SOCIAL NETWORKING SITES AND ADJUSTMENT PROBLEMS IN OFFLINE AND ONLINE CONTEXTS IN ADOLESCENCE

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The Role of Emotional Intelligence on Psychological Adjustment and Peer Victimization in a Sample of Spanish Adolescents

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In the last decades, interest in the study of the negative consequences of bullying for the victims has increased. Victims are often known to show emotional adjustment issues, such as negative self-concept and low life satisfaction. Moreover, some studies have observed important associations between self-concept and life satisfaction, in which a positive self-concept is related to high levels of life satisfaction. Other studies have pointed out the importance of emotional intelligence (EI), as a regulatory and protective factor against the negative impact of victimization on adjustment in adolescents. The main objective of this work was to analyze the mediating effect of self-concept on life satisfaction and the moderated mediation effect of EI on self-concept and life satisfaction in the context of peer victimization. The participants in the study were 1,318 Spanish students of both sexes and aged between 11 and 18 (M = 13.8, SD = 1.32) years, from four compulsory secondary education centers. The results indicated that, on the one hand, self-concept mediated the relationship between victimization and life satisfaction. On the other hand, EI was not only positively associated with self-concept, but it also significantly moderated the negative influence of victimization on self-concept. EI may also indirectly moderate the relationship between victimization and life satisfaction through the self-concept. These data show the importance of EI as a possible protective and moderating factor of the negative effect of bullying on emotional adjustment, which is interesting for the design of future prevention and intervention programs in school contexts.

Keywords: victimization, self-concept, life satisfaction, emotional intelligence, moderating effect

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INTRODUCTION

In the last decades, the school context is facing an important social problem that is related to violent behavior among adolescents, known as peer victimization (Rey et al., 2019). Peer victimization involves receiving any acts of aggression from similar-age peers (Wu et al., 2015). This victimization can occur directly through verbal or physical aggressions, or indirectly, using more subtle forms of attack through actions that include social exclusion or peer rejection, spreading rumors, and threats to withdraw friendship (Mehari and Farrell, 2015; García et al., 2017). Victimization rates in young population require close attention, since according to the data collected by the World Health

Organization (WHO) in the Global School-based Student Health Survey (from 2003 to 2017) in collaboration with UNESCO (2018), the proportion of students who report being bullied is 33% in those aged 13, 32.3% aged in those aged 14 and 30.4% in those aged 15 years. Besides, they are more likely to experience negative consequences associated to this problem. Research conducted until now shows that victimization negatively affects the emotional adjustment, health, and well-being of the victims (Menesini and Salmivalli, 2017).

Relationship Between Victimization and Emotional Adjustment

Recent research with adolescent samples has considered negative self-concept as an important emotional consequence associated with peer victimization (Norrington, 2020). Self-concept is defined as the subject's perceptions of the self in different domains, such as academic, social, family, and physical dimensions (García and Musitu, 1999). The growing number of studies focusing on the indicators of emotional maladjustment in victimization has suggested that most adolescents who are bullied tend to perceive themselves negatively (Malhi et al., 2014; Cañas et al., 2019) and, in consequence, to experience negative self-concept (Cañas et al., 2020). In this vein, some studies have found that adolescents' assessment of their self-concept is intimately related to their overall assessment of their lives, so a positive self-concept is associated with high levels of life satisfaction (Chui and Wong, 2016; Ortuño-Sierra et al., 2019; Povedano-Diaz et al., 2020).

Particularly, life satisfaction has been considered as an indicator of the overall quality of life (Diener et al., 1999), as well as of well-being (Diener et al., 1999). Like self-concept, well-being has been also negatively associated with victimization in adolescence (Callaghan et al., 2015; Weng et al., 2017; Gini et al., 2018; Cañas et al., 2020). Additionally, some works have indicated that victimization has a negative influence on the victims' well-being (Låftman and Modin, 2017; Callaghan et al., 2019), so it is not surprising that bullying victims are significantly more likely to experience low life satisfaction. For this reason, some investigations into youth violence have considered victimization as a salient risk factor for poor life satisfaction in adolescence (Méndez-Giménez et al., 2017; Gini et al., 2018).

Thus, according to empirical evidence, self-concept and life satisfaction are significantly related in adolescence (Carrascosa et al., 2018; Estévez et al., 2019a).

The Mediating Effect of Self-Concept on Victimization and Life Satisfaction

In the context of peer victimization, Norrington (2020) carried out a longitudinal study about the effect of self-concept on psychological distress in victims of bullying, revealing that self-concept may act as a mediator in the relationship between victimization and mental health. Norrington's study is relevant when considering that mental health is usually measured evaluating life satisfaction (Kardefelt-Winther and Maternowska, 2020). In short, these findings seem to confirm that self-concept during adolescence plays an important role in the perception of adolescents' life satisfaction. However, in the field of peer victimization, research focused on the relationship between self-concept and life satisfaction in adolescents is still limited.

Considering the previous findings, it is important to emphasize that self-concept and life satisfaction, separately, comprise an emerging area of inquiry related to victimization in youths (Navarro et al., 2015; Gini et al., 2018; Miranda et al., 2019). Besides, the available results help to understand how self-knowledge and ego-building are key elements for adolescent well-being (Povedano-Diaz et al., 2020), which can be indicative of life satisfaction. However, thus far, there is little research on the mechanism linking self-concept to life satisfaction in the context of peer victimization in adolescents. The moderating effect of emotional intelligence (EI).

The study of the role of emotion regulation in peer victimization has increased in recent years, because it is considered a protective factor against the negative impact of bullying during adolescence (Zych et al., 2017; Quintana-Orts et al., 2019). One of the approaches with a stronger theoretical and empirical basis concerning emotion regulation is the concept of EI, which refers to the ability to perceive, assimilate, understand, and regulate emotions (Salovey and Mayer, 1990). EI also includes motivating oneself and recognizing and managing emotions, both regarding oneself and others (Goleman, 1995). The model proposed by Salovey and Mayer (1990) highlights three components of general EI: (1) attention – the ability to perceive one's own and others' emotions; (2) clarity – the ability to understand emotional information, how emotions combine and change over time, and to appraise emotional meanings; and (3) regulation – remaining open to feelings and monitoring and regulating emotions to promote understanding and personal growth.

Regarding the protective mechanism of EI, research has shown that youths with high levels of EI are more likely to cope with negative experiences than their peers with lower levels of EI (Estévez et al., 2019c). This effect has been attributed to better affective processes, which allow maintaining positive mental states, promoting emotional adaptation, and regulating negative moods when faced with threatening situations (Gómez-Baya et al., 2017; Martínez-Monteagudo et al., 2019). Consequently, at high levels, EI may act as a potent construct for the promotion of emotional adjustment and well-being (De la Barrera et al., 2019). In this vein, some studies point out that adolescents with high levels of EI tend to maintain a positive self-concept (Martínez-Monteagudo et al., 2019; Suriá-Martínez et al., 2019) and to have high life satisfaction (Sun et al., 2014; Lázaro-Visa et al., 2019; Ramos-Díaz et al., 2019). Although it is clear that EI has a significant influence on self-concept and life-satisfaction, there has thus far been limited research examining the moderating mechanism of EI in these variables in samples of adolescents.

Concerning victimization, some works have suggested that EI may be an important protective factor against the detrimental effects of victimization, because it provides positive emotional management tools and resources to cope with this stressful situation (Domínguez-García and Fernández-Berrocal, 2018; Extremera et al., 2018; Estévez et al., 2019c; Quintana-Orts et al., 2019). However, victims of bullying

generally tend to show low levels of EI (Estévez et al., 2019a; Cañas et al., 2020), and to experience problems of emotional adjustment (Lomas et al., 2012). Perhaps the low EI levels reported by victims are the cause of their manifestations of the negative consequences of victimization. Additionally, it should be noted that not all victimized youth develop the same negative consequences or with the same degree of intensity (García et al., 2020). Recent studies have suggested that differences in the consequences or their intensity could be attributed to the degree to which the person concerned has developed EI (Extremera et al., 2018). Although the available research is focused on cyberbullying, the results underline that EI may not only be a mediator of emotional adjustment but may also be a potential moderator in the relationship between victimization and the associated emotional problems (García et al., 2020). These data support the idea that EI may act as a buffer against the negative impact of victimization (Extremera et al., 2018). Despite the increasing attention given to the relationship between EI and victimization in recent years, the moderating role of EI on individual factors such as self-concept and life satisfaction in the peer victimization context is still not fully understood.

The Present Study

Based on the reviewed literature, there is evidence suggesting that victimization negatively influences the victims' emotional adjustment and well-being, such as self-concept (Turner et al., 2017) and life satisfaction (Varela et al., 2017). There is also evidence that self-concept is intimately related to life satisfaction (Chui and Wong, 2016; Ortuño-Sierra et al., 2019; Povedano-Diaz et al., 2020), but, until now, no study has investigated whether self-concept mediates the relationship between victimization and life satisfaction. Similarly, even though the literature pays considerable attention to the relationship between EI and victimization (Zych et al., 2017; Estévez et al., 2019a), there are still deficiencies in the study of EI as a potential moderator of self-concept and life satisfaction in the context of peer victimization. This study proposes moving in this direction to fill the gaps in these issues. Thus, the objectives of the present study were: (1) to examine a mediation model that investigates the effect of self-concept on life satisfaction and victimization; (2) to analyze a moderated mediation model that studies the role of EI on the relationship between victimization and self-concept and life satisfaction. Based on the previously reviewed research on victimization in adolescence, the following hypotheses were established: (1) self-concept would mediate the association between victimization and life satisfaction; (2) EI would moderate the direct and indirect effect of victimization on self-concept and life satisfaction.

MATERIALS AND METHODS

Participants

Analyses of this study are based on data from a representative sample of secondary school students who were recruited through probabilistic sampling, using as primary sampling units the urban geographical areas of the provinces of Alicante, Valencia, Seville, and Teruel, and as secondary units, the public schools in each area. The grades or classrooms were not used as tertiary units, as all the students of the four courses of Compulsory Secondary Education (CSE) in all the schools participated. The socioeconomic level of the areas and schools was average. Approximately, the percentage of the parents of the participating students that had primary education, secondary education, high school studies, or university studies was equitable (25%). Most of the parents performed paid work outside the home: 86.7% of the fathers and 69.5% of the mothers. The final sample was composed of 1318 adolescents (47% boys and 53% girls), aged between 11 and 18 years (M = 13.8, SD = 1.32), and enrolled in four CSE schools in the Andalusian, Aragonese, and Valencian communities, in Spain. Students' distribution by academic grade was balanced: 24.7% were enrolled in 1st grade of CSE, 27.3% in 2nd grade, 23.7% in 3rd grade, and 24.3% in 4th grade.

Instruments

Peer Victimization

To identify victims of bullying, the self-report measure *Peer Victimization Scale* (PVS; Mynard and Joseph, 2000), was used. The scale was translated into Spanish, using the parallel back-translation procedure of Brislin (1986). This 22-item instrument measures three peer victimization dimensions: relational victimization (e.g., "A classmate tried to get me into trouble with my friends"), overt physical Victimization (e.g., "A classmate beat me up"), and overt verbal victimization (e.g., "A classmate called me names"). Rated on a 4-point Likert-type scale (1 = *never*; 4 = *always*), the Cronbach alphas of the three dimensions in the present sample were 0.92, 0.69, and 0.88, respectively, and 0.95 for the global scale.

Self-Concept

The global dimension and four dimensions of self-concept were measured using *the Self-Concept Form-5 Scale* (AF5; García and Musitu, 1999). This 24-item scale measures four dimensions of self-concept (6 items per dimension): academic (e.g., "I work a lot in class"), social (e.g., "I have trouble talking to strangers"), family (e.g., "I am very happy at home"), and physical (e.g., "I take care of myself"). The response scale ranges from 0 (*strongly disagree*) to 9 (*strongly agree*). The Cronbach alpha in the present study was 0.89 for the global scale (academic 0.90; social 0.76; family 0.86, and physical 0.79).

Satisfaction With Life

Life satisfaction was measured using the *Satisfaction with Life Scale* (Diener et al., 1985) adapted to Spanish by Atienza et al. (2000). This instrument contains 5 items that provide a general index of subjective perceived well-being (e.g., "I'm not happy with my life"). The items are rated on a four-point Likert-type scale ranging from 1 (*strongly disagree)* to 5 (*strongly agree)*. In this study, the Cronbach alpha was 0.78.

Perceived Emotional Intelligence

Emotional intelligence was measured using the *Perceived Emotional Intelligence Scale* (TMMS, Salovey et al., 1995) adapted to Spanish by Domínguez et al. (2010). This scale consists of

22 items with 5 Likert-type response options (*strongly agree* to *strongly disagree*), which provide a measure of EI based on three dimensions: emotional attention (e.g., "I think about my mood constantly"), emotional clarity (e.g., "Often, I am mistaken about my feelings"), and emotion regulation (e.g., "Although I sometimes feel sad, I have an optimistic viewpoint"). The global Cronbach alpha of this study was 0.91, and for the dimensions, it was 0.89, 0.86, and 0.87, respectively.

Procedure

Data of this research were collected as part of a larger study on psychological adjustment in adolescence in Spain. After receiving authorization for the study from the Ethics Committee of the Miguel Hernández University, research assistants sent a letter with a summary of the research project to the headmasters of the selected schools as a first step. Subsequently, initial telephone contact with them was established, followed by a meeting with all the teaching staff in which the objectives of the study and the procedure to be followed for data collection were reported. After the staff had agreed to participate, an explanatory letter was sent to the parents, requesting them to indicate in writing if they did not wish their child to participate in (1% of parents used this option). The administration of the instruments was carried out by a group of trained and expert researchers in each region. Before data collection, students also attended a short briefing in which they provided written consent (none of the adolescents refused to participate). On the dates scheduled with the teaching staff, students were approached in their school classrooms to fill out the questionnaires voluntarily during a regular class period. The order of administration of the instruments was counterbalanced in each classroom and school. The instructions were read aloud, emphasizing the importance of answering all questions and the anonymity of the answers. During the administration of the tests, the researchers were present to resolve doubts and ensure an unbiased process. The surveys that were suspicious in terms of the response patterns were not coded in the database (these surveys represented 1% of the total original samples). Finally, a class of approximately 55 min were required for data collection.

Statistical Analyses

Firstly, we examined whether the data followed a normal distribution. As **Table 1** shows, the skewness and kurtosis of victimization, self-concept, life satisfaction, and EI fell within the acceptable range, with skewness $< |2.0|$ and kurtosis $< |7.0|$ (Hancock et al., 2018). Therefore, the variables were used directly in subsequent analyzes. A moderated mediation model was developed through various steps to test the hypotheses. Firstly, descriptive statistics and Pearson correlations among the study variables were calculated (**Table 1**). Secondly, PROCESS macro for SPSS (Hayes, 2018) was used, applying Model 4 to examine the mediating effect of self-concept between victimization and life satisfaction (**Table 2**). Thirdly, Model 58 was used to examine the moderating effect of EI on the relationship between victimization and self-concept on one hand, and self-concept and life satisfaction, on the other (**Table 3**). Sex and age were entered to control their effect on the results. The predictor variables that defined the products were mean-centered to avoid non-essential multicollinearity (Frazier et al., 2004; Fairchild and Mcquillin, 2010). The bootstrap confidence intervals (CIs) helped to determine whether the effects in Model 4 and Model 58 were significant at the $\alpha = 0.05$ level of significance, based on 5000 random samples. An effect is regarded as significant if the CI does not include zero.

TABLE 1 | Pearson correlations and descriptive statistics of the variables.

Variables	1	2	3	4
1. Victimization (1–4)	1.00			
2. Self-concept (0–9)	−0.23**	1.00		
3. Life satisfaction (1–5)	−0.34**	0.55**	1.00	
4. Emotional intelligence (1–5)	−0.05	0.38**	0.30**	1.00
Mean	1.61	6.39	3.73	3.32
Standard deviation	0.52	1.25	0.86	0.71
Skewness	1.23	−0.77	−0.47	−0.08
Kurtosis	1.46	0.42	−0.48	0.04

***p < 0.01.*

TABLE 2 | Coefficients for the tested mediation model between victimization and life satisfaction.

Independent and mediation variables	Dependent variable: self-concept β (95% CI)	Dependent variable: life satisfaction β (95% CI)
Victimization	−0.55** (−0.68, −0.43)	−0.39** (−0.46, −0.31)
Self-concept		0.34** (0.31, 0.38)
Age	−0.18** (−0.23, −0.13)	−0.03 (−0.54, 0.02)
Sex	0.01 (−0.11, 0.14)	0.10** (0.02, 0.17)
Constant	9.80** (9.12, 10.48)	2.47** (1.96, 2.98)
	$R^2 = 0.09$	$R^2 = 0.36$
	$F(3,1300) = 44.27$, $p < 0.01$	$F(4,1299) = 181.17$, $p < 0.01$

***p < 0.01.*

TABLE 3 | Coefficients for the tested moderated mediation model linking victimization, self-concept, life satisfaction, and emotional intelligence.

