelings. Another goal of the program is to build support networks for parents within the community. The content is delivered through a home visit and seven group sessions. Preliminary results indicated improvements in reflective functioning and mother-baby interaction, but not in anxiety and parenting stress. However, the data was not analyzed statistically so the significance and size of effects could not be determined (Maskell-Graham, 2014).

The *Lighthouse Parenting Program* is a 20-week Mentalization-Based Treatment (MBT) designed for high-risk parents of infants aged 0–2 years (Byrne et al., 2018). This intervention is designed to increase sensitive parenting and prevent child maltreatment through increasing parents' capacity to mentalize their child's internal states. The program involves weekly group sessions and fortnightly individual sessions for parents; children are not included in the intervention.

The program displayed a significant effect on parental self-efficacy ( $d = 1.675$ ) for mothers. Non-significant improvements were seen in parental stress, parental sensitivity, anxiety, depression, parental mentalizing and global distress. The low levels of depression and anxiety reported at baseline, as well as the small sample size could have impacted the significance of findings.

The *Circle of Security* (COS) intervention aims to increase parental sensitivity in order to promote the development of secure attachment in children (Kohlhoff et al., 2016). Initially, COS was designed as a 20-session weekly group-intervention intended to enhance parental ability to interpret child cues

(Yaholkoski et al., 2016), however, a shorter 8-session version (COS-P) has also been created, with the same key components and aims as the original version (Cooper et al., 2009). Both the original and the shortened versions include an overview of attachment theory as well as videos designed to demonstrate secure and problematic parent-child interactions; however, unlike COS-P, where pre-recorded footage is used, the original version includes videos of participants and their own children filmed in the strange situation (Kohlhoff et al., 2016).

The COS program has been researched extensively since its development. A study involving women in a jail diversion program found that depressive symptoms were significantly lower after the intervention ( $ES = 0.88$ ), yet the rates of attachment security and maternal sensitivity did not differ from those in the population (Cassidy et al., 2010). Another study found significant decreases in disorganized and insecure attachment (Hoffman et al., 2006). A pilot version of the shorter version of the program found favorable effects on reflective functioning ( $ES = 0.59$ ), caregiving helplessness ( $ES = 0.73$ ), maternal rejection and anger ( $ES = 0.48$ ), and maternal stress ( $ES = 0.48$ ) (Kohlhoff et al., 2016). Effects have also been found on aspects of self-efficacy ( $ES = 0.55$ ) (Rose et al., 2018). However, all of these studies used a one-group pretest posttest design and thus did not have a control group, so it is difficult to determine whether or not these findings reflect intervention effects.

The program has also been studied using randomized controlled trials. In a targeted study for economically stressed mothers, effects were not found for the overall sample, however, among highly irritable infants, intervention group children were more likely to be securely attached after the intervention, as compared to the control group (Cassidy et al., 2011). A study of the shortened version found significant increases in balanced caregiver perceptions and emotionally available interactions in the intervention group but not the control group (Mothander et al., 2018).

A meta-analysis has been conducted on the program, although it must be noted that this included data from sources not within the scope of this review, such as unpublished data and articles, and COS as a program for children older than 3 years old (Yaholkoski et al., 2016). The analysis found significant, medium effects on both child attachment security ( $g = 0.65$ ) and caregiving quality ( $g = 0.60$ ).

The *Minding the Baby* (MTB) attachment-based intervention aims to promote secure attachment in infants through increasing maternal reflective functioning in vulnerable young primiparous mothers (Sadler et al., 2013). Beginning in the second trimester of pregnancy, this intensive program endeavors to improve developmental, health and relationship outcomes for participating families (Slade et al., 2020). Families receive weekly alternating visits by a nurse and a social worker for the first year of the child's life, followed by bi-weekly visits until the child reaches age 2 (Slade et al., 2020). Other family members including the child's father are encouraged to participate, however, the mother and child remain the focus of this intervention (Slade et al., 2020).