Independent and mediation variables	Dependent variable: self-concept β (95% CI)	Dependent variable: life satisfaction β (95% CI)
Victimization (V)	−0.51** (−0.62, −0.39)	−0.39** (−0.47, −0.32)
Emotional intelligence (EI)	0.64** (0.56, 0.73)	0.16** (0.10, 0.22)
EI × V	0.21** (0.6, 0.36)	
Age	−0.18** (−0.23, −0.14)	−0.03* (−0.06, −0.01)
Sex	0.07 (−0.04, 0.18)	0.11** (0.04, 0.19)
Self-concept (SC)		0.31** (0.27, 0.35)
EI × SC		0.02 (−0.02, 0.06)
Constant	2.52** (1.92, 3.11)	4.15** (3.76, 4.54)
	$R^2 = 0.23$	$R^2 = 0.37$
	$F(4,1313) = 78.12$, $p < 0.01$	$F(6,1297) = 128.49$, $p < 0.01$

**p < 0.05; **p < 0.01; EI × V, interaction between emotional intelligence and victimization; EI × SC, interaction between emotional intelligence and self-concept.*

RESULTS

Preliminary Analysis

Table 1 shows means, standard deviations, and Pearson correlations for the studied variables. Victimization was negatively correlated with self-concept and life satisfaction and showed an almost null correlation with EI. The rest of the variables in the study showed positive and significant correlations with each other. The highest coefficient was observed between self-concept and life satisfaction.

Testing for Mediation Effect

A Process Macro Model 4 was built to test the mediation effect, which is illustrated in **Figure 1**.

Table 2 shows two columns: the first reveals the relationship between the independent variable and the mediator, and the second shows all the coefficients in a simple mediation model. The first column in this table indicated that victimization and self-concept were significantly and negatively related ($\beta = -0.55$, $p < 0.01$). However, the percentage of explained self-concept variance was very small ($R^2 = 0.09$), suggesting the existence of other explanatory variables that had not been introduced in the model. The last column of **Table 2** presents the complete mediation model that relates victimization and life satisfaction including self-concept as mediator. This model showed a statistically significant and negative relationship between victimization and life satisfaction ($\beta = -0.39$, $p < 0.01$). Besides, the percentage of explained self-concept variance, as the mediator, increased in this model compared to the previous model ($R^2 = 0.36$), suggesting that self-concept plays an important explanatory role in this model. Self-concept also showed a significant and positive coefficient with life-satisfaction ($\beta = 0.34$, $p < 0.01$). The model estimated that the total effect of victimization on life satisfaction was −0.58 [95% CI (−0.66, −0.49)], and showed a significant indirect effect of victimization through self-concept [$\beta = -0.19$, 95% CI (−0.24, −0.14)].

In summary, the analysis revealed that self-concept can act as a mediator of the relationship between victimization and life satisfaction, such that victimization negatively affects self-concept, and this, in turn, affects victims' life satisfaction.

Testing the moderated mediation effect of EI. The results of the EI moderated mediation analysis are presented in **Table 3**. Victimization again showed a negative relationship with self-concept in the model that used self-concept as a dependent variable ($\beta = -0.51$, $p < 0.01$). However, EI had a positive coefficient with self-concept ($\beta = 0.64$, $p < 0.01$). Furthermore, the interaction between EI and victimization (EI × V), which indicated whether or not there was a moderating effect, showed a positive and highly significant coefficient, indicating that EI could act in two ways in this relationship between victimization and self-concept. The first way through its positive direct relationship with self-concept ($\beta = 0.64$, $p < 0.01$), and the second way by exerting a moderating effect on the negative influence of victimization in self-concept ($\beta = 0.21$, $p < 0.01$). In contrast, the last column of **Table 3** showed that EI did not have a moderating effect on the relationship between self-concept and victimization (EI × SC, $r = 0.02$, $p > 0.05$), but it did have a direct relationship with life satisfaction ($\beta = 0.16$, $p < 0.01$). Thus, these results indicated that EI was positively related both to self-concept and life satisfaction, and that EI moderated the influence of victimization on self-concept. In this sense, although no evidence was found that EI directly moderated the relationship between victimization and life satisfaction, it can indirectly moderate this relationship through self-concept.

The influence of EI on self-concept was then analyzed according to the level of victimization, controlling the effects of the other variables (**Figure 2**). It was found that adolescents with low levels of victimization ($M = -0.50$ in the previously mean-centered variable) had a different starting point in self-concept depending on their EI level. That is, with low EI levels—one standard deviation below the mean (−0.67)—, self-concept was below the mean (−0.11) indicated for that variable (value 0), and at high levels—one standard deviation above the mean (0.67)—, self-concept was well above the mean (0.62).

This is related to the fact that EI showed a positive relationship with self-concept. Considering the interaction between EI and victimization, simple slope tests showed that for students with low EI, the effect of victimization was significant

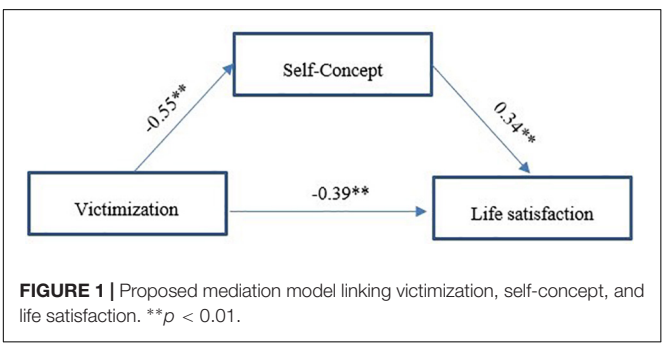

FIGURE 1 | Proposed mediation model linking victimization, self-concept, and life satisfaction. **$p < 0.01$.

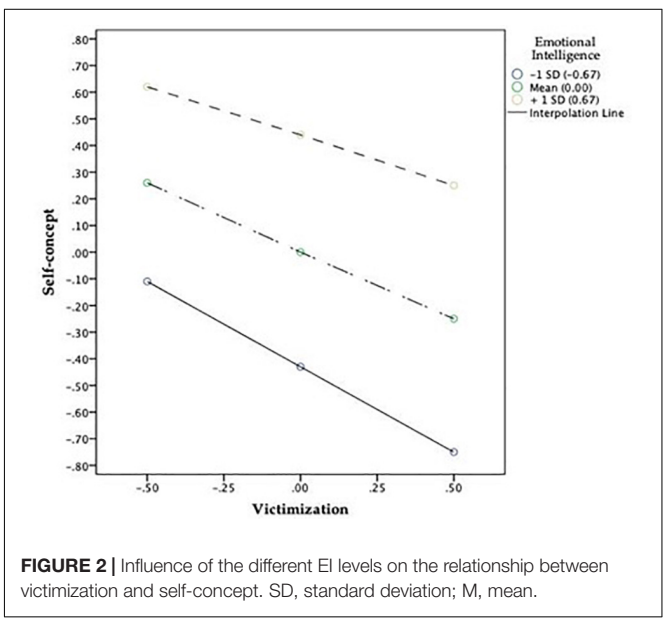

FIGURE 2 | Influence of the different EI levels on the relationship between victimization and self-concept. SD, standard deviation; M, mean.

($\beta_{simple} = -0.65$, $p < 0.001$). The effect was also significant on the medium EI group ($\beta_{simple} = -0.501$, $p < 0.001$), and regarding the high EI group ($\beta_{simple} = -0.37$, $p < 0.001$). **Figure 2** indicates that the effects of victimization on self-concept differ depending on the three above-mentioned starting points, as the slopes of the three lines are different.

DISCUSSION

Given the importance attributed by the literature to victimization and EI regarding emotional adjustment, the present study went one step further by examining several factors that may be relevant to these relationships. Thus, the objectives of this research were, first, to examine the effect of self-concept on satisfaction with life and victimization using a mediation model. And, secondly, to analyze the role of EI in the relationship between victimization and self-concept and satisfaction with life through a moderate mediation model. The results indicated that self-concept mediated the relationship between victimization and life satisfaction, and EI moderated the negative influence of victimization on self-concept. The findings also allow to conclude that EI may moderate the relationship between victimization and life satisfaction through self-concept.

Furthermore, considering that previous research infers that emotional competence has shown to have a protective role on victims' mental health (Quintana-Orts et al., 2019), this work has achieved to deepen into the relationship between victimization and EI on self-concept and life satisfaction. In this sense, the results indicated that both self-concept and life satisfaction were negatively associated with victimization and positively associated with EI. In line with these findings, previous studies have identified that difficulties in peer relationships, like victimization, may have a myriad of negative consequences impacting healthy development of self-concept and life satisfaction (Blakely-McClure and Ostrov, 2016; Estévez et al., 2019a; Varela et al., 2019; Cañas et al., 2020). On another hand, several studies have indicated that high EI impacts the process necessary to achieve a positive self-concept (Furqani, 2020). Some authors have tried to explain this relationship by exposing that adolescents with high EI show better emotion management, which can contribute to their perceiving themselves more positively (Fernández-Berrocal and Extremera, 2006; Martínez-Monteagudo et al., 2019). Other works have also observed an association between EI and life satisfaction, indicating that EI can act as a predictor of life satisfaction (Kong et al., 2019). However, these works do not attribute this association to better emotion management, typical of EI, but instead, they suggest that several variables may be mediating this relationship.

The first hypothesis proposed in this study postulated that self-concept would mediate the association between victimization and life satisfaction. Taking into account that victimization was directly related to life satisfaction, the results obtained confirm this hypothesis since this relationship was mediated by self-concept. These data coincide with previous studies indicating that adolescents' assessment of their self-concept is closely related to the assessment of their lives, such that a positive self-concept is associated with high rates of life-satisfaction (Rodríguez-Fernández et al., 2016; Povedano-Diaz et al., 2020). Other works have even suggested that self-concept could predict youths' life satisfaction (Chui and Wong, 2016; Ortuño-Sierra et al., 2019; Povedano-Diaz et al., 2020). However, these works have not focused on the context of peer victimization.

Despite the difficulty of finding studies that include analysis of emotional variables in the context of peer victimization, some research could support the results of this study, indicating that self-concept may play an indirect role in the psychological well-being of adolescent victims of bullying (Norrington, 2020). In line with this research, it is tentative to assume that self-concept might mediate the relationship between victimization and life satisfaction. However, the evidence highlights that there are also other variables, such as hope and school connectedness, that may mitigate the effect of victimization on satisfaction with life in youths (Liu et al., 2020). Despite the fact that the self-concept is not the only mediator of this relationship, there are still important gaps in the literature about that. In this regard, the current study expanded the available knowledge on the subject by including self-concept as a mediator of the relationships between victimization and satisfaction with the life of students. That is why this first mediation analysis was especially useful, by allowing to obtain pioneering results in this field.

The second hypothesis of this study proposed that EI would moderate the negative relationship of victimization with self-concept and life satisfaction. The results supported partially this hypothesis since EI only moderated the impact of victimization on self-concept. These findings are consistent with previous works, which despite being focused on cybervictimization, have analyzed the influence of EI on emotional adjustment variables, such as self-concept in victims (Estévez et al., 2020). Although these studies do not confirm the moderating effect of EI between victimization and self-concept, the literature on cyberbullying suggests that victimization could have less impact on self-perception and self-assessment when victims have high levels of EI (Extremera et al., 2018). Based on these findings and taking into account that self-concept can act as a mediator in the relationship between victimization and satisfaction with life, the moderating effect of IE could be observed indirectly on satisfaction with life, by exerting its influence on through self-concept. The literature supports the idea that higher levels of EI promote the use of adaptive strategies in uncomfortable or difficult situations, preserving the positive assessment of life in general (Lopez-Zafra et al., 2019). Therefore, it is not strange to find studies suggesting that EI may act as a buffer between maltreatment experiences and life satisfaction (Harasemiw et al., 2019) by alleviating the emotional discomfort associated with these experiences (Zhao et al., 2019).

The results obtained in this research highlight, on the one hand, the role that self-concept plays in the relationship between victimization and life satisfaction. And on the other, the importance of the effect that EI has on self-concept and satisfaction with life in the context of peer victimization. Therefore, the data of this study underline the protective and moderating factor of EI on the negative impact that victimization has on the emotional adjustment of victims.

Strengths, Limitations, and Future Directions

To date, no such study analyzing the role of EI on the relationship of victimization with self-concept and life satisfaction has been carried out. The results of this study provide valuable insights into the moderating effect that EI has on the impact of victimization. Moreover, this study also highlights the role of self-concept as an important mechanism linking victimization and life satisfaction.

Despite the strengths of this study, it also has several limitations that must be taken into account for future research. A first limitation is based on the cross-sectional nature of the data, making it impossible to establish causal relationships between the variables examined. Future studies should carry out a longitudinal study, using measurements at different times to provide more information on causal relationships among the study variables. Second, it should be considered that, although the questionnaires were administered anonymously, self-administered instruments in adolescence could generate response bias, which affects the validity and generalizability of the data. Finally, it should be noted that the results of this study are limited to the adolescent stage from 11 to 18 years. It would be interesting to consider other samples to generalize the results to other ages or educational levels (early childhood education, primary, and higher education), or even school settings belonging to other cultures.

CONCLUSION

The present study has provided empirical evidence of the negative impact of victimization on victims' emotional adjustment. Besides, this study has also deepened our knowledge of the role of EI in the context of peer victimization, suggesting that EI should be considered as a personal resource whose effect is relevant to moderate the negative impact of victimization on emotional adjustment. Thus, this work contributes significantly to the scientific literature on peer victimization and its emotional impact in adolescence.

PRACTICAL IMPLICATIONS

This article offers several implications. First, self-concept development should be an integral part of bullying programs at school, as this could become decisive for the well-being of the victims. In this line, EI should be also considered as a personal resource that is relevant to the negative consequences associated with victimization. Besides, given the important impact on emotional adjustment (i.e., negative self-concept and low life satisfaction) related to victimization, greater development of EI in victims, and youth, in general, could reduce the negative outcomes of victimization. Specifically, schools could pay more attention to the emotional development of students and promote healthy relationships among schoolmates. Moreover, it is important and necessary for students to learn about the problems associated with bullying. In consequence, schools could be used to develop school-based, integrated bullying prevention programs aimed at increasing the emotional abilities of adolescents to protect them against, or at least mitigate, the negative consequences of being a victim of bullying (Estévez et al., 2019b). Also, educational programs on the Internet and social networking sites should implement good practices so that adolescents will develop a healthy use of these communication tools to detect violence and peer victimization problems (Martínez-Ferrer et al., 2018).

DATA AVAILABILITY STATEMENT

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

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethics Committee of the Miguel Hernández University, besides complying with the ethical values required for research with human beings and respecting the basic principles included in the Helsinki Declaration. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

All authors contributed to the development of this study and provided quality checks in data analyses and the writing of the final manuscript. JE and DA were responsible for data analyses and interpretation. EE obtained funding and was also responsible for data collection and study supervision. EC was responsible for data collection and the first draft of the manuscript.

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ORIGINAL RESEARCH
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Parenting Style and Cyber-Aggression in Chinese Youth: The Role of Moral Disengagement and Moral Identity

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Previous research has shown that parenting style is intricately linked to cyber-aggression. However, the underlying mechanisms of this relationship remain unclear, especially among young adults. Guided by the social cognitive theory and the ecological system theory, this study aimed to examine the effect of parenting style on cyber-aggression, the potential mediating role of moral disengagement, and the moderating role of moral identity in this relationship. Participants comprised 1,796 Chinese college students who anonymously completed questionnaires on parenting style, moral disengagement, moral identity, cyber-aggression, and demographic variables. After controlling for sex and age, parental rejection and over-protection were positively related to cyber-aggression; however, parental emotional warmth was non-significantly related to cyber-aggression. Mediation analysis revealed that parenting style was related to cyber-aggressive behavior through moral disengagement. Moderated mediation analysis further indicated that the indirect effect of parenting style on cyber-aggression was much stronger in college students with higher moral identity. The study carries important practical implications for parents and educators concerned about the destructive consequences of cyber-aggression.