In a study of young mothers, results indicated a significantly higher percentage of secure infant attachment in the intervention

group and significantly lower disorganized attachment. There were no significant effects found for maternal mental health or reflective functioning, although there were effects on subgroups within the sample (Sadler et al., 2013). There was a non-significant trend toward less referrals to the Child Protective Services at 24-months follow-up. Another study found significant effects on maternal reflective functioning and infant secure attachment, but not on affective communication or maternal mental health (Slade et al., 2020).

## EXISTING EARLY LIFE INTERVENTIONS FOR CHILDREN

### Interventions That Target Child Wellbeing

*Families in Mind* (Hiscock et al., 2012) is a combination of two interventions – *Toddlers Without Tears* and *the Family Check-Up*. The *Toddlers Without Tears* program is universal and targets negative parenting styles and child mental health (Bayer et al., 2010a). It is delivered through a combination of one individual session and two group sessions. The parents learn strategies for managing behavior in their toddlers. A study has found that this program alone does not appear to be enough to prevent emotional and behavioral problems in children or mental health problems in mothers. The only effect demonstrated was on mothers' unreasonable expectations of their toddlers, which were significantly lower in the intervention group (Bayer et al., 2010a). Not enough information was provided to calculate effect sizes. The *Family Check-Up* is targeted and has previously displayed efficacy when delivered to disadvantaged families. In this program, families receive one-on-one home visits from a psychologist. A longitudinal study of the *Families in Mind* program has commenced and is still in progress.

*Tuning into Toddlers* (TOTS) is a universal program designed to enhance emotional development in toddlers through addressing their parents' emotion socialization and emotion regulation (Havighurst et al., 2019). It is also based on the theories of attachment, mindfulness and neurobiology. In particular, TOTS aims to build emotional coaching skills in parents, as this is a major protective factor for child mental health. The program is run across six weekly sessions, each of which are 2 h long (Lauw et al., 2014). Parents learn the five steps of emotional coaching, for example, being aware of children's emotions and helping label emotions. They learn information about toddler needs and development. The program is manualised and is presented to groups using discussions, role-plays, psychoeducation and other activities.

A pilot study of the program (Lauw et al., 2014) found a number of effects, including increased emotion coaching beliefs ( $d = 0.50$ ), emotion coaching behaviors ( $d = 1.38$ ), observed emotion coaching ( $d = 0.92$ ), emotion labels ( $d = 0.87$ ) and emotion exploration ( $d = 0.68$ ). There were also significant decreases in emotion-dismissing beliefs ( $d = 0.70$ ), emotion-dismissing behaviors ( $d = 0.80$ ), observed emotion dismissing ( $d = 0.49$ ) and toddler behavior problems ( $d = 0.30$ ). As the pilot study used a small intervention only design, another study

using a randomized controlled trial design is currently underway (Havighurst et al., 2019).

The *Relationships for Growth and Learning Program* is designed to target preschool children who are at risk for developing mental health problems (Bekar et al., 2017). The program uses peer play psychotherapy and other mental health services. While the program is essentially child-focused, parents and teachers are also involved, as the program uses a whole system approach. The program was run in childcare centers for children at clinical risk due to internalizing and externalizing symptoms, environmental risk and challenging histories. The children received peer play therapy in groups with a trained therapist. Individual sessions were also given if necessary.

The clinical children increased significantly in social competence and decreased in total problems and behavioral problems. After participation in the program, the clinical group of children had caught up to the nonclinical group of children in behavioral functioning in that they no longer had more total problems, including behavioral, internalizing, externalizing and other problems.

*Early Head Start* (Raikes and Love, 2002) refers to a range of programs for low-income pregnant women and their families, which can be based at the family home or in the community. The programs involves two generations and follows children over the first few years of life.