Keywords: college students, parenting style, cyber-aggression, moral disengagement, moral identity

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INTRODUCTION

With the development of technology, cyber-aggression has dramatically increased in society. Cyber-aggression refers to any behavior aimed at intentionally harming individuals or groups of individuals that a person wishes to avoid (Zhao and Gao, 2012). It is enacted through digital devices such as smartphones, computers, and tablets. Cyberbullying is a subtype of cyber-aggression that has received considerable attention recently. It is focused on producing a power imbalance between perpetrators and victims (Olweus, 2013). However, research on cyber-aggression remains incipient. A previous study confirmed that despite the growing body of research regarding cyber-aggression among adolescents, studies involving young adults remain scarce (Zheng et al., 2016; Jin, 2018). In China, adolescents are forbidden to use mobile phones during school hours. However, young adults have more time and autonomy to surf the web, with college/university students comprising most of this population. Moreover, roughly 90% of all young adults devote considerable amounts of time to using the internet (Wright and Li, 2013),

and the prevalence of cyber-aggression is as high as 59.47% among Chinese young adults (Jin, 2018). Importantly, research suggests that participating in cyber-aggression increases the incidence of mental health problems and suicide ideation, regardless of whether the individual acts as a perpetrator, victim, or bystander (e.g., Van Geel et al., 2014; Kowalski et al., 2016). Given the scarcity of cyber-aggression research and the adverse effects associated with this behavior, studies examining the potential risks and protective factors of cyber-aggression are necessary.

According to the ecological system theory, an individual's family forms the first social context during development, and research indicates that parenting style is closely associated with the emergence of cyber-aggressive behavior (Bronfenbrenner and Morris, 2006; Dehue et al., 2012; Rajendran et al., 2016). Parenting style comprises three dimensions: rejection, emotional warmth, and over-protection (Arrindell et al., 1999). Rejection is characterized by criticism and coldness, with such parents treating their children in a hostile, deprecating, and inattentive manner. Emotional warmth is characterized by parents who support their children, show them consideration and affection, and make them feel accepted and affirmed. Over-protective parenting is determined by a high degree of intrusion, involvement in all the child's activities, and the imposition of harsh restrictions. According to the social learning theory, the external environment contributes to the emergence and maintenance of cyber-aggressive behavior, and parenting style forms a basic model for individuals' behavior (Bandura, 1986). Moreover, previous research indicates that cyber-aggression is related to high rejection (Georgiou, 2008b; He et al., 2016, 2017), low emotional warmth (Dehue et al., 2012; Floros et al., 2013; Elsaesser et al., 2017; Moreno Ruiz et al., 2019), and high over-protection (Floros et al., 2013). Furthermore, three meta-analyses indicated that parenting style is correlated with cyber-aggression (Lereya et al., 2013; Kowalski et al., 2014; Chen et al., 2016).

However, while extant literature demonstrates that parenting style influences cyber-aggression, there is a paucity of studies regarding the underlying mechanisms that may mediate/moderate this relationship. Thus, we theorized that moral disengagement may serve as a mediating factor, and moral identity may act as a moderating factor in the direct/indirect relationship between parenting style and cyber-aggression, when controlling for sex and age.

Moral disengagement refers to specific cognitive tendencies that are used to justify immoral actions, avoid moral condemnation, and commit immoral behaviors (Bandura et al., 1996). Therefore, it can be regarded as a type of cognitive distortion. Within the social cognitive theory of morality, Bandura posited that external social contexts can activate a series of internal moral self-regulatory mechanisms which facilitate behavioral outcomes such as prosocial behavior (Bandura, 1986). However, moral disengagement can be used to selectively deactivate these moral self-regulatory mechanisms (Bandura, 1999). From this perspective, individuals who are exposed to morally disengaged attitudes may develop methods of condoning their immoral behaviors. People are not passive recipients of environmental information; instead, they actively create cognitive inferences based on environmental cues to display corresponding behaviors (Bandura et al., 1996). Moreover, the first developmental precursors of moral disengagement are experienced with one's parents, such as repeated exposure to rejecting caretaking where parents behave in morally disengaged ways. Therefore, positive parenting which employs clear limits and appropriate discussion regarding the predictable consequences of violent behavior reduces moral disengagement, and thus reduces cyber-aggression. In contrast, negative parenting characterized by unresponsive or ineffective disciplinary approaches to resolving conflicts or disputes between parents and children, and the justification of parents' harmful acts (e.g., to help children correct their mistakes), increases moral disengagement and thus increases cyber-aggression. Based on the previous delineations, we theorized that parenting style operates through moral disengagement to produce cyber-aggression.

Supporting this theoretical framework, several studies have demonstrated that moral disengagement can serve as a potential mediator among family factors (e.g., negative parenting and parental attachment), aggression, and bullying (Pelton et al., 2004; Hyde et al., 2010; Yang and Wang, 2011; Bao et al., 2015). Nonetheless, when comparing traditional aggression and bullying with cyber-aggression and cyberbullying, participation in the latter two has been shown to have greater negative effects (Bonanno and Hymel, 2013). However, to our knowledge, no prior research has examined whether moral disengagement mediates the association between parenting style and cyberbullying/cyber-aggression. Furthermore, no such study has been conducted among Chinese young adults. Additionally, there are clear cultural differences between Western and Eastern countries. For example, compared with people from Western countries, Chinese people tend to spend more time with and allocate higher value to their families (Yao et al., 2014). In sum, we believe that moral disengagement may mediate the relationship between parenting style and cyber-aggression among Chinese young adults. Two further lines of evidence can support this argument.

First, several studies have shown that parenting style is associated with moral disengagement. Additionally, while individuals with a positive parenting style may have lower levels of moral disengagement, those with a negative parenting style may have higher levels of moral disengagement (Pelton et al., 2004; Yang and Wang, 2011; Liu and Lu, 2013; Qi, 2019). Furthermore, one study showed that experiencing a rejecting parenting style at the age of 2 years positively predicted moral disengagement at the age of 15 years (Hyde et al., 2010). Research involving students in Italian elementary and middle schools also showed that poor parenting positively predicted moral disengagement 1 year later (Campaert et al., 2018).

Second, moral disengagement is an important predictor of cyber-aggression (Pornari and Wood, 2010; Wachs, 2012; Lazuras et al., 2013; Bussey et al., 2015; Yang et al., 2015, 2018; Orue and Calvete, 2016; Wang et al., 2016; Zheng et al., 2016). Consistent with this assumption, a longitudinal study showed that moral disengagement was a common antecedent for adolescents' aggressive and delinquent behavior 1 year later (Hyde et al., 2010). Moreover, five meta-analyses showed that

moral disengagement was positively related to cyber-aggression (Gini et al., 2014; Kowalski et al., 2014; Wang et al., 2014; Chen et al., 2016; Killer et al., 2019).

Although parenting style may predict adults' cyber-aggression via moral disengagement, not all adults are equally influenced by parenting style. Therefore, only some adults exhibit cyber-aggressive behavior. This indicates that the relationship between parenting style and cyber-aggression may be moderated by individual characteristics. Accordingly, we propose that moral identity may influence this variation. Moral identity refers to the importance of morality in an individual's self-concept (Aquino and Reed, 2002). It has been firmly established by a series of studies as a positive correlate of prosocial behavior (Hardy et al., 2015; Reed et al., 2016) and as a negative correlate of antisocial behavior, including cyberbullying (Hardy et al., 2015; Kavussanu et al., 2015; Wang et al., 2017; Yang et al., 2018). Furthermore, a recent meta-analysis of almost 100 studies indicated that adolescents who highly value their moral identities are more engaged in moral behavior (Hertz and Krettenauer, 2016).

According to the social-ecological theory, the interaction between contextual and individual factors jointly predict cyber-aggression (Hong and Espelage, 2012). Additionally, the social cognitive theory posits that moral identity interacts with contextual factors to predict moral behaviors (Aquino et al., 2009). Thus, a strong moral identity enhances the accessibility of knowledge structures related to self-regulation and the promotion of moral behavior. However, in the presence of situational cues (e.g., violent video games), moral identity becomes less accessible (Kennedy et al., 2017). There is ample corroborating evidence suggesting that the interactions between moral identity and contextual factors predict aggression. For instance, the relationship between exposure to violent video games and cyberbullying varied according to moral identity levels among Chinese youth. Specifically, the association was weaker among youths with strong moral identities (Teng et al., 2020). Yang et al. (2018) empirically showed that having a higher moral identity weakened the mediating effect of moral disengagement in the relationship between interparental conflicts and cyberbullying. Some studies have also confirmed the association between moral identity and other predictors (e.g., school climate and trait anger) in cyberbullying (Hardy et al., 2015; Wang et al., 2017, 2019). However, to date, there is a lack of plausible evidence that moral identity may function as a moderating variable in the relationship between parenting style and cyber-aggression.

Thus, this study aimed to further investigate the links among parenting style, moral disengagement, moral identity, and cyber-aggression. Based on the social cognitive theory, we expected moral disengagement to be a mediator in the relationship between parenting style and cyber-aggression. Furthermore, we examined whether moral identity moderated the hypothetical mediation model linking parenting style and cyber-aggression via moral disengagement (see **Figure 1**). Accordingly, the following hypotheses were formulated:

- **Hypothesis 1**: Parenting style relates to cyber-aggression through moral disengagement.
- **Hypothesis 2**: The direct and indirect effects of parenting style on cyber-aggression via moral disengagement are moderated by moral identity levels. Specifically, the effects will be weaker under high moral identity conditions.

MATERIALS AND METHODS

Participants

This study was conducted at two universities in Chongqing, southwestern China. We employed a convenient cluster sampling technique to recruit 1,917 students to participate in the survey. Of these, 54 participants did not complete the surveys and were excluded from the analysis. After data cleaning, the final sample size was 1,796. The sample comprised 517 males, 1,218 females, and 61 participants of undisclosed sex. Participants' ages ranged from 16 to 27 years ($M = 19.45$, $SD = 1.80$). The sample size was calculated by G*Power. According to a previous meta-analysis, the relationship between positive parenting style and aggression is small yet significant ($r = -0.15$) (Lei et al., 2018). Accordingly, our calculations showed that a sample size of 1,796 could provide 95% statistical power to estimate the association between parenting style and cyber-aggression.

Instruments

Parenting Styles

The 21-item self-reported *Egna Minnen Beträffande Uppfostran* ("My Memories of Upbringing") short (s)-EMBU (Arrindell et al., 1999) scale was used to evaluate students' perceptions of parental rearing style. It comprised three subscales, namely rejection, emotional warmth, and over-protection. Rejection comprised seven items, with statements such as "It happened that my parents were sour or angry with me without letting me know the cause." Emotional warmth included 6 items, such as "My parents praised me." Finally, over protection had 10 items, including "It happened that I wished my parents would worry less about what I was doing." The items were rated on a 4-point Likert scale ranging from 1 (never) to 4 (always). We calculated average scores for each subscale. Higher scores in each subscale indicated a more frequent use of the corresponding parenting style. The Chinese version of the scale has shown adequate validity and reliability when applied to Chinese young adults (e.g., Sun and Li, 2015). In this study, the McDonald's omega reliability coefficients for the three subscales were between 0.71 and 0.85.

Cyber-Aggression

The 15-item Adolescent Online Aggressive Behavior Scale (AO-ABS; Zhao and Gao, 2012) was used to assess students' online behaviors for the previous 2 months. It comprised subscales of reactive aggression and instrumental aggression. Reactive aggression included seven items (e.g., "I often abuse others when playing online games") and instrumental aggression comprised 8 items (e.g., "I speak ill of someone with other friends on the internet"). Responses are rated on a 4-point Likert scale ranging from 1 (never) to 4 (always). Higher average scores

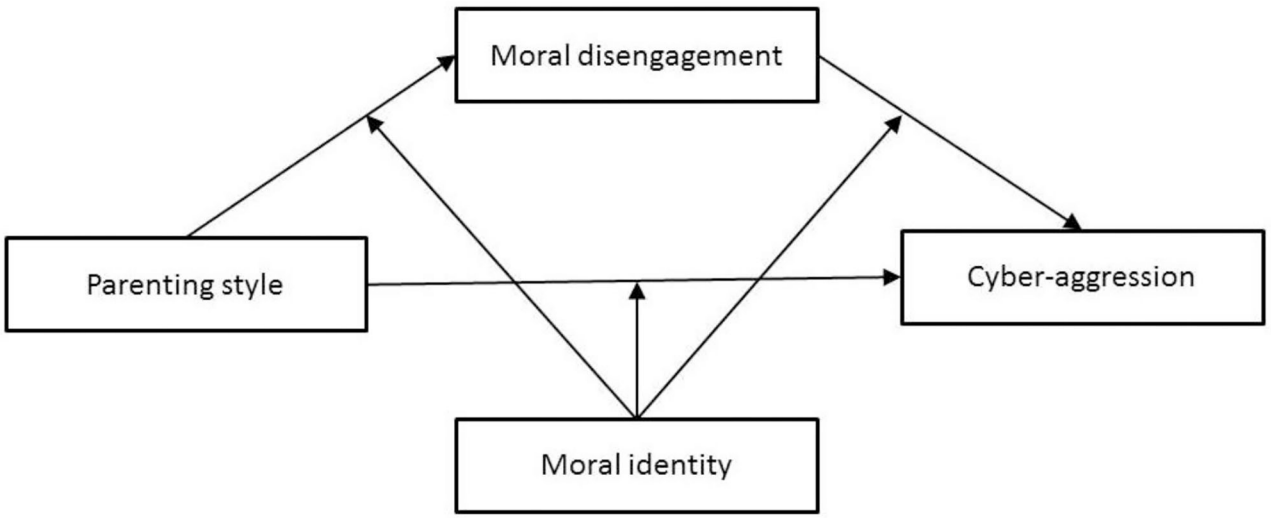

FIGURE 1 | The hypothetical moderated mediation model for the associations among parenting style, cyber-aggression, moral disengagement, and moral identity.

indicate a higher frequency of cyber-aggression. For this study, the McDonald's omega coefficient was 0.92.

Moral Disengagement

The 32-item Moral Disengagement Scale (Bandura et al., 1996) was used to assess 8 psychological mechanisms of moral disengagement. It comprises eight subscales, each with four items. These included moral justification (e.g., "It is alright to fight to protect your friends"); euphemistic labeling (e.g., "Slapping and shoving someone is just a way of joking around"); advantageous comparison (e.g., "Stealing some money is not too serious compared to those who steal a lot of money"); displacement of personal responsibility (e.g., "A kid in a gang should not be blamed for the trouble the gang causes"); diffusion of personal responsibility (e.g., "If a group decides together to do something harmful, it is unfair to blame any kid in the group for it"); distortion of consequences (e.g., "Teasing someone does not really hurt them"); attribution of blame (e.g., "If kids fight and misbehave in school, it is their teacher's fault"); and dehumanization of victims (e.g., "Some people deserve to be treated like animals"). Responses are rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). We calculated the average score of the total items. Higher scores indicated a higher level of moral disengagement. The scale showed good validity and reliability when applied to Chinese young adults (e.g., Yang and Wang, 2012). In the current study, the McDonald's omega coefficient was 0.93.

Moral Identity

The 10-item Moral Identity Scale (Aquino and Reed, 2002) was used to assess the centrality of morality in students' self-concepts. It comprised two subscales, each with five items. These were internalization (e.g., "It would make me feel good to be a person who has these characteristics") and symbolization (e.g., "I strongly desire these characteristics"). First, this scale asks participants to imagine a person who has a set of moral ideals (i.e., someone who is caring, compassionate, fair, friendly, generous, hardworking, honest, helpful, and kind). Next, participants rated the perceived level of importance of these moral ideals for each of the 10 items. Responses are rated on a 5-point Likert scale ranging from 1 (completely disagree) to 5 (completely agree). We calculated the average score of the 10 items. Higher scores indicated higher levels of moral identity. This scale demonstrated adequate validity and reliability (e.g., Aquino and Reed, 2002; Aquino et al., 2009). In the current study, the McDonald's omega coefficient was 0.81.

Procedure

The Research Ethics Committee at Southwest University reviewed and approved this study. All participants completed the questionnaires as outlined above in classrooms after providing written and oral informed consent. Demographic information, including age and sex, was also collected. In addition, all participants were informed that the questionnaires would remain anonymous and would be used in the analysis of the present research.

Data Analysis

We used IBM SPSS Statistics for Windows, version 23.0 to test for the missing mechanism and estimate the missing values. First, we compared the distributions of fully observed variables for a created indicator variable (1 = missing, 0 = complete) via *t*-tests and chi-square tests, with the aim of testing whether the missing data was dependent on any of the key variables (Little, 1988). Results were significant for over protection [$t_{(1838)} = -2.50$, $p = 0.01$] and age [$t_{(1839)} = 2.09$, $p = 0.04$]. This suggested that the data for these variables were missing at random (MAR), but not missing completely at random (MCAR). Findings were

TABLE 1 | Descriptive statistics and correlations among variables.

		1	2	3	4	5	6	7	8
1	Sex[a]	1							
2	Age	0.09**	1						
3	Rejection	−0.09**	−0.08**	1					
4	Emotional warmth	0.08**	0.03	−0.41**	1				
5	Over-protection	−0.07**	−0.13**	0.50**	−0.15**	1			
6	Moral disengagement	−0.22**	−0.09**	0.17**	−0.19**	0.13**	1		
7	Moral identity	0.11**	0.09**	−0.11**	0.30**	−0.05*	−0.35**	1	
8	Cyber-aggression	−0.11**	−0.06*	0.13**	−0.06*	0.09**	0.22**	−0.11**	1
M		0.70	19.45	1.31	3.05	2.03	1.68	4.14	1.05
SD		0.46	1.80	0.35	0.62	0.45	0.44	0.54	0.12

Sex: 0 = male, 1 = female.
**p<0.05, **p<0.01.*

insignificant for rejection, $t_{(1854)} = -1.95$, $p = 0.051$; emotional warmth, $t_{(1835)} = -1.22$, $p = 0.22$; moral disengagement, $t_{(1809)} = -0.57$, $p = 0.57$; moral identity, $t_{(1838)} = -0.34$, $p = 0.74$; cyber-aggression, $t_{(1848)} = -1.80$, $p = 0.07$; and sex, $\chi^2_{(1,N=1,800)} = 1.37$, $p = 0.24$. This suggested that these data were MCAR, but not MAR. When both MCAR and MAR occurred for the main variables, we used the maximum likelihood estimation (ML) method to fill in the missing values (Graham, 2009).

We used R software package 3.6.1 for data cleaning, since it is essential for researchers to identify invalid responses which may attenuate a study's power and increase the occurrence of type II errors in hypothesis testing (Meade and Craig, 2012). We excluded questionnaires that met any of the following conditions: the maximum number of consecutive items was equal to or greater than half the length of the total scale (Curran, 2016), the standard deviation of the last 30 items was close to zero (Meade and Craig, 2012; Dunn et al., 2018), or the correlation coefficient of psychometric synonymous items was below 0.60 (DeSimone et al., 2015).

Since the study employed the self-report method to collect data, it may have led to the common method bias effect. Therefore, an exploratory factor analysis of all items in the study was conducted to assess the severity of common method variation using the Harman single-factor test. The results showed that there were 28 factors with initial eigenvalues >1, and the largest one explained 12.79% of the total variance, which was <40%. The results of single-factor confirmatory factor analysis showed poor fit indices ($\chi^2/df = 9.09$, CFI = 0.189, TLI = 0.172, RMSEA = 0.095, SMRM = 0.116). Therefore, the common method bias in this study was negligible.

In our preliminary analyses, we used IBM SPSS Statistics for Windows, version 23.0 to calculate means, standard deviations, and Pearson correlations between interest variables, and the JASP 0.12.2 to conduct reliability analysis. In primary analyses, we used the SPSS macro PROCESS to test our models. When the skewness and kurtosis values are <2 and 7, respectively, the data distribution is accepted as normal (Curran et al., 1996). However, in our study, the distributions of cyber-aggression were skewed (skewness = 10.80, kurtosis = 235.50). The bootstrapping method does not assume normality when conducting statistical tests and constructing confidence intervals (Preacher and Hayes, 2008). Therefore, to investigate the mediation model and examine the mediating role of moral disengagement, we used PROCESS macro (model 4) with 5,000 bootstrap samples, which can provide an estimate at 95% confidence interval (CI) (Hayes, 2013). If the 95% CI of the index does not include zero, the index of the mediation is significant. We used PROCESS macro (model 59) to investigate the moderated mediation model and examine the moderating effect of moral identity on: (1) the relationship between parenting style and cyber-aggression (Model 1); (2) the relationship between parenting style and moral disengagement (Model 2); and (3) the relationship between moral disengagement and cyber-aggression (Model 3). If the 95% CI of the index did not include zero, the interaction effect was significant.

RESULTS

Preliminary Analyses

Table 1 lists means, standard deviations, and the correlations among sex, age, parenting style, moral disengagement, moral identity, and cyber-aggression. As expected, cyber-aggression was positively related to rejection ($r = 0.13$, $p < 0.01$), over-protection ($r = 0.09$, $p < 0.01$), and moral disengagement ($r = 0.22$, $p < 0.01$). It was negatively correlated with emotional warmth ($r = -0.06$, $p < 0.05$) and moral identity ($r = -0.11$, $p < 0.001$). Meanwhile, both rejection and over-protection showed positive relationships with moral disengagement ($r = 0.17$, $p < 0.01$; $r = 0.13$, $p < 0.01$, respectively) and negative relationships with moral identity ($r = -0.11$, $p < 0.01$; $r = -0.05$, $p < 0.05$, respectively). Furthermore, emotional warmth showed a negative relationship with moral disengagement ($r = -0.19$, $p < 0.01$) and a positive relationship with moral identity ($r = 0.29$, $p < 0.01$). Finally, greater moral identity was associated with lower moral disengagement ($r = -0.35$, $p < 0.01$).

TABLE 2 | Mediation of the association between parenting style and cyber-aggression through moral disengagement.

Predictors	Model 1 (Criterion: cyber-aggression)		Model 2 (Criterion: moral disengagement)		Model 3 (Criterion: cyber-aggression)	
	b	*t*	*b*	*t*	*b*	*t*
Sex	−0.02	−3.91***	−0.20	−8.83***	−0.02	−2.32*
Age	−0.003	−1.93	−0.02	−2.92**	−0.002	−1.43
Rejection	0.04	4.92***	0.18	6.17***	0.03	3.84***
Moral disengagement					0.05	7.51***
R^2	0.03		0.08		0.06	
F	16.70***		47.74***		27.03***	
Sex	−0.03	−4.13***	−0.20	−8.75***	−0.02	−2.47*
Age	−0.004	−2.22*	−0.02	−3.11**	−0.002	−1.66
Emotional warmth	−0.01	−1.93	−0.13	−7.47***	−0.003	−0.53
Moral disengagement					0.05	7.91***
R^2	0.02		0.09		0.05	
F	9.76***		53.97***		23.22***	
Sex	−0.03	−4.13***	−0.20	−9.05***	−0.02	−2.43*
Age	−0.003	−1.92	−0.02	−2.30**	−0.002	−1.42
Over-protection	0.02	2.84**	0.10	4.33***	0.01	2.05*
Moral disengagement					0.05	7.88***
R^2	0.02		0.07		0.05	
F	11.23***		40.90***		24.26***	

Each column is a regression model that predicts the criterion at the top of the column.
**p < 0.05, **p < 0.01, ***p < 0.001.*

Testing for the Mediation Effect

As illustrated in Model 2 (**Table 2**), moral disengagement had a positive influence on rejection ($b = 0.18$, $p < 0.001$) and over-protection ($b = 0.10$, $p < 0.001$), and a negative influence on emotional warmth ($b = -0.13$, $p < 0.001$). In Model 3, both rejection ($b = 0.03$, $p < 0.001$) and over-protection ($b = 0.01$, $p < 0.05$) positively influenced cyber-aggression. However, emotional warmth did not significantly influence cyber-aggression ($b = -0.003$, $p > 0.05$). In addition, moral disengagement, which was independent of rejection, showed a positive influence on cyber-aggression ($b = 0.05$, $p < 0.001$). Moral disengagement, which was independent of emotional warmth, showed a positive influence on cyber-aggression ($b = 0.05$, $p < 0.001$). Moral disengagement, which was independent of over-protection, showed a positive influence on cyber-aggression ($b = 0.05$, $p < 0.001$). These results indicated that moral disengagement mediated: (1) the association between rejection and cyber-aggression (indirect effect = 0.009, SE = 0.002, 95%CI = [0.006,0.013]); (2) the association between emotional warmth and cyber-aggression (indirect effect = −0.007, SE = 0.001, 95%CI = [−0.009, −0.004]); and (3) the association between over-protection and cyber-aggression (indirect effect = 0.005, SE = 0.001, 95%CI = [0.003, 0.008]). Thus, Hypothesis 1 was supported.

Testing for the Moderated Mediation

As illustrated in **Table 3**, Model 1 demonstrated that both rejection ($b = 0.04$, $p < 0.001$) and over-protection ($b = 0.02$, $p < 0.01$) were significantly related to cyber-aggression. However, emotional warmth was non-significantly related to cyber-aggression ($b = -0.004$, $p > 0.05$). Furthermore, the interactions between parenting styles and moral identity were all non-significant when predicting cyber-aggression. Model 2 indicated that rejection ($b = 0.14$, $p < 0.001$), emotional warmth ($b = -0.06$, $p < 0.001$), and over-protection ($b = 0.09$, $p < 0.001$) were significantly related to moral disengagement. However, the relationships between parenting styles and moral disengagement were not moderated by moral identity. Finally, when controlling for rejection, emotional warmth, and over-protection, the interaction between moral disengagement and moral identity in predicting cyber-aggression was significant ($b = 0.03$, $p < 0.05$; $b = 0.02$, $p < 0.05$; and $b = 0.03$, $p < 0.05$, respectively). Results of the simple slope tests showed that when moral identity was high (i.e., 1 *SD* above the mean), the positive relationship between moral disengagement and cyber-aggression was also high ($b_{\text{simple}} = 0.64$, $p < 0.001$). When moral identity was low (i.e., 1 *SD* below the mean), the positive relationship between moral disengagement and cyber-aggression was significant ($b_{\text{simple}} = 0.37$, $p < 0.001$; see **Figure 2**), albeit much weaker than when moral identity was high.

Furthermore, we examined the extent to which moral identity conditionally moderated the mediation effect of moral disengagement based on the bootstrapping results. The indirect effect of rejection was significant and stronger when moral identity was high (indirect effect = 0.011, SE = 0.003, 95%CI = [0.005, 0.018]) than when it was low (indirect effect = 0.004, SE = 0.002, 95%CI = [0.001, 0.008]). Moreover, although the indirect effect of emotional warmth was significant when moral

TABLE 3 | Results of the moderated mediation model for the effects of parenting styles on cyber-aggression.

Predictors	Model 1 (Criterion: cyber-aggression)		Model 2 (Criterion: moral disengagement)		Model 3 (Criterion: cyber-aggression)	
	b	*t*	*b*	*t*	*b*	*t*
Sex	−0.02	−3.63***	−0.17	−8.02***	−0.02	−2.33*
Age	−0.002	−1.46	−0.01	−1.47	−0.002	−1.20
Rejection	0.04	4.60***	0.14	5.17***	0.03	3.76***
Moral identity	−0.02	−3.40**	−0.26	−14.08***	−0.01	−1.03
Rejection × Moral identity	0.01	0.93	0.05	1.07	0.003	0.24
Moral disengagement					0.05	6.94***
Moral disengagement × Moral identity					0.03	2.21*
R^2	0.04		0.17		0.06	
F	12.30***		71.23***		16.17***	
Sex	−0.02	−3.85***	−0.17	−8.11***	−0.02	−2.48*
Age	−0.003	−1.84	−0.01	−1.84	−0.002	−1.47
Emotional warmth	−0.004	−0.85	−0.06	−3.84***	−0.001	−0.20
Moral identity	−0.02	−3.44**	−0.25	−12.88***	−0.01	−1.14
Emotional warmth × Moral identity	−0.01	−1.21	−0.003	−0.09	−0.01	−0.65
Moral disengagement					0.05	7.37***
Moral disengagement × Moral identity					0.02	2.08*
R^2	0.02		0.17		0.06	
F	8.34***		68.25***		14.11***	
Sex	−0.02	−3.78***	−0.18	−8.13***	−0.02	−2.43*
Age	−0.002	−1.42	−0.01	−1.29	−0.002	−1.18
Over-protection	0.02	2.66**	0.09	4.02***	0.01	1.99*
Moral identity	−0.02	−3.71***	−0.27	−14.41***	−0.01	−1.19
Over-protection × Moral identity	0.01	0.71	0.03	0.76	0.001	0.12
Moral disengagement					0.05	7.21***
Moral disengagement × Moral identity					0.03	2.24*
R^2	0.03		0.17		0.06	
F	9.44***		68.74***		14.64***	

Each column is a regression model that predicts the criterion at the top of the column.
**p < 0.05, **p < 0.01, ***p < 0.001.*

identity was high (indirect effect = −0.004, SE = 0.002, 95%CI = [−0.008, −0.001]), it was weaker and non-significant when moral identity was low (indirect effect = −0.002, SE = 0.001, 95%CI = [−0.005, 0.000]). The indirect effect of over-protection was much weaker when moral identity was low (indirect effect = 0.003 SE = 0.001, 95%CI = [0.001, 0.0060]) than when it was high (indirect effect = 0.007, SE = 0.002, 95%CI = [0.003,0.011]). Therefore, Hypothesis 2 was partially supported.

DISCUSSION

While previous research has demonstrated the relationship between parenting style and cyber-aggression, the underlying mechanisms of this association remain unclear. Therefore, this study aimed to examine the mediating effect of moral disengagement and the moderating effect of moral identity in the relationship between parenting style and cyber-aggression among Chinese young adults. Through the moderated mediation model proposed by the social cognitive and social ecological theories. This study suggested that parenting styles contributed to moral disengagement, which in turn, on cyber-aggression. Moreover, the mediating effect of moral disengagement in the relationship between parenting styles and cyber-aggression increased when participants have a high levels of moral identity.

The Mediating Effect of Moral Disengagement

Consistent with previous research (Dehue et al., 2012; Lereya et al., 2013; Rajendran et al., 2016; Elsaesser et al., 2017; Moreno Ruiz et al., 2019), we found that cyber-aggression was positively

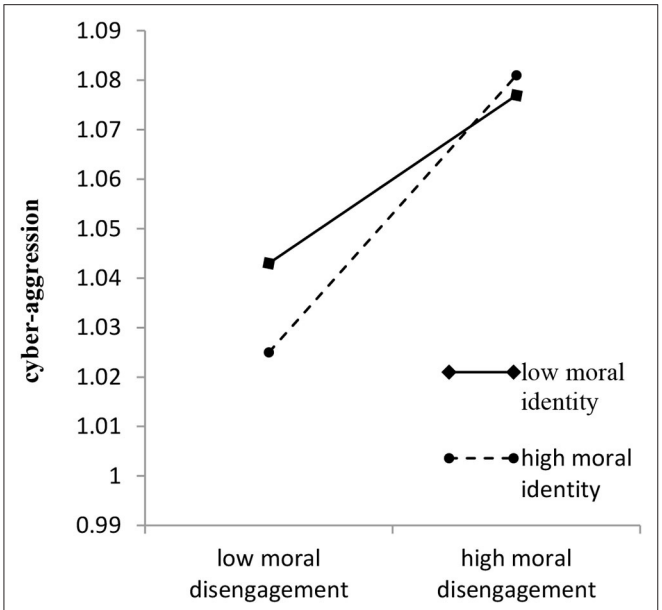

FIGURE 2 | Effects of moral disengagement and moral identity on the prediction of cyber-aggression.

correlated with rejection and over-protection. Bronfenbrenner and Morris (2006) ecological theory proposed that the family ecosystem has a significant effect on the physical, psychological, and social development of family members. Bandura (1986) social learning theory indicated that the daily interactions with parents provided a model for individuals to interact with others. That is, if parents use aggressive behaviors (e.g., quarrels, insults, and violence) to address problems and conflicts, their children may exhibit more aggressive behaviors toward others. Moreover, parents with rejecting or over-protective parenting styles are likely to neglect their children's daily behaviors and fail to effectively supervise and guide their online activities. Therefore, their children are more likely to participate in cyber-aggression (Flouri and Buchanan, 2003; Georgiou, 2008a). However, emotional warmth was not related to cyber-aggression. While numerous studies have shown that positive parenting is beneficial to children's mental health (Ok et al., 2010; Kowalski et al., 2014; Vasquez et al., 2016), a study among 180 Israeli students showed that positive parenting (i.e., autonomy-supportive parenting style) was not a positive predictor of preventing cyberbullying (Katz et al., 2019). This may be because positive parenting is not solely sufficient to prevent cyber-aggression; other factors, such as the proactive development of conflict-resolution skills and strategies, are required (Livingstone et al., 2011). However, parents who engage in the emotional warmth parenting style can guide their children's behaviors and openly discuss the risks of internet use. Therefore, their children are less likely to engage in cyber-aggression. The above-mentioned literature corroborated our results.

As expected, this study demonstrated the mediating role of moral disengagement in the relationship between parenting style and cyber-aggression. Previous studies have indicated that moral disengagement acted as a mediator in the relationship between contextual factors (e.g., school environment, violent video games) and aggression (Teng et al., 2019), including cyberbullying (Wang et al., 2019). However, to our knowledge, the current study is the first to provide evidence that the impact of parenting style on cyber-aggression is mediated by moral disengagement among Chinese young adults. In previous aggression research, the social ecological theory emphasized that ecological systems, such as one's family, served as both protective or risk factors for adolescents (Moreno Ruiz et al., 2019). However, the social cognitive theory emphasized the detrimental effect of moral disengagement (Killer et al., 2019). By integrating these two theories, we were able to explore the influence of not only parenting style on moral disengagement but also moral disengagement as a mediating variable in the relationship between parenting style (i.e., contextual factors) and cyber-aggression.