A large study of the Early Head Start programs, which included data from 3,001 families across 17 programs, measured the efficacy of the programs when children were 2 and 3 years of age (Love et al., 2005). Families within each of the 17 programs were randomly assigned to an intervention or control group. When children were 2 years of age, the results indicated decreased risk for intervention group children in a number of areas, including children's cognitive and language development (14.9%), problem behaviors (10.2%), parental support (13.5%), parenting stress (11%) and family support in the home environment (11.5%), as compared to the control group children (Administration for Children, Youth and Families, 2001).

At 3 years old, children who were part of the interventions had better cognitive and language functioning ( $d = 0.12$ ), fewer aggressive behaviors ( $d = 0.11$ ) and higher emotional engagement ( $d = 0.20$ ) and sustained attention ( $d = 0.16$ ) with their parents, compared to children in the control group. Parents also displayed better interactions with their children ( $d = 0.11$ ). An analysis of program type revealed that programs that were both home and community based had the most desirable results for children ( $d = 0.23$ – $0.31$ ) and parents ( $d = 0.21$ – $0.28$ ).

The *Responsive Early Childhood Curriculum* (RECC; Landry et al., 2014) was developed for toddlers from low income backgrounds in childcare centers, with the goal of enhancing the quality of care received during the formative years. The program involved equipping teachers with the ability to engage in responsive teacher-child interactions. Teachers were trained and implemented the curriculum in their centers.

A randomized study was conducted, with two intervention groups and one control group. One intervention group used the regular RECC and the enhanced intervention group used the RECC plus extra activities to build social emotional



skills. Children in the intervention groups scored higher than control group children in expressive emotion understanding ( $d = 0.47$ ), receptive emotion understanding ( $d = 0.25$ ) and a situational emotions task ( $d = 0.44$ ). Control group children displayed a significant rise in anxiety, but intervention group children did not. Children in the regular ( $d = 0.42$ ) and enhanced ( $d = 0.39$ ) intervention groups increased in social competence at some, but not all time points. Children in the regular intervention group decreased significantly in anger and aggression compared to the control group ( $d = 0.55$ ).

## Interventions That Target Parent Mental Health, the Couple Relationship and Child Wellbeing

*Family Foundations* is a universal program for expectant couples which focuses on enhancing co-parenting and mental health (Feinberg and Kan, 2008). It was developed based on extensive research on the importance of co-parenting, including the dimensions of co-parental support and parenting-based closeness. The program is psychoeducational and teaches skills such as teamwork, conflict management and communication. It has eight sessions throughout the perinatal period and is run in groups. The program has been tested in multiple studies, revealing promising effects for mothers, fathers and children. Outcomes include: decreased depression and anxiety for mothers, higher co-parenting support for both parents, higher parenting-related closeness for fathers, more adaptive duration of orienting and soothability for infants, better relationship quality for parents and less child internalizing problems up to 7 years later (Feinberg and Kan, 2008; Feinberg et al., 2014; Jones et al., 2018a).

The initial study (Feinberg and Kan, 2008) found significant effects on coparental support (mother report,  $d = 0.35$ ; father report,  $d = 0.54$ ), father reported parenting-based closeness ( $d = 0.44$ ), maternal depression ( $d = 0.56$ ), maternal anxiety ( $d = 0.38$ ), father reported parent-child dysfunctional interaction ( $d = 0.70$ ), and infant duration of orienting ( $d = 0.34$ ). Effects were not found for paternal mental health or coparental undermining. The follow-up study (Feinberg et al., 2014) found that 6 years later there were significant effects on teacher reported internalizing problems ( $d = 0.55$ ) and boys' externalizing problems ( $d = 0.75$ ), but no effects for parent reported outcomes. Another larger study of the program (Jones et al., 2018a) found significant effects at 2-year follow-up on triadic relationship quality ( $d = 0.39$ ), negative coparenting ( $d = 0.38$ ), negative parenting ( $d = 0.41$ ), child internalizing problems ( $d = 0.19$ ) and child night wakings ( $d = 0.30$ ).

*Baby Triple P* (Tsivos et al., 2015) is a targeted program for mothers with postnatal depression that uses parenting education. The content includes: infant care strategies, parent coping skills, catching unpleasant thoughts and emotions, breathing, positive self-talk, partner and social support, parenting routines, communication, transition to parenthood and goal setting. There are eight sessions and homework tasks to complete between sessions.

A study including women who had been diagnosed with postnatal depression did not find any significant differences in parent or child outcomes as a result of the intervention (Tsivos et al., 2015). However, the program displayed high acceptability levels with participants. Another study of the program (Popp et al., 2019) took a universal approach and included both mothers and fathers in the program. The study found that babies in the intervention group were more frequently awake and content ( $d = 0.88$ ) and had less inconsolable crying ( $d = 0.85$ ) than those in the control group. Effects were not found for infant behavioral problems or parental outcomes.

*What Were We Thinking* is a universal psychoeducational program for couples and their babies (Fisher et al., 2010). It is delivered in a group setting through one session after birth, with additional take-home materials. The aim of the program is to prevent depressive and anxiety disorders. The program addresses caring for the baby, managing infant crying, and having a healthy mother and father relationship.

A study found effects for the intervention on mental health, but only among mothers with no psychiatric history (Fisher et al., 2010). For these mothers, the intervention was associated with a significantly lower risk of being diagnosed with depression, anxiety or adjustment disorder, the relative risk reduction being 48%. In a later study, the intervention has also displayed effects on self-rated health (Fisher et al., 2016). No effects have been found for unsettled infant behaviors, mother-baby relationship quality or partner relationship satisfaction (Fisher et al., 2016).

## DISCUSSION

In this review, we found a total of 27 interventions for infants and young children aged 0–3 and their parents, with these spanning a wide range of approaches and target outcomes. Programs were universal or targeted, with some being delivered as both across different studies (Tsivos et al., 2015; Popp et al., 2019). Interventions were focused on outcomes such as maternal mental health, parenting skills, coparenting, parent-infant attachment, reflective functioning, child wellbeing and the couple relationship. Some programs focused on multiple outcomes. The programs also differed in the approaches they used, with these including cognitive behavioral therapy, mentalization based therapy, psychoeducation, practical skills training, and mindfulness.

McLuckie et al. (2019) conducted a scoping review of mental health programs for 0–5 year old children, exploring the overall view of existing interventions, including a broad summary of therapeutic mechanisms, outcome measures, geographical location, research designs, levels of intervention and target populations. The researchers found that the largest proportion of programs were selective, while there were far lower numbers of universal programs. The most common approaches utilized were parenting education groups, interventions targeting the parent-child dyadic relationship and home visits (McLuckie et al., 2019).

We took a similar approach in this review, although we focused on a more specific age group and explored the content of individual programs. In our review, we focused on the 0–3 age



group, as this is a critical time of development in which early influences can greatly shape a child's future trajectory (Zero to Three, 2012; Lyons-Ruth et al., 2017). Following on from the scoping review (McLuckie et al., 2019), we aimed to examine individual programs that currently exist, in order to determine the approaches that have been effective at targeting mental health in this age group.

## Universal and Targeted Programs

Universal and targeted programs have both displayed evidence of efficacy for child and parent outcomes. Targeted programs appear to be particularly effective for maternal mental health outcomes. Programs targeted for mothers at higher risk – such as PREPP, the ROSE Program, Mother and Babies, Mindful Motherhood, Mom Power and the antenatal group program – have demonstrated multiple impacts on mental health outcomes such as symptoms of depression, anxiety and PTSD, risk of a clinical diagnosis, stress, negative affect and mood regulation (Zlotnick et al., 2001; Vieten and Astin, 2008; Thomas et al., 2014; Muzik et al., 2015; Werner et al., 2016; Tandon et al., 2018). Although targeted programs have also demonstrated some effects on other outcomes, the majority of effects appear to be related to maternal mental health.