Furthermore, our findings demonstrated that parenting style was significantly related with moral disengagement, which is consistent with previous research (e.g., Pelton et al., 2004; Hyde et al., 2010). Individuals who were raised with higher levels of rejection or over-protection and lower levels of emotional warmth tend to have difficulties in feeling remorse over misconduct, which reflects the way they were treated by their parents. Accordingly, these individuals tend to gradually disengage from moral standards.

Consistent with social cognitive theory and previous studies (e.g., Bussey et al., 2015; Orue and Calvete, 2016), our research showed that moral disengagement was a useful predictor of cyber-aggression. That is, when individuals are more successful in disengaging from moral standards, they tend to feel less guilt and engage more in cyber-aggression. In sum, our study findings supported moral disengagement as a mediating mechanism through which parenting style influences cyber-aggression in adulthood.

The Moderating Effect of Moral Identity

The present study showed that the predicted path linking moral disengagement and cyber-aggression was moderated by moral identity. Specifically, young adults with lower moral identities showed a weaker link between moral disengagement and cyber-aggression; this finding contradicts that of previous studies (Wang et al., 2017). However, our finding is congruent with the self-consistency of Blasi (1983)'s Self Model, which proposes that individuals wish to behave consistently with their self-concept. That is, if morality is central to a person's self-concept, this can evoke moral behaviors. For example, an adult with a high moral identity may deem it important to be a moral person. If this individual was to behave immorally, they would have to make greater efforts to morally disengage, compared to someone with a low moral identity. Aquino and Reed (2002) social cognitive theory of moral identity posits that a higher moral identity may cause us to focus more on the interests and needs of others (Winterich et al., 2009). Based on our findings and prior research, high moral identity is necessary to reduce cyber-aggressive behavior. Furthermore, solely reducing

moral disengagement may have a relatively small impact on cyber-aggression. Thus, both enhancing moral identity and reducing moral disengagement may help to more effectively decrease cyber-aggression.

Contrary to our expectations, the first part of the mediation model (i.e., parenting style→ moral disengagement) and the direct association between parenting style and cyber-aggression were not moderated by moral identity. These results contradict previous findings, which demonstrated that moral identity moderated the association among a contextual factor, moral disengagement, and aggression (Wang et al., 2019; Teng et al., 2020). This may be attributed to the presence of situational cues that can mitigate the relationship between moral identity and immoral action. For example, a study showed that the recency and a continuous reinforcement of situational activation (e.g., an immoral action) may temporarily reduce the accessibility of moral identity (Aquino et al., 2009). That is, regardless of moral identity levels, contextual factors (e.g., parenting styles) may powerfully influence moral cognition and behavior. Further research is necessary to elucidate the moderating effect of moral identity in the relationship between cyber-aggression and parenting styles.

LIMITATIONS AND PRACTICAL IMPLICATIONS

Our study has several limitations. First, we relied on self-reported instruments to collect data, which facilitates social desirability and common method biases. Thus, observational and experimental studies using multi-methods and evaluators (e.g., interviews) are necessary to address this shortcoming. Second, this study had a cross-sectional design, thus hindering the assessment of causality in the studied relationships. Accordingly, future longitudinal and experimental studies are necessary to confirm the reliability and effectiveness of our findings.

Nonetheless, this research also presents important practical implications for preventing and intervening in cyber-aggression. The moderated mediation developed and confirmed by us both explains how parenting style affects cyber-aggression and demonstrates when this link is most potent. Thus, interventions for the reduction of cyber-aggression in China should focus on parental education programs to raise awareness of how parents' rearing styles can influence their children's engagement in cyber-aggression. Moreover, school-level interventions must focus on strategies to decrease moral disengagement and to improve moral identity to help reduce cyber-aggression more effectively in adulthood.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/**Supplementary Material**, further inquiries can be directed to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by The Research Ethics Committee at Southwest University. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

All authors participated and contributed in study design. CC collected the experimental data. YZ and ZT analyzed and interpreted the data. YZ, ZT, and CG drafted the work. Besides, all authors read and approved the final manuscript.

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SUPPLEMENTARY MATERIAL

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Rejection Sensitivity and Psychological Capital as the Mediators Between Attachment Styles on Social Networking Sites Addiction

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This study was based on the framework of attachment, reinforcement sensitivity, and positive psychology theories. The main objective is to investigate rejection sensitivity and psychological capital as the mediators between attachment styles on social networking sites addiction. The sample comprised 607 college students, and the data was collected using an online survey owing to the rapid development and penetration of social networking sites in China. Results demonstrated a mediating effect between rejection sensitivity, psychological capital, and attachment styles on social networking sites addiction. Moreover, fearful style is predicted significantly and positively on social networking sites addiction. Preoccupied style and dismissive-avoidant style are not significant effect on social networking sites addiction after adding the mediating variables of rejection sensitivity and psychological capital. Furthermore, attachment styles also influence the social networking sites addiction due to their dual effect on rejection sensitivity and psychological capital. Overall, the findings suggest that weakening rejection sensitivity, and enhancing psychological capital can be considered in future studies as contributors to social networking sites addiction for prevention or intervention studies.

Keywords: secure attachment, insecure attachment, social networking sites addiction, positive psychological capital, rejection sensitivity

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INTRODUCTION

With the growth in popularity of social networks and Wi-Fi, Social Networking Sites (SNS) are now the most popular and ubiquitous communication tools, especially among young people. The emergence of social networks has profoundly changed the way of human communication (Firth et al., 2019). However, excessive social networking sites' behaviour or problematic SNS usage is considered a behavioral addiction. Furthermore, according to Griffiths (2005), criteria for addictive behavior include salience, mood modification, tolerance, withdrawal, conflict, and relapse. Most of the traits that meet this standard are considered addictive behaviors.

Currently, there is no unified definition of SNS addiction. Some existing studies define SNS addiction as online social networking sites addiction (Andreassen, 2015) or problematic social networking sites usage (Hou et al., 2017), or pathological Internet use (Carli et al., 2013; Maroma et al., 2019). SNS addiction is one of the primary forms of Internet addiction (Griffiths et al., 2014). Limited evidence in the literature suggests that SNS addiction does not depend on a specific

substance, unlike general addiction (Young, 2009; Van Rooij and Prause, 2014). SNS addiction refers to an excessive focus on the utility of social networking sites, which results in a loss of control in the investment of time and energy, even ignoring the development and maintenance of interpersonal relationships in real life (Kuss and Griffiths, 2011). Besides the uncontrolled visiting of SNS, online social networking reduces the level of an individual's mental health (Schou Andreassen et al., 2016), unhealthy food intake, shopping addiction (Tang and Koh, 2017), and other social functioning states (Alzougool, 2018).

Empirical research has revealed that the main factors of SNS addiction are generally summarized as personality factors, social-cultural factors, and behavioral reinforcing factors, such as neuroticism and impulsive personality of individuals (Abbasi and Drouin, 2019; Evren et al., 2019). In addition, individuals with self-esteem, lower general self-efficacy, loneliness, social anxiety, emotional stability, and narcissism are more likely to be predictors of SNS addiction (Hawi and Samaha, 2017; Atroszko et al., 2018; Hawi and Samaha, 2019). Additionally, the desire to fulfill an individual's psychological needs and privacy concerns are also important factors affecting their SNS addiction (Chen and Kim, 2013).

Growing scientific evidence shows that excessive SNS use is closely associated with an unhealthy psychological problem, like more depression symptoms (Lin et al., 2011; Giota and Kleftaras, 2013; Shensa et al., 2017), anxiety (Dhir et al., 2018), and poor sleep (Woods and Scott, 2016). Furthermore, students who overuse social networking sites have maladaptive cognitions (Pontes et al., 2018; Turel and Serenko, 2020), decreased executive control like low self-control (Brevers and Turel, 2019), the worse performance of academic achievement (Tartari et al., 2019), and mental health problem (Rasmussen et al., 2020), among others. Therefore, it is crucial to understand the internal formation mechanism of how to use SNS rationally. Several previous studies have focused on the factors of addiction regardless of the individual's traits. The individual's personality characteristics or tendencies are often affected by her or his cognitive and attention biases and thus produce different behavioral responses. Given these previous findings, the current study hypothesizes the influence of attachment styles on SNS addiction.

Based on the attachment theory, the early relationship pattern between the children and the caregiver promotes the formation of the children's personality characteristics and internal work pattern of social interaction. More importantly, it is relatively stable and lasts into adulthood (Bretherton, 1992). Attachment styles positively correlated with the physical and mental health of individuals. Moreover, maternal insecure attachment influenced children's risk of poor behavioral outcomes via direct and indirect intermediary pathways (Cooke et al., 2019). Researchers mainly divided attachment styles into two major dimensions: attachment anxiety and attachment avoidance, which further constitute four attachment types: secure style (low anxiety, low avoidance), dismissive-avoidant style (low anxiety, high avoidance), preoccupied style (high anxiety, low avoidance), and fearful-avoidant style (high anxiety, high avoidance) (Bartholomew and Horowitz, 1991; Li and Kato, 2006). The latter three of these categories are all insecure attachment styles. These different forms of insecure attachments are linked to various coping strategies.

The connection between attachment styles and SNS addiction is still controversial. Individuals with different attachment styles use different attachment strategies in threat situations (Bowlby, 1982). Attachment anxiety individuals employed excessive activation attachment strategy (i.e., hyper-activating strategy), and attachment avoidance individuals utilized deactivating strategy (Lopez and Brennan, 2000). Some studies have shown that the attachment anxiety dimension is positively correlated with SNS addiction, while the attachment avoidance dimension showed no significant moderating effect (Chen et al., 2019). The former implies that individuals need to seek external support and comfort, and the latter refers to individuals who characterized by an inactive attachment system, including inhibition of an individual's psychological needs, interpersonal needs, keeping a social distance from others, among others factors (Chen, 2019; Lin et al., 2019). However, it is not sufficient to explain the correlation between attachment styles and SNS addiction only from attachment anxiety or avoidance dimensions. A consideration of different attachment styles offers a potential opportunity to research the behavioral mechanism of individual SNS addiction with the possibility of uncovering new knowledge in this context. This rationale inspired the current study.

Some existing studies suggest that individuals with insecure attachment styles are easily prone to high rejection sensitivity and experience more negative emotions, whereas individuals with attachment avoidance have a personality trait of rejection sensitivity (Marshall, 2019; Sato et al., 2019). Rejection sensitivity is a personality disposition that is overly sensitive to social rejection. It is mainly manifested as anxious or angry expect, readily perceive, and overreact (Gao et al., 2021). Previous studies have also shown that rejection sensitivity is closely related to attachment styles. Individuals with anxious attachment styles (preoccupied and fearful) significantly positively correlation with rejection sensitivity (Khoshkam et al., 2012). Individuals with high rejection sensitivity tend to think that others would reject them, and they would react with anger or negative emotions (Mor and Inbar, 2009). Other studies also showed that individuals with higher rejection sensitivity exhibit higher social anxiety and depression (Hundt et al., 2007), related to peoples' negative expectations of an interpersonal relationship (Harnett et al., 2013; Thomas and Bowker, 2015). Therefore, a higher individual's rejection sensitivity will result in a corresponding higher individual's social anxiety.

Furthermore, due to the availability of a wide variety of social networking platforms, individuals with interpersonal problems are exposed to more psychological and social capital in real life through SNS. Psychological capital is an essential psychological element of the individual's initiative and transcends beyond human and social capital (Luthans et al., 2006). It includes four constructs: self-efficacy, hope, optimism, and resilience. Its overall effect is greater than that of each contributing construct. A change in one of the constructs leads to a change in other constructs (Luthans et al., 2004; Luthans et al., 2015).

According to Hobfoll's Conservation of Resources Theory (Hobfoll, 2001), psychological capital as a valuable personal resource for coping with stress and burnout has been proposed (Abbas and Raja, 2015; Meseguer de Pedro et al., 2021). Krasikova et al. (2015) suggest that individuals with higher levels of psychological capital are less likely to receive diagnoses for mental health problems and substance abuse. Generally speaking, the more positive psychological capital an individual attains, the more optimistic the individual becomes, and the higher the level of mental health.

Studies have confirmed the correlation effect psychological capital plays as a mediator of risk perception. The higher the level of psychological capital, the higher the negative correlation with negative belief and risk perception (Peng et al., 2019; Ye et al., 2020). The current study investigates the notion of the influence of positive psychological theory.

Meanwhile, there exists a connection between psychological capital and rejection sensitivity. Studies have found that rejection sensitivity affects the individual's mental health through perception and reaction to rejection cues, a response such as anxiety, depression, among others (Downey et al., 2004). Other studies have further shown that positive sensitivity increases an individual's positive psychological capital, and it also plays a crucial role in improving mental health. The level of psychological capital reflects an individual's perception of the potential danger of rejection sensitivity. A high psychological capital level reduces the individual's perception of the potential of rejection sensitivity. Conversely, the lower the level of psychological capital, the more the individual's perceived rejection sensitivity (Peterson et al., 2008; Youssef-Morgan and Petersen, 2019). According to the Reinforcement Theory (Corr, 2004), the impact of SNS on the individual can be positive and negative depending on the attachment styles. The higher the rejection sensitivity, the higher the level of insecure attachment. Therefore, this study also hypothesized that attachment styles influence psychological capital through rejection sensitivity, which influences SNS addiction. Hence, the following hypotheses are put forward:

H1: There is a significant relationship between attachment styles and SNS addiction.
H2: Rejection sensitivity and psychological capital play a multi-chain mediating role between attachment styles and SNS addiction.
H3: Rejection sensitivity and psychological capital play a multi-chain mediating role between secure style, dismissive-avoidant style, fearful-avoidant style, preoccupied style and SNS addiction.

In summary, under the attachment theory, reinforcement sensitivity theory, cognitive-behavioral system theory and positive psychology theory framework, and using psychological capital and rejection sensitivity as mediating variables, this research investigated the effects of attachment styles on SNS addiction. The hypothesis model is presented in **Figure 1**.

MATERIALS AND METHODS

Participants

We recruited 789 students, and all were college students from Henan province in Central China. First, we randomly selected two comprehensive universities located in Zhengzhou, the capital city of Henan province. A private university and the other is a public university. They all have a representative of its diverse culture and rich specialities. Next, we randomly selected students from different majors and classes from freshman to seniors to participate. We obtained the data for this research via an online questionnaire according to the Sojump software. We send the questionnaire link to the student and let them decide whether to answer the question or not. Before participation, they could quit participation anytime they wanted without attracting any negative consequences. Participants were recruited voluntarily and received no rewards for their participation. The beginning part of the online questionnaire clearly states the purpose of the study and what to pay attention to when answering the questions, and each questionnaire has corresponding instructions. If there are missing questions or not completed, they cannot be submitted. Moreover, we also explained the guidelines concerning confidentiality, authenticity, and questionnaire completion method to participants at the beginning part of the online questionnaire. The survey was conducted between March 2020 and April 2020. In preprocessing the data, questionnaires from participants whose response time was lower than 240s and longer than the 1800s were considered invalid, and therefore, removed from the overall sample data. We set this criterion to ensure that participants provide valid responses that meet the objective of our research. In this regard, we eliminated 182 invalid responses. After eliminating invalid responses, a total of 607 (385 Females; 222 Males, Age range = 18–23 years, M±SD = 19.24 ± 1.01) valid responses data were retained and included for further analysis.

Measures

Social Networking Sites Addiction Scale

The Chinese social networking sites addiction scale (Wang, 2016; **Supplementary Appendix A**) consists of 18 items, categorized into three dimensions: compulsive (e.g., As long as I can connect to the Internet, I will check my social network messages), emotional change (e.g., I feel depressed when I can't use social networks), and social adaptability (e.g., I would be happy to get more attention and comments on social networks). Each item adopted a 5-point Likert-type scale (*1 = disagree to 5 = completely agree*), with higher scores indicating a higher level of SNS addiction. In this study, the Cronbach's α value for the SNS addiction scale was 0.939. The obsessive-compulsive dimension Cronbach's α value was 0.824, the emotional change dimension Cronbach's α value was 0.864, and the social adaptability Cronbach's α value was 0.866.

Experiences in Close Relationship Scale

The Chinese Experiences in Close Relationship (ECR) scale version (Li and Kato, 2006; **Supplementary Appendix B**),

consists of 36 measurement items (18 anxiety-based and 18 avoidance-based) for evaluating attachment styles. Each item adopted a 7-point Likert scale ranging from 1 (*disagree*) to 7 (*completely agree*). The odd-numbered items were scored for the attachment avoidance dimension (e.g., I prefer not to show a partner how I feel deep down), and the even-numbered items were scored for the attachment anxiety dimension (e.g., I worry about being abandoned). Based on the two dimensions, we divided the scores into four categories: secure style, dismissive-avoidant style, preoccupied style, and fearful-avoidant style. The scale of this study has a high Cronbach's α value of 0.867. As for the avoidance-based dimension and anxiety-based dimension, we obtained a Cronbach's α values of 0.785 and 0.909, respectively.

Positive Psychological Capital Scale

The four elements of the Positive Psychological Capital scale (Zhang et al., 2010; **Supplementary Appendix C**) are self-efficacy (e.g., Many people appreciate my talents), resilience (e.g., When encountering setbacks, I can recover quickly), hope (e.g., I study and work actively to realize my dream), and optimism (e.g., I think the future is full of hope), with a total of 26 items. The evaluation of each dimension was carried out according to the Likert seven-point scale ranging from 1 (disagree) to 7 (completely agree). The higher the score on this scale, the better the positive psychological capital status. The scale of this study has a high Cronbach's α value of 0.926. The Cronbach's α values for self-efficacy, resilience, hope, and optimism were 0.764, 0.711, 0.870, and 0.856, respectively.

Rejection Sensitivity Scale

The Rejection Sensitivity scale (Downey and Feldman, 1996; Zhao et al., 2012; **Supplementary Appendix D**) is mainly composed of 18 scenarios that college students need in their daily lives. The response of the subjects to each scenario consists of two dimensions: the degree of anxiety about rejection (e.g., You ask your friend to do you a big favor. How concerned or anxious would you be over whether or not your friend would do this favor?) and the expected degree of acceptance (e.g., You ask your friend to do you a big favor. I would expect that he/she would willingly do this favor for me.). The former used a 6-point Likert-type scale (*1= not worried at all to 6= very worried*), with higher scores indicating a higher level of anxiety and worry about rejection. Each of the latter dimension used a 6-point Likert-type scale (*1= completely impossible to 6= very likely*). A higher score on this scale indicates the possibility of high acceptance by others. Thus, the rejection sensitivity score is a product of the reverse score of rejection anxiety degree and acceptance expectation degree. The rejection sensitivity questionnaire recorded a Cronbach α value of 0.902, 0.910 for the anxiety dimension of rejection, and 0.928 for the expectation dimension of acceptance, respectively.

Statistical Analysis

Firstly, a common variance bias analysis was conducted with a factor analysis for testing common variances biases. All data were collected and processed electronically using SPSS Statistics 23.0 (IBM Corp., Armonk, NY, United States). Secondly, descriptive and correlation statistics were performed to analyze the scores obtained for the four scales. Thirdly, multiple mediation regression analysis was conducted using the PROCESS (Hayes et al., 2017) procedure. Finally, we used the Bootstrap method (with 5,000 samples) and selected model 6, which produced a 95% bias-corrected confidence interval (excluding zero), indicating a significant effect at $p \leq 0.05$ on the hypothesized research model.

RESULTS

Common Variance Bias

Process control and Harman factor analysis were used for possible common method deviations. Throughout the questionnaire application, we emphasized anonymity, confidentiality, and the fact that we used the questionnaire results for academic research purposes. Harman factor analysis found that the characteristic values of 16 factors were greater than 1, and the amount of variation explained by the first factor was 16.745%, far less than the 40% critical criterion. Therefore, the common variance bias in this study presented no significant issues.

Descriptive and Correlation Statistics

Table 1 presents a summary of the Pearson correlation analysis results of the four primary constructs model. The descriptive statistics found that attachment styles were negatively correlated with rejection sensitivity and positively correlated with psychological capital, which, in turn, negatively correlated with SNS addiction. However, the connection between psychological capital and SNS addiction indicated a significant but negative correlation. Moreover, the significant correlation between variables provides a basis for the test of multiple mediating effects.

Mediating Analysis

In **Table 2**, we present the results of the mediation analysis. While controlling for age and gender as demographic variables, we

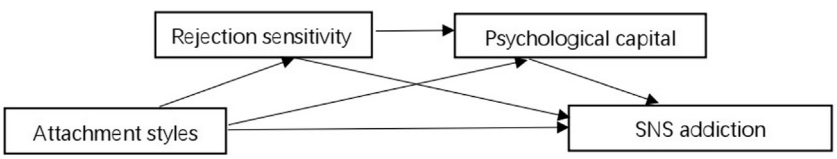

FIGURE 1 | The hypothesized model.

TABLE 1 | Descriptive statistics and results of correlational analysis of variables (N = 607).

Variables	M	SD	1	2	3	4	5	6	7
1 Attachment styles	3.597	0.612	—	—	—	—	—	—	—
2 Fearful avoidant style	4.162	0.287	−0.816**	—	—	—	—	—	—
3 Preoccupied style	3.819	0.416	−0.208**	−0.327**	—	—	—	—	—
4 Dismissive style	3.523	0.331	0.206**	−0.327**	−0.249**	—	—	—	—
5 Secure attachment style	2.937	0.433	0.816**	−0.430**	−0.328**	−0.328**	—	—	—
6 Rejection sensitivity	8.571	3.442	−0.398**	0.303**	0.082*	−0.005	−0.369**	—	—
7 Psychological capital	4.736	0.741	0.300**	−0.180**	−0.134**	−0.160	0.311**	−0.396**	—
8 SNS addiction	2.847	0.696	−0.306**	0.217**	0.227**	−0.278**	−0.173**	0.248**	−0.238**

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

TABLE 2 | Analysis of multiple mediating effects of rejection sensitivity and psychological capital with demographic variables as covariates.

Regression equation		Fit index				Significance of the regression coefficient		
Effect variable	**Predictor variable**	***R***	***R²***	***F***	***β***	**Boot LLCI**	**Boot ULCI**	***t***
SNS addiction (Y)	Rejection sensitivity (M1)	0.321	0.103	13.78***	0.152	0.013	0.048	3.452**
	Psychological capital (M2)	—	—	—	−0.151	−0.221	−0.062	−3.512***
—	Attachment styles (X)	—	—	—	−0.166	−0.242	0.012	−1.784
Psychological capital (M2)	Rejection sensitivity (M1)	0.435	0.190	35.18***	−0.322	−0.086	−0.053	−8.106***
	Attachment styles (X)	—	—	—	0.422	0.187	0.439	4.880***
Rejection sensitivity (M1)	Attachment styles (X)	0.386	0.149	35.10***	−0.821	−1.328	−0.930	−10.014***

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

TABLE 3 | Multiple mediating effects and 95% confidence intervals (N = 607).

Mediation path	Indirect effect estimation	SE	[Lower, Upper]
Attachment styles→ Rejection sensitivity→ SNS addiction	−0.087	0.030	[−0.147, −0.032]
Attachment styles→ Psychological capital→ SNS addiction	−0.044	0.020	[−0.085, −0.009]
Attachment styles→ Rejection sensitivity→ Psychological capital→ SNS addiction	−0.028	0.013	[−0.055, −0.005]

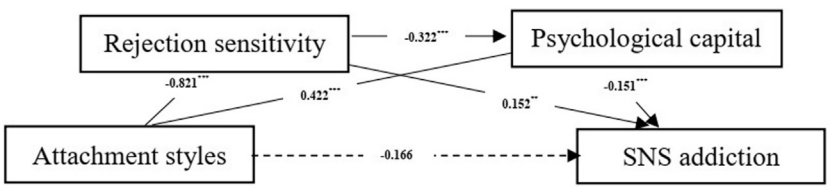

FIGURE 2 | The unstandardized coefficients of the model.

tested psychological capital and rejection sensitivity as multi-chain mediators using college students. The results were obtained using the Hayes et al. (2017) test method of 1) multi-step mediation variables and 2) the intermediate variable of Bootstrap (with model 6 selected; sample size = 5,000; and 95% confidence interval).

Attachment styles significantly and negatively predicted rejection sensitivity (β = −0.821, p <0.001), and they positively correlated with psychological capital (β = 0.422, p <0.001). The effect of attachment styles on SNS addiction remained unchanged even after adding mediator variables of rejection sensitivity and psychological capital. Rejection sensitivity has a significant correlation with SNS addiction (β = 0.152, p <0.001) and negatively predicted psychological capital (β = −0.322, p <0.001). Psychological capital negatively predicted SNS addiction (β = −0.151, p <0.001).

TABLE 4 | Analysis of multiple mediating effects of four dimension of attachment style with demographic variables as covariates.

Regression equation		Fit index				Significance of the regression coefficient		
Effect variable	**Predictor variable**	***R***	***R^2***	***F***	***β***	**Boot LLCI**	**Boot ULCI**	***t***
SNS addiction (Y)	Rejection sensitivity (M1)	0.343	0.118	16.06***	0.134	0.100	0.344	3.107***
	Psychological capital (M2)	—	—	—	−0.155	−0.223	−0.069	−3.708
—	Fearful avoidant style (X)	—	—	—	0.322	0.104	0.344	3.663***
SNS addiction (Y)	Rejection sensitivity (M1)	0.362	0.131	18.07	0.170	0.018	0.051	4.096***
	Psychological capital (M2)	—	—	—	−0.144	−0.212	−0.058	−3.443
—	Preoccupied style (X)	—	—	—	0.458	0.187	0.451	4.742**
SNS addiction (Y)	Rejection sensitivity (M1)	0.410	0.168	24.33	0.176	0.019	0.052	0.008**
	Psychological capital (M2)	—	—	—	−0.172	−0.237	−0.087	0.038
—	Dismissive style (X)	—	—	—	−0.678	−0.602	−0.342	0.066
SNS addiction (Y)	Rejection sensitivity (M1)	0.321	0.103	13.79***	0.152	0.133	0.048	3.452***
	Psychological capital (M2)	—	—	—	−0.151	−0.221	−0.062	−3.512***
—	Secure attachment style (X)	—	—	—	−0.166	−0.242	0.012	−1.784***

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

TABLE 5 | Multiple mediating effects of four dimensions of attachment style and 95% confidence intervals (N = 607).

Mediation path	Indirect effect estimation	SE	[Lower, Upper]
Fearful avoidant style → Rejection sensitivity→ SNS addiction	0.062	0.022	[−0.019, 0.011]
Fearful avoidant style → Psychological capital→ SNS addiction	0.016	0.012	[−0.003, 0.044]
Fearful avoidant style → Rejection sensitivity→ Psychological capital→ SNS addiction	0.027	0.011	[−0.007, 0.050]
Preoccupied style → Rejection sensitivity→ SNS addiction	0.022	0.014	[−0.002, 0.054]
Preoccupied style → Psychological capital→ SNS addiction	0.026	0.016	[−0.003, 0.064]
Preoccupied style → Rejection sensitivity→ Psychological capital→ SNS addiction	0.007	0.006	[−0.001, 0.020]
Dismissive style → Rejection sensitivity→ SNS addiction	0.004	0.013	[−0.022, 0.031]
Dismissive style → Psychological capital→ SNS addiction	0.006	0.013	[−0.023, 0.029]
Dismissive style → Rejection sensitivity→ Psychological capital→ SNS addiction	0.002	0.005	[−0.009, 0.013]
Secure attachment style → Rejection sensitivity→ SNS addiction	−0.087	0.030	[−0.147, −0.032]
Secure attachment style → Psychological capital→ SNS addiction	−0.044	0.020	[−0.085, −0.009]
Secure attachment style→ Rejection sensitivity→ Psychological capital→ SNS addiction	−0.028	0.013	[−0.055, −0.005]

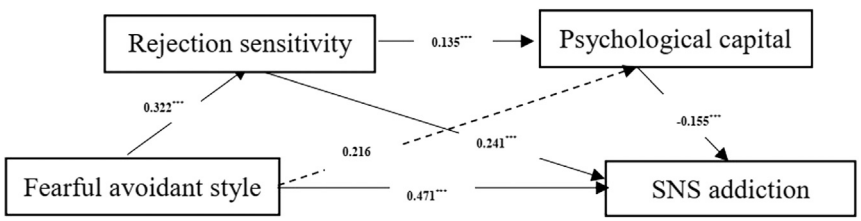

FIGURE 3 | The unstandardized coefficients of the model.

As shown in **Table 3**, college students' attachment styles have a significant effect on the overall prediction of SNS addiction, in which the overall prediction effect size was -0.275 (SE = 0.060, p <0.001), and the 95% confidence interval was [−0.393, −0.156]. The direct prediction effect size was not significant. The significant total indirect mediating effect size was- 0.159, and the 95% confidence interval was [−0.229, −0.094]. The mediating effect accounts for 57.996% of the total prediction effect. The above results indicate that psychological capital and rejection sensitivity play multiple mediator roles via their contribution to the influence of attachment styles on SNS addiction. Unstandardized coefficients of the model are shown in **Figure 2**. All the paths were significant, except the trail from attachment styles to SNS addiction.

Table 4 and **5** present the mediation analysis results of four dimensions of attachment style with demographic variables as covariates. While controlling for age and gender as demographic variables, we tested psychological capital and rejection sensitivity as multi-chain mediators between each dimension of attachment style and SNS addiction. According to the data analysis, the multiple mediations of the fearful-avoidant style on SNS addiction is significant, and the mediated effect size is 0.027 (SE =0.011, p <0.001), 95% confidence interval is [0.006, 0.050], accounting for 8.11% of the total prediction effect. The total

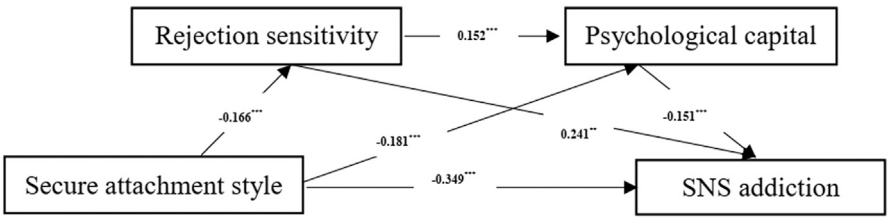

FIGURE 4 | The unstandardized coefficients of the model.

mediating effect was significant, effect size was 0.328 (SE =0.059, p <0.001), and the 95% confidence interval was [0.210, 0.445]. The direct effect size was 0.224 (SE =0.061, p <0.001), and the 95% confidence interval was [0.104, 0.344]. The direct effect accounted for 68.37% of the total predicted effect. **Figure 3** shows the unstandardized coefficients of the model.

The multiple mediation effect of the preoccupied style on SNS addiction is not significant after adding the mediating variables of rejection sensitivity and psychological capital, and the mediated effect size is 0.0073 (SE = 0.006, p > 0.05) and the 95% confidence interval is [-0.001 0.207]. The total mediation effect size is 0.374 (SE = 0.069, p < 0.001), and the 95% confidence interval is [0.239 0.510]. The direct effect is significant, and the direct effect size is 0.319 (SE = 0.067, p < 001), the 95% confidence interval is [0.187, 0.451]. The multiple mediation effect of the dismissive style on SNS addiction is not significant after adding the mediating variables of rejection sensitivity and psychological capital, and the mediated effect size is 0.0015 (SE = 0.005, p > 0.05), and the 95% confidence interval is [−0.008, 0.013]. The total mediation effect is significant, the total effect size is -0.461 (SE = 0.069, p < 0.001), the 95% confidence interval is [−0.597, −0.324]; the direct effect is significant, the direct effect size is −0.4721 (SE = 0.066, p <0.001), the 95% confidence interval is [−0.602, −0.342].

Secure attachment style affects SNS addiction through multiple mediating effects of rejection sensitivity and psychological capital. The total mediating effect was significant, and the effect size was −0.275 (SE =0.060, p <0.001), and the 95% confidence interval was [−0.393, −0.156]. The direct effect size was −0.115 (SE =0.647, p <0.001), and the 95% confidence interval was [−0.242, 0.012]. We can see from **Table 5** that the mediated effect is significant, and the mediated effect size is −0.028 (SE =0 .013, p <0 .001), 95% confidence interval [−0.055, −0.06], accounting for 10.13% of the total prediction effect. **Figure 4** shows the unstandardized coefficients of the model.

DISCUSSION

As previously mentioned, attachment styles have a crucial role to play in predicting SNS addiction among students. The effect of attachment styles on SNS addiction has yet again been confirmed based on our study. Our results are also following the findings of a previous report (Monacis et al., 2017). However, fewer studies have been conducted on the role of attachment styles as they affect SNS addiction. Based on the framework of reinforcement sensitivity theory and positive psychology theory, the outcome of the current study indicates that rejection sensitivity and psychological capital have multiply mediations on attachment styles and SNS addiction, and our research data provided support for all the mediations.

Fearful attachment styles significantly and positively influence SNS addiction through the rejection sensitivity and psychological capital mediator variable. Individuals with fearful style are more prone to show high anxiety and high avoidance, and a low level of psychological capital. When the individual with fearful style perceives a rejection, they become hostile or aggressive. To avoid the anxiety of face-to-face social interaction situations, the social compensation hypothesis postulates that individuals with this trait tend to adopt avoidance strategies and conduct interpersonal interaction and information communication through the SNS. Fearful attachment individuals experience more negative events, resulting in a relatively low level of psychological capital, so they are more inclined to choose SNS to escape or seek better comfort. In addition, they usually fulfill their real social needs on SNS, so they tend to be more immersed in online activities.