Universal programs are able to impact maternal mental health outcomes too, yet also appear to have wider effects on other outcomes. A number of universal programs – Family Foundations, Toward Parenthood, What Were We Thinking, and Couple CARE – appear able to influence outcomes across a number of domains, including parental mental health, infant mental health, the parenting relationship, and the parent-child relationship (Feinberg and Kan, 2008; Fisher et al., 2010; Halford et al., 2010; Milgrom et al., 2011). Universal programs have the added advantage that they are able to reach a larger proportion of the population.

Family Foundations, in particular, is a universal program that has demonstrated effectiveness on outcomes for both parents and children. It is one of the programs with the longest term effects, with reduced child internalizing symptoms evident up to 6 years after the program was delivered (Feinberg et al., 2014). The studies on this program have been of high quality, using randomized controlled trials with sample sizes of a few hundred participants.

## The Parent-Child Relationship

Considering the importance of the parent-child relationship that has been highlighted in the literature, we explored the programs that focused enhancing secure attachment and parental reflective functioning. In line with the scoping review of McLuckie et al. (2019), we found that a large proportion of current intervention programs focus on the parent-child relationship.

The AMPLE program was effective at increasing emotional availability for young mothers (Nicolson et al., 2013). Studies on the PALS program have found results for maternal and child behavioral outcomes, especially for high risk women (Landry et al., 2008). The Lighthouse Parenting Program was able to improve parental self-efficacy (Byrne et al., 2018). Minding the Baby has been effective at improving maternal reflective functioning and child attachment (Sadler et al., 2013;

Slade et al., 2020). The HUGS program was able to improve bonding and maternal communication with infants (Holt et al., 2021) and reduce parenting stress (Milgrom et al., 2006).

Mom Power appears to be a promising program which has demonstrated efficacy for maternal mental health symptoms and other outcomes across four studies, two of which were randomized controlled trials (Rosenblum et al., 2018). A large number of studies have been conducted on the Circle of Security intervention. Many of these were intervention only studies, which makes it difficult to determine if results were due to the intervention (Rose et al., 2018). However, randomized controlled trials of the program have also indicated that it is effective in improving parenting and child attachment (Cassidy et al., 2011; Mothander et al., 2018).

The PEEP program, Families First, and the universal attachment skills program also focused on building the parent-child relationship. However, the efficacy of these programs is hard to determine. Families First does not yet have any published data, and the data for the PEEP program and the universal attachment skills program was not analyzed in a way that enabled statistical conclusions to be drawn.

Considering that attachment and reflective functioning based programs have demonstrated some effects for parents and their children, it appears that targeting aspects of the parent-child relationship is an important feature to include in interventions. It is worth noting that the research on Mom Power, AMPLE, PALS, Minding the Baby, HUGS and the Lighthouse Parenting Program has been on targeted samples, while Circle of Security has been trialed as both a universal and targeted program. The majority of these studies only involved mothers, rather than both parents. In future studies, it would be beneficial to explore the effects of attachment and reflective functioning programs on universal samples, and on targeted samples which include both parents, as this is a gap in the literature.

## The Parent Couple Relationship

As well as the parent-child relationship, the relationship between parents has also been identified in the literature as an important factor for child mental wellbeing. Programs that specifically targeted the parenting relationship were Couple CARE for Parents, Family Foundations, and What Were We Thinking. Couple CARE has demonstrated a number of effects, particularly on couple communication (Halford et al., 2010). However, some of the program's effects were only found for mothers. Family Foundations has been effective in improving parent mental health, the couple relationship and child outcomes (Feinberg and Kan, 2008; Feinberg et al., 2014). What Were We Thinking has demonstrated mixed results; it is possibly effective at improving mental health outcomes, but does not seem to impact the parenting relationship or infant outcomes (Fisher et al., 2010, 2016). All three of these programs have been tested in universal studies, while Couple CARE has also been run as a targeted intervention.