However, the other two types of insecure attachments, the preoccupied style and dismissive-avoidant style have no significant effect on SNS addiction. But they all have a significant direct impact on SNS addiction. This outcome means that part of the reasons could be overshadowed by the effects of rejection sensitivity and psychological capital. Rejection sensitivity and psychological capital's mediating product is in the opposite direction (competitive mediator). Furthermore, the preoccupied style characterized by high anxiety and low avoidance and dismissive-avoidant style characterized by high avoidance and low anxiety use median to classify subjects may also be one reason for this result.

Secure attachment styles significantly and negatively influence SNS addiction through the rejection sensitivity and psychological capital mediator variable. Individuals with a secure style are more prone to show low anxiety and low avoidance. Furthermore, individuals with secure attachment usually have higher psychological capital, which will reduce their sensitivity to rejection by the outside world. According to the theory of positive psychology, psychological capital affects the individual's attitude and behavior and affects many aspects of his life, including educational attainment, employment,

relationships, and mental health. Gender differences revealed a connection between psychological capital with good mental health in male students who demonstrate hyperactivity compared to female students (Younas et al., 2020). Riolli et al. (2012) believe that individuals with high positive psychological capital adopt mature and positive coping methods for resolving challenges. Not only does it have a positive impact by raising the level of individual psychological capital, but it also has a positive impact on organizations and groups. This study verified that psychological capital plays a mediating role in the influence of attachment styles on SNS addiction.

Attachment styles influence SNS addiction through a chain of pathways that affects rejection sensitivity and psychological capital. In other words, when individuals are of insecure attachment styles, they have higher rejection sensitivity and have lower psychological capital to deal with the challenge of the external environment. According to the social compensation hypothesis, individuals with high rejection sensitivity perceive that their offline interpersonal networking is inadequate, and they are likely to compensate by using online social networking sites more extensively (Valkenburg and Peter, 2007). Meanwhile, based on ego depletion theory (Muraven and Baumeister, 2000), psychological capital consisting of positive psychological resources may be limited. If individuals lack psychological capital, they can't effectively cope with stressful events. They are still prone to suffer from negative emotions and behaviors, such as well-being (Poots and Cassidy, 2020), anxiety (Rahimnia et al., 2013), self-directed behavior (Choi, 2020), social media membership (Simsek and Sali, 2014).

To summarize the discussion, the current study combined and applied the theories of reinforcement sensitivity and positive psychology and found the multiply mediating effect of rejection sensitivity and psychological capital on SNS addiction to different attachment styles. That outcome provides a research basis for the future prevention and intervention of SNS addiction and its influence on the accompanying after-effects.

CONCLUSION

This study explored the psychological mechanism of different attachment styles influencing college students' SNS addiction and verified the dual mediating roles of rejection sensitivity and psychological capital. It also references for future theoretical research on SNS and the individuals' rationale for using SNS. The current study found that attachment styles have a significant negative predictive effect on SNS addiction, and rejection sensitivity and psychological capital play multiple mediating roles between attachment styles and SNS addiction.

It provides a substantial reference for further investigating the mediating role of other types of rejection sensitivities of attachment style effect on addictive behavior. Also, the results of this study can provide theoretical support that explains an individual's SNS addiction, thus helping the individual to use SNS rationally. Methods such as Web-based training (Luthans et al., 2008), cognitive behavioral therapy (Group counseling, individual counseling) can be used to improve the psychological capital level of students with insecure attachment and reduce their risk of sensitivity, while at the same time also further alleviating their SNS addiction.

This study mainly focused on two aspects and therefore presented some limitations. On the one hand, the variables of this study were investigated by questionnaire among college students. An actual situation simulation method can contribute to the evaluation of SNS, with a deeper understanding of its internal mechanisms of formation, development, withdrawal, and relapse. On the other hand, the result of one cross-sectional design used in the study is not yet reliable. There is not longitudinal research conducted to investigate the dynamic effects of variable changes. Besides, due to this reason, it can be studied by experimental research, Event-Related Potential (ERP), and other methods in the future. Furthermore, the findings related to causality could be obtained, as well. It will contribute to forming a theoretical basis and support for the clinical diagnosis, intervention, and treatment of SNS addiction.

DATA AVAILABILITY STATEMENT

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

AUTHOR CONTRIBUTIONS

HS and ZI conceived the study. HS analyzed the data, tables, figures, and JL provided critical edits. HS drafted the initial manuscript. All authors discussed the results and contributed to the final manuscript.

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The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/feduc.2021.586485/full#supplementary-material

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A Review of the Relationship Between Social Media Use and Online Prosocial Behavior Among Adolescents

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Social media (SoMe) activity constitutes a large part of the lives of adolescents. Even though the behavior on SoMe is complex, the research on SoMe has mostly focused on negative effects, bad content, and online antisocial behavior (OAB). Less research has been conducted on online prosocial behavior (OPB), and to what extent OPBs are widespread is relatively unknown. A review was conducted to investigate to what extent OPB is related to SoMe use among adolescents based on studies published from 2014 to May 2021. To be included, the studies had to be quantitative, non-experimental, have participants aged 13–18, include measures of SoMe and OPB, and be published in peer-reviewed journals with full text available in English, Swedish, Danish or Norwegian. A research was conducted in databases PsychINFO, Ovid MEDLINE(R), EMBASE, COCHRANE Database of Systematic Reviews, Web of Science, Sociological Abstracts, Sociological Services Abstracts, and Eric. Two studies met the eligibility criteria. Both studies found an association between OPB and SoMe use. Methodological issues, however, were identified through a quality assessment using an adapted version of the Newcastle-Ottawa Scale (NOS) for cross-sectional studies, and the small samples in the studies prevent us from drawing any firm conclusions. Possible reasons for the scarcity of eligible studies and directions for future research are discussed.

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Keywords: online prosocial behavior, social media, systematic review, Newcastle-Ottawa scale, adolescents

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INTRODUCTION

Social media (SoMe) have been defined as websites, services, and related tools that allow participants to create and share their content (Boyd, 2014). An estimated 3.48 billion people were using SoMe worldwide in 2019 and an increase of 9% since 2018 (Kemp, 2019).

Adolescents are among the most active users, and the 2018 Pew Report showed that almost half of all U.S. teenagers report being online "almost constantly," and 87% report using at least one SoMe

platform daily (Pew Research Center, 2018). Social networking sites dominate the landscape, with Facebook, Twitter, and Instagram being the most popular sites. Instant messaging services (e.g., Snapchat and WhatsApp) have recently overtaken a substantial part of the userbase, with reports showing over one-third of adolescents using Snapchat more often than the larger social networking sites (Pew Research Center, 2018). Lastly, vlogging sites, sites where adolescents can upload or stream personal content for others to react, share, and respond to (i.e., YouTube), are also widely popular among youth (Pew Research Center, 2018).

A growing concern has been raised by several researchers regarding the potential negative effects of SoMe use (Han, 2018; Twenge and Campbell, 2019). SoMe use has especially been linked to mental health problems, and one meta-analysis found an association between social networking use and depression and anxiety (Keles et al., 2020). Others have found both negative and positive associations with well-being (Verduyn et al., 2017).

Much of the previous research on SoMe has focused on its possible *effects* (Orben, 2020; Schønning et al., 2020), while some studies focus on drivers for SoMe use and screen-based activities (Scott et al., 2019; Thomas et al., 2020), such as fear of missing out. Another area of study has been the *type of behavior* children and adolescents perform on SoMe (Kircaburun et al., 2019). The type of online social behavior, as opposed to more general measures, such as "time-spent on SoMe" or "amount of screen time-activity," might influence the associations with outcome variables (i.e., mental health and well-being). Indeed, a great deal of attention has been directed at the negative behavior performed online by adolescents, typically in the form of cyberbullying (Kowalski et al., 2014). Cyberbullying is quite common (Brochado et al., 2016) and can have a serious impact on children and adolescents, as it is linked to depression, anxiety, lower self-esteem, and academic performance both for the bullies and the bullied (Kowalski and Limber, 2013).

A recent scoping review on SoMe use and mental health and well-being among adolescents concluded that most previous studies have focused on negative aspects of SoMe use (Schønning et al., 2020). Less research seems to have been devoted to positive aspects of SoMe (Schønning et al., 2020), such as online prosocial behavior (OPB). To our knowledge, there are no reviews on OPB; there is only one comprehensive book chapter by Wright and Li (2012). For comparison, a systematic map of reviews on screen-based activities and mental health outcomes of children and adolescents found 19 reviews on cyberbullying, whereby included primary studies in each review ranged from 10 to 131 (Dickson et al., 2018). Within research on SoMe use, it can be argued that cyberbullying is so widely researched that it constitutes its own research domain (Schønning et al., 2020). Thus, the potential aspects of SoMe use (Schønning et al., 2020) and OPB seem to be under-researched, and little is known about OPB of adolescents today.

However, a wealth of research has been conducted on offline (i.e., traditional) prosocial behavior since the 1970s (Eisenberg et al., 2007). Prosocial behavior has conventionally been defined as voluntary actions intended to benefit others (Eisenberg et al., 2007). Such behaviors can be helping, comforting, sharing with, and supporting others. Prosocial behaviors can be motivated by a variety of factors, such as getting a reward, gain approval from others, acting according to social norms, or out of genuine sympathy (Eisenberg and Mussen, 1989). Studies have found that offline prosocial behavior is associated with several positive outcomes, such as better academic performance (Carlo et al., 2018), higher self-esteem (Laible et al., 2004), and subjective well-being (Aknin et al., 2013). Experimental research shows that performing prosocial behaviors can lead to feelings of well-being and happiness (Aknin et al., 2013; Martela and Ryan, 2016). These findings warrant a greater interest in the online counterpart of prosocial behavior.

Online Prosocial Behavior

Online prosocial behavior, or cyberprosocial behavior (Wright and Li, 2012), refers to prosocial behavior in a digital context (i.e., while being on the internet). As previously mentioned, only one book chapter (Wright and Li, 2012) has attempted a summary of the research on OPB, and no reviews exist. We argue that the need for an updated review is warranted for several reasons.

First, the chapter by Wright and Li (2012) compiled much of the seemingly relevant research on OPB, yielding a wide picture, unable to draw practical conclusions or future directions. The chapter details a historical account of OPB, starting with prosocial behavior during the pre-internet bulletin board systems, in the 1980s (Schneider, 1986), up to prosocial behaviors on social networking sites (Wright and Li, 2011). The authors operated with a wide definition of prosocial behaviors, such as online mentoring, donating to online charities, virtual voluntarism, helping through electronic groups, social networking services, and online gaming. Such a wide definition of prosocial behaviors on SoMe today may be too wide as it may encapsulate inherently different forms of prosocial behaviors. Evidence suggests that there are different forms of helping and that they may differ on the basis of motivation, targets, and outcomes (Carlo and Randall, 2002; Carlo et al., 2003; Padilla-Walker and Carlo, 2015). For instance, motivations behind prosocial behavior may be altruistic or egoistic. While altruistic prosocial behavior would for instance entail helping someone despite personal costs, egoistic prosocial behavior would mean doing certain good deeds to get a good conscience. Thus, OPBs directed at individuals compared to prosocial behaviors directed at organizations and large groups (e.g., donating or voluntarism) may differ substantially. One can for example argue that donations and voluntarism are closely linked to civic engagement and political orientation in general and not OPB *per se*. In addition, voluntary organizations and political parties commonly invest in commercials and other activities aimed at soliciting specific (prosocial) behaviors from potential contributors, such as donations. To obtain a more specified account of OPB of the adolescents, this review seeks to investigate OPB directed at particular others, excluding donations and voluntarism, and including forms of communication between individuals online.

Second, although the chapter by Wright and Li (2012) was comprehensive, the studies enlisted may no longer be generalized or relevant, due to the continuous and enormous evolution

of SoMe during the last 15 years. As the review detailed studies conducted in the interval from 1980 to 2011, with the majority of them being conducted prior to 2005, many of the studies missed the advent of Facebook in 2004 (Facebook, 2020) and smartphones, particularly the iPhone in 2007[1]. Arguably, the landscape of SoMe and the size of its userbase have transformed since 2005. Thus, there is a clear need for a new and updated review.

Third, OPB is arguably in need of research attention, as the research on offline prosocial behavior yield findings contributing to adolescent well-being and happiness. In their book chapter, Wright and Li (2012) outline that cyberprosocial behavior may result in the same benefits as offline prosocial behavior, both for the receiver (Brennan et al., 1992; Sudzina et al., 2015) and for the helper (Mukherjee, 2010; McAleer and Bangert, 2011), indicating the need for more research on the topic.

Fourth, just as the potential for harmful behaviors on the internet is ample (i.e., cyberbullying), the potential for prosocial behaviors is also extensive. Content analyses of online messages in blogs, chats, and social networks indicate the ominous presence of prosocial behaviors in terms of empathic and supportive comments and messages (Baym, 2002; Thelwall et al., 2010). The cyber context contains an abundance of possible helpers and receivers, and a variety of prosocial behaviors are being performed and received on SoMe. Adolescents use SoMe to give and receive support from informal peer networks (Gibson and Trnka, 2020), but also from strangers (Gibson, 2016), to share emotions and to respond aptly to emotion sharing (Bazarova et al., 2015; Vermeulen et al., 2018), to help each other when playing online games (Wang and Wang, 2008), and cooperate with adolescents they identify with (Kim and Kim, 2017). They are more willing to confide in friends than in adults and professionals (Michelmore and Hindley, 2012), indicating that a lot of OPBs remain unnoticed by parents, teachers, and other authority figures in their lives. Most of this research is qualitative, using focus groups or interviews, with a low number of respondents. Thus, it is hard to form a comprehensive overview of to what degree the time of adolescent on SoMe concerns OPB.

To form a more concrete and comprehensive overview, this paper aimed to conduct a systematic review on the relationship between SoMe use and OPB among adolescents.

Definitions

We used the following definition offered by Kietzmann et al. (2011, p. 1): "Social media employ mobile and web-based technologies to create highly interactive platforms via which individuals and communities share, co-create, discuss, and modify user-generated content" (see Kietzmann et al., 2011, for a comprehensive account).

Online prosocial behavior refers to "voluntary behavior carried out in an electronic context (/social media context) with the intention of benefitting particular others or promoting harmonious relations with others" (Erreygers et al., 2018a). Examples of OPB include comforting a friend via digital technologies, online sharing of resources and information with a classmate, and helping peers out on social network sites. This definition excludes behaviors, such as online donations to charities, online volunteering, and helping online organizations, as the definition of OPB focuses on *particular others* and thus the relational nature of adolescent behavior (Erreygers et al., 2018a).

[1]Apple Reinvents the Phone with iPhone. Apple Inc. (2007).

METHODS

Protocol and Registration

The protocol for this review was registered with the International Prospective Register of Systematic Reviews on December 12, 2019 (PROSPERO; ID CRD42020162161). It has also been registered with the Current Research Information System in Norway (CRISTIN; ID 2038994). This paper follows the PRISMA guidelines and uses a systematic approach to the review process (see **Appendix A**).

Search Strategy and Databases

The databases PsychINFO, Ovid MEDLINE(R), EMBASE, COCHRANE Database of Systematic Reviews, Web of Science, Sociological Abstracts and Sociological Services Abstracts, and Eric were systematically searched on December 9 and 10, 2019. For an example of search strategy, see **Table 1** (the complete search strategy for all databases are available in **Appendix B**).

Eligibility Criteria

The following eligibility criteria were developed to ensure that the search and selection process returned studies of interest.

a. Inclusion:

   i. Participants: Age 13–18
   ii. Exposure: Measurement of SoMe use
   iii. Outcome: OPB
   iv. Studies published in peer-reviewed journals with full text available in English, Swedish, Danish or Norwegian from 2014.
   v. Quantitative, non-experimental studies reporting on the relationship between the exposure variable and the outcome variable.

b. Exclusion

   i. Social media use is not covered by Kietzmann et al.'s definition (Kietzmann et al., 2011, p. 1).
   ii. Online prosocial behaviors are not covered by the definition by Erreygers et al. (2018a), thus excluding voluntarism and digital donations to organizations among others.

Data Extraction

All papers from the automated database search were collated using the Rayyan Systematic Reviews web app (Ouzzani et al., 2016). After duplicates were deleted, screening was conducted to ensure that studies fulfilled the eligibility criteria. The following information was extracted from each included study:

TABLE 1 | Example of search strategy.