Baby Triple P is a program for mothers that has recently been studied when run in a couples format (Popp et al., 2019). Results were found for infant outcomes but not for parenting outcomes. Of the programs targeting the couple relationship

and coparenting, Family Foundations and Couple CARE for Parents appear to be the most promising (Feinberg and Kan, 2008; Petch et al., 2012). Couple Care for Parents appears effective at improving outcomes related to the relationship between partners, while Family Foundations has demonstrated effects on the parenting relationship and mental health for parents and children. Both of these programs are psychoeducational and involve running through six to eight sessions as a couple with a trained facilitator. They have the advantage of being relatively brief and cost effective to implement.

Four of the programs – Toward Parenthood, the antenatal group program, Families First, and Minding the Baby – encouraged partners to attend some of the sessions, but did not have the couple relationship as a specific focus of the intervention. This appears to be a common finding in the literature. A review of partner inclusive interventions found that nine out of thirteen studies addressing the parenting relationship appeared effective in reducing depression and anxiety (Pilkington et al., 2015). However, the majority of these did not actually test the effectiveness for partners, and some did not even involve partners, despite including content on the parenting relationship (Pilkington et al., 2015). Given the consistent evidence of the importance of partner support, this needs to be taken into account when developing future interventions (Pilkington et al., 2015).

## The Role of Fathers

While the programs previously mentioned included both parents, there is a shortage of programs that specifically focus on helping fathers to transition to the parenting role. Programs tend to focus on the mental health of mothers, and do not include fathers and partners (Pilkington et al., 2015; O'Brien et al., 2017). Given the link between the mental health of mothers and partners, and the influence of the father on the infant and young child's development, this is an important gap to address.

Boot Camp for New Dads was the only program reviewed that was designed specifically for fathers, to help them bond with their baby (Capuozzo et al., 2010). It appears that the program was effective, however, the results were not analyzed statistically, so this is difficult to determine with certainty. More research needs to be conducted, especially to investigate the effects of this program on mental health for fathers. Focusing interventions on the mother–child attachment relationship alone is not sufficient, and further research should be conducted on the impact of these interventions on father–child relationships, as well as fathers' mental health.

## Programs Aimed at Children

While the majority of programs involved the parents as participants, the Responsive Early Childhood Curriculum, the Relationships for Growth and Learning Program and Early Head Start focused mainly on children (Love et al., 2005; Landry et al., 2014; Bekar et al., 2017). These programs were targeted for toddlers at risk, due to individual or environmental risk factors. Relationships for Growth and Learning used principles of play psychotherapy and was successful in that it enabled at-risk toddlers to catch-up to their peers in behavioral functioning

(Bekar et al., 2017). Early Head Start has been studied extensively with 3,000 families, with the research finding that it has positive impacts on children's cognitive, behavioral, social and emotional functioning (Love et al., 2005). The Early Head Start programs were most effective when delivered in both home and community settings. The RECC focused on building responsive interactions with toddlers, and found results for social and emotional competence (Landry et al., 2014). It has been studied with a large sample of toddlers.

## Qualitative Experiences

Most of the research we found was quantitative in nature. However, studies would also benefit from collecting qualitative data. Qualitative results can illuminate effects of the program that are missed by quantitative data. For example, the Lighthouse Parenting Program interviewed mothers who participated in the program. Although the program did not achieve all of the expected outcomes, the discourse from mothers emphasize its value to participants. It would be beneficial for future studies to explore qualitative experiences of parents in the program.

## CONCLUSION

Pregnancy and infancy are important developmental periods where the mental wellbeing of both parents and infants needs to be considered in order to prevent the emergence of mental health difficulties during infancy and early childhood. Research has demonstrated that it is possible for infants and children aged from zero to three to develop mental disorders, which must be addressed and treated (Warner and Pottick, 2006). Influences in the early developmental years of a child's life have the capacity to affect them into adulthood. For this reason, there is scope for early interventions during this period to set children up for a positive future life trajectory. Furthermore, rates of parental depression and anxiety during the perinatal period emphasize the need for interventions to address mental health during this time (Woody et al., 2017; Philpott and Corcoran, 2018).

A number of interventions for parents and children have already been researched. The literature suggests that programs that target the parent's mental health and wellbeing, as well as the parent–child and couple relationship have the potential to promote good parent and child mental health. Our findings suggest that mothers, partners and children should all be included for an intervention to be most effective. Parent interventions ideally focus on improving the parents' mental health as well as building protective factors that will benefit their children. As demonstrated in a range of studies already described, interventions for parents and children have the capacity to build protective factors including secure attachment, parental mentalizing capacity and a positive coparenting relationship.

The interventions described above can act as a guide for future intervention efforts during pregnancy and infancy. Programs that were based on cognitive-behavioral principles showed evidence of efficacy (Milgrom et al., 2011; Petch et al., 2012; Tandon et al., 2018). Practical skills training about how to care for the baby

was another feature of effective programs (Fisher et al., 2010; Werner et al., 2016). A number of programs considered attachment or parent-infant bonding (Capuozzo et al., 2010; Maskell-Graham, 2014; Kalland et al., 2016; Werner et al., 2016; Tandon et al., 2018). *Families First* and the *PEEP Reflective Parenting Program* did this through building parental reflective functioning capacity (Maskell-Graham, 2014). The coparenting relationship between parents was another effective component (Feinberg and Kan, 2008; Fisher et al., 2010; Petch et al., 2012), as was the importance of building wider support networks (Zlotnick et al., 2001; Milgrom et al., 2011; Maskell-Graham, 2014; Kalland et al., 2016). Research also suggests that interventions involving children aged zero to three are effective for promoting healthy development. This may be particularly important for infants who come from a high risk background. The interventions for infants described in this review were targeted at high risk infants and displayed evidence of efficacy.

The research evidence suggests that the theoretical backgrounds of interpersonal therapy, cognitive-behavioral therapy, attachment theory and mentalization are ideal starting points for program development. A review of available interventions highlights the need to pull together all of the successful elements of the available interventions and attempt to combine them in an effort to establish an intervention that aims to improve parental mental health and prevent difficulties, support the couple relationship and develop secure parent child relationships which in turn will improve infant mental health. Furthermore, many of the studies, even when aimed to improve child outcomes, did not measure or report these outcomes to evaluate if the intervention indeed had the desired outcome. Future studies should include control groups for the comparison of outcomes. They should also measure the mental health of both parents, attachment style and parental reflective functioning, childhood outcomes and the quality of the couple relationship.

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In summary, there is great potential to intervene during pregnancy and infancy to improve the mental health of both infants and their parents. Early life mental health difficulties can continue to impact the individual well beyond this time, and thus it is important to develop interventions that can prevent these difficulties. As outlined in this review, several programs have already been developed with this goal in mind. Knowledge of the effective components of these interventions can be used to inform the development of future prevention efforts, with the aim of optimizing mental health outcomes for infants and their families. The mental health team of the ORIGINS Project, in partnership with Telethon Kids Institute, is currently developing a program that addresses these outcomes, with the aim of enhancing prevention efforts during infancy and early childhood. The program will be piloted at a large health campus located in Perth, to assess the efficacy for children and their parents.

## AUTHOR CONTRIBUTIONS

RR conceptualized the scope of the review and was the lead researcher in the project. EI researched the topic and wrote article content. SP is the director of the ORIGINS Project, to which this review belongs; she contributed content to the review. MD and MM researched the topic, wrote article content, and prepared the manuscript. All authors contributed to the article and approved the submitted version.

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