Participants	(adolescen* or boy? or girl? or juvenil* or underage* or "under age" or teen? or teenager? or minor? or pubescen* or "young people" or "young person?" or youth* or [("high school" or "middle school" or "secondary school" or "special education" or transfer) adj (student? or graduate?)] or pupil? or "emerging adult?" or pediatric? or paediatric?).tw. OR Middle School Students/ or High School Students/or Junior High School Students/or Special Education Students/or Transfer Students/or High School graduates/or Pediatrics/
Exposure	exp Social Media/ or Computer Games/or Digital Gaming/ or Blog/ or Electronic Communication/ or Computer Mediated Communication/ OR ("Social Media" or "Social Medium" or "Online Social Network*" or "virtual social world?" or "content communit*" or "Internet communication" or "communicating online" or "computer mediated communication" or "Internet group?" or Twitter or Snapchat or Facebook or Messenger or Youtube or Instagram or Tumblr or Reddit or Pinterest or blog? or blogging or vlog? or vlogging or weblogs or podcast? or skype or facetime or "Google talk" or Myspace or Flickr or Twitch or "instant message" or "instant messaging" or chat? or forum? or "Video game*" or "Computer game*" or Videogame* or Computergame* or "virtual gam* world?" or "World of warcraft" or "league of legends" or "Apex Legends" or PlayStation or Xbox or Nintendo).tw.
Outcome	Prosocial Behavior/ or Caring Behaviors/ or Altruism/ or Cooperation/ or "Assistance (Social Behavior)"/ or "Sharing (Social Behavior)"/ or "Trust (Social Behavior)"/ OR ([(prosocial or "pro social" or prosocially or "pro socially") adj1 (behavio?r? or behave? or behaving or value? or interaction? or motivation? or "moral reasoning")] or [("positive online" or caring or sharing or comforting or helping or cooperative or respectful or trust*) adj (behavio?r? or interaction?)] or altruis* or helpfulness).tw.
Limit by	yr="2014-Current" AND to (Danish or English or Norwegian or Swedish)

This is an example of the search strategy used for PsycInfo. Search strategies were adapted to fit different search engines.

1. Bibliography
    a. Author(s)
    b. Title
    c. Journal
    d. Year of publication
2. Study characteristics
    a. Study design
    b. Study setting
    c. Country of origin
    d. Number and age of participants
    e. Gender distribution
    f. The main aim of the study
    g. How SoMe was defined and assessed
    h. How OPB was defined and assessed
    i. Type of scales used
    j. Data analysis methodology
3. Results
    a. Main findings

Risk of Bias in Individual Studies

For the assessment of the risk of bias in individual studies, the Newcastle-Ottawa Scale (NOS) (Wells et al., 2014) adapted for cross-sectional studies (Herzog et al., 2013) was used. The adapted NOS uses a star system, whereby five stars are allocated for selection—two for comparability and three for outcomes (Herzog et al., 2013; Modesti et al., 2016). Thus, an article can receive a total of 10 stars, depending on the quality and the risk of bias in the article. We used the same star evaluation as (Herzog et al., 2013), divided into four groups: very good studies (9–10 points), good studies (7–8 points), satisfactory studies (5–6 points), and unsatisfactory studies (0–4 points; see **Appendix C** for a detailed account of the elements in the NOS adapted for cross-sectional studies). The risk of bias assessment was ascertained jointly by two of the authors (JCS and CL).

Updated Literature Search

The literature search was updated on May 5, 2021. This update covered the period from the last search, December 9 and 10, 2019 to May 5. Some of the included databases do not allow for delimiting the search by months (e.g., Web of Science), for these databases the lower limit was set to the year 2019.

RESULTS

From the Original Literature Search

The search in PsycInfo ($n = 77$), Ovid MEDLINE (R) ($n = 70$), Embase ($n = 35$), Cochrane ($n = 9$), Web of Science ($n = 160$), Sociological Abstracts and Sociological Services Abstracts ($n = 6$), and Eric ($n = 20$) resulted in 377 articles. Duplicates were deleted manually in the Endnote library, resulting in 295 unique articles. Two independent reviewers (JS and CL) conducted a blinded screening of title and abstract based on general relevancy concerning quantitative studies on SoMe and prosocial behavior. The reviewers agreed on 283 of 295 articles, yielding a total agreement score of 95.6%. The remaining 12 articles of disagreement were reviewed by a third reviewer (GJH) and discussed to reach confidence in exclusion and inclusion criteria. Primary screening and secondary reviewing and discussion excluded in total 276 articles.

Thus, 19 articles (Coyne et al., 2014; Prot et al., 2014; Loparev, 2016; Lu et al., 2016; Ranney, 2016; Wartberg et al., 2016; Erreygers et al., 2017, 2018b, 2019; Jin and Li, 2017; Lee et al., 2017; Greer, 2018; Guo et al., 2018; Lane and Dal Cin, 2018; Machackova et al., 2018; Meeus et al., 2018; Wang and Xing, 2018; Parlangeli et al., 2019; Lee, 2020) were assessed for eligibility based on full texts based on the original literature search. Seventeen articles were evaluated as not fulfilling the inclusion criteria due to measuring offline prosocial behavior instead of OPB (Coyne et al., 2014; Prot et al., 2014; Wartberg et al., 2016; Jin and Li, 2017; Lee et al., 2017; Greer, 2018; Lane and Dal Cin, 2018; Meeus et al., 2018; Wang and Xing, 2018; Lee, 2020), not containing measurements of SoMe use (Loparev, 2016; Lu et al., 2016; Erreygers et al., 2018b; Guo et al., 2018; Machackova et al., 2018) or not reporting any analyses or descriptive statistics on the relationship between SoMe use and OPB (Ranney, 2016; Parlangeli et al., 2019). To be clear, two of the excluded articles

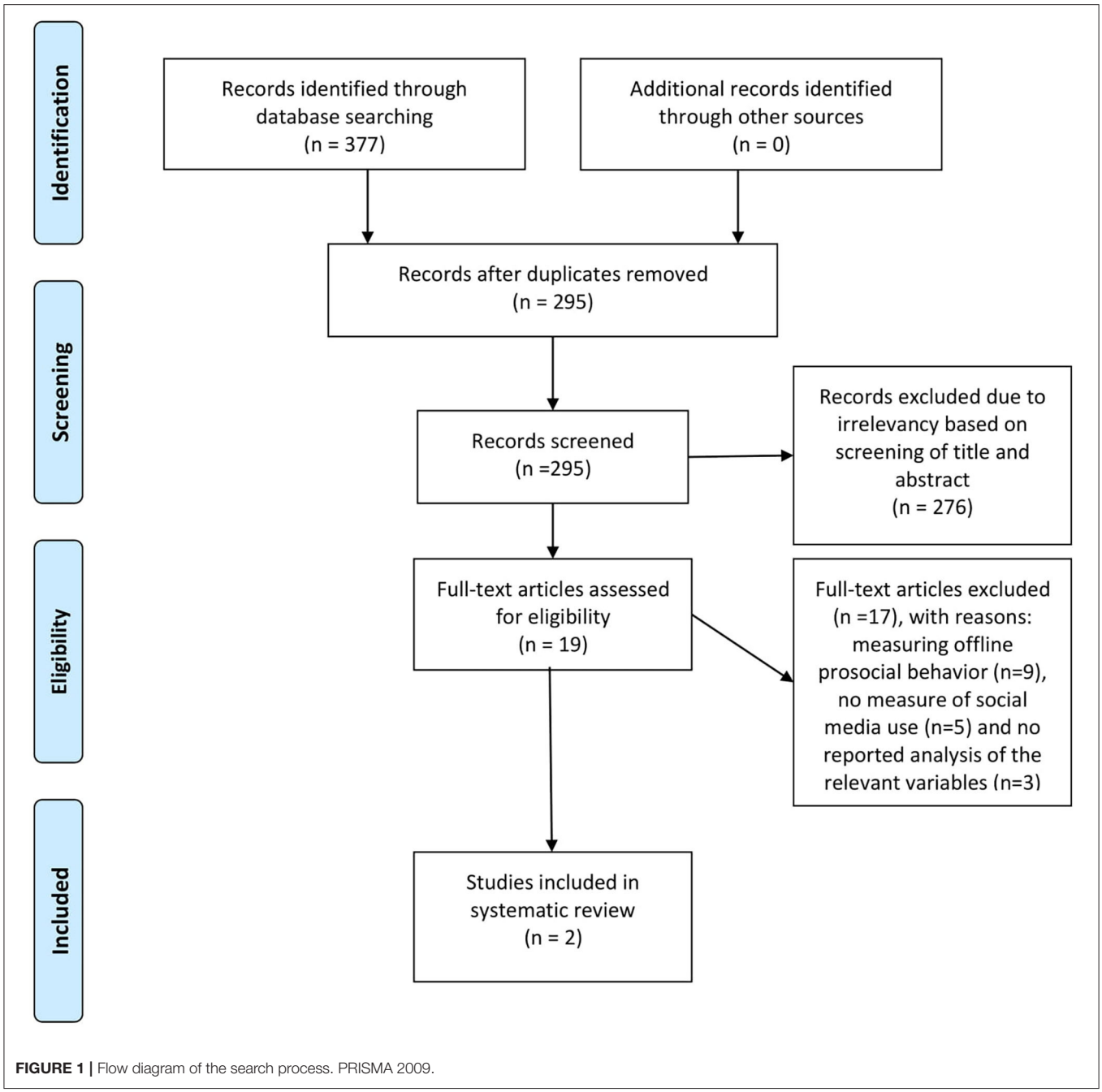

FIGURE 1 | Flow diagram of the search process. PRISMA 2009.

did include satisfactory measures of SoMe use and OPB but did not report data regarding the variables of interest or analysis of the relationship between them. See the flow chart in **Figure 1**.

From the Updated Literature Search

The updated search resulted in 133 articles [PsycInfo (N = 17), Ovid MEDLINE (N = 22), Embase (N = 9), Cochrane (N = 3), Web of Science (N = 73), Sociological Abstracts and Sociological Services Abstracts (N = 1), and Eric (N = 8)]. Duplicates were deleted, resulting in 119 unique articles, where 24 overlapped with the original search. The remaining 95 articles were retained for assessment. Two independent reviewers (JS and CL) conducted a blinded screening of title and abstract based on general relevancy concerning quantitative studies on SoMe and prosocial behavior. The reviewers initially agreed on 94 of the 95 articles (agreement score 98.9%). One study was included after the initial assessment and reviewed in full text. The study in question did report a relevant measure of SoMe use, focused on "altruistic behaviors in social networks," and reported a non-significant association between these factors (Zhu et al., 2020). However, the description of these behaviors seemed to be outside our definition of OPBs, covering dimensions related

to "sharing with others the experiences and perceptions of their lives in social networks," "creating a platform for a person to communicate, "sharing your successful learning experience with others in social networks," and "network warning" (Zhu et al., 2020, p. 4). Although these dimensions may indirectly be conduit for OPB, they are not prosocial behaviors *per se*. Therefore, we decided to exclude this study.

This paper aimed to provide a quantitative assessment of the extent to which SoMe use is related to OPB among adolescents. Based on the present search, no study had the sole explicit aim to investigate the association between these variables. However, as part of a study design and/or several measures, four studies (Ranney, 2016; Erreygers et al., 2017, 2019; Parlangeli et al., 2019) measured SoMe use and OPB among adolescents. Only two of these (64 and 65) reported data on the relationship between the variables. The two included studies are authored by the same researchers. Erreygers et al. (2017) were published in the journal "*Media Psychology*" and Erreygers et al. (2019) were published in "*Journal of Happiness Studies*." For a summary of the results, see **Table 2**.

Study Characteristics

Participants and Samples

The mean age for the participants in the included studies was 13.5 (Erreygers et al., 2019) and 13.6 (Erreygers et al., 2017). The sample sizes were 136 (Erreygers et al., 2019) and 1,720 (Erreygers et al., 2017). The samples contained slightly more girls than boys, with 54% (Erreygers et al., 2017) and 51% (Erreygers et al., 2019). Erreygers et al. (2017) recruited participants through schools whereas Erreygers et al. (2019) used schools, universities, SoMe, and a market research agency as recruitment arenas. Both studies were carried out in Belgium.

Aims, Study Design, and Measures of the Included Studies

The aims and designs of the included studies differed. Erreygers et al. (2017) aimed to investigate dimensions of online antisocial and prosocial behavior and how these were related to experienced emotions of adolescent and their use of digital media. To do so, the study used a cross-sectional design, obtaining several measures of the same population at a specific point in time. Erreygers et al. (2019) wanted to investigate spillover (context) and crossover (person) effects of adolescents' and their parents' daily happiness on adolescents' OPB via a daily diary. Spillover effects refer to the transmission of emotional states from one context (e.g., school) to another context (e.g., home) within individuals. Crossover effects refer to the transmission of emotional states between individuals. The study used a repeated-measures design via a daily diary, obtaining data on parental and adolescent happiness after school/work and in the evening, and adolescent OPB in the evening. The study also included SoMe use as a control variable as previous studies had indicated that SoMe could be a confounder in the association between happiness and OPB.

Both studies collected data using self-report measures. Erreygers et al. (2017) collected data on these outcomes once at participants' school and Erreygers et al. (2019) collected data once every evening over a period of 5 days. SoMe use was defined and measured somewhat differently. Erreygers et al. (2019) measured the "use of digital technologies for interpersonal contact," such as the use of social networking sites, instant messaging, and sending e-mails and texts. Erreygers et al. (2017) measured "internet use." The study used a version of the EU Kids Online questionnaire for internet use that included 11 internet activities. Although the scale was adapted for Erreygers et al. (2017), the original version has been revised and validated as part of a research toolkit used by the EU Kids Online network funded by the EC (DG Information Society) Safer Internet Program (project code SIP-KEP-321803). To explore their adapted version, the researchers ran an exploratory factor analysis. The questionnaire yielded three factors: one related to online gaming (i.e., playing online games with others), one related to the use of social and audiovisual media (i.e., visiting a social network site), and one related to the functional use of digital media (i.e., sending or receiving an email).

The two studies used similar assessments of OPB. Erreygers et al. (2017) assessed OPB as part of a larger scale including online antisocial behavior (OAB). The scale included 14 OPB elements and 11 OAB elements. The frequency of these behaviors as both the performer and the receiver was assessed. The OPB part of the scale consisted of five items adapted from the scale used by Wright and Li (2011) (i.e., "cheering up," "offer help," "say nice thing," and "let someone know I care about them") and nine adapted items from two scales (Caprara and Pastorelli, 1993; Carlo and Randall, 2002). Two of the items were poorly understood by the participants and thus not included in the final analysis, yielding a total of 12 items. The scale was later validated using the same sample, measuring the participants a second time. Exploratory factor analysis yielded 10 items, as two of the items were omitted due to low factor loadings compared to the rest of the items. The authors named the scale the Online Prosocial Behavior Scale (OPBS) (Erreygers et al., 2018a). Erreygers et al. (2019) assessed OPB using a shortened and modified version of the OPBS for diary use, leaving five items.

Data Analysis Methodology

Erreygers et al. (2019) used a time-based daily diary design. Participants were assessed two times a day on happiness, and once a day on SoMe use and OPB. The study used a 1-1-1 multilevel structural equation model (MSEM) with fixed slopes to test the mediation model of T1 happiness predicting T2 OPB via T2 happiness (T1 = after school/work, T2 = adolescent bedtime). For the association between OPB and SoMe use, SoMe use (use of digital technologies) was used as a control variable in the MSEM for both within- and between-persons. Erreygers et al. (2017) measured OPB, emotions, and SoMe use in a standard cross-sectional design. In their main analysis, a structural equation model for the association between online behaviors and emotions was estimated. In a *post-hoc* analysis, a structural model with SoMe was used as a mediation variable between online behavior and emotions was estimated.

TABLE 2 | Data extraction of included studies.

References	Title and journal	Study design, setting and country	Main aim	Participants	Type of SM and type of measure	Type of OPB and type of measure	DAM	Type of scales	Findings
Erreygers et al. (2017)	Nice or Naughty? The Role of Emotions and Digital Media Use in Explaining Adolescents' Online Prosocial and Antisocial Behavior. In *Media Psychology.*	Cross-sectional. School. Belgium.	Examine dimensions of online prosocial and antisocial behavior and how these are related to adolescents' experienced emotions and their uses of digital media.	$N = 1{,}720$ (*M*age= 13.61, SD= 0.49) Boys = 784 Girls = 930 Six participants did not report on gender.	Internet use (social media, online gaming and functional media) Self-report	Performing and receiving OPB, including cheering up, comforting and supporting others. Self-report	SEM on the association between OPB and emotions, where SM was used as a mediation variable	The Online Prosocial Behavior Scale (Erreygers et al., 2018a). SM: adapted version of the EU Kids Online (2014) questionnaire for internet use.	Gaming was related negatively to performing ($b = -0.217$, $p < 0.001$) and receiving ($b = -0.252$, $p < 0.001$) OPB. Using social and audiovisual media was strongly positively associated with performing and receiving OPB (POPB: $b = 0.768$, $p < 0.001$; ROPB: $b = 0.956$, $p < 0.001$).
Erreygers et al. (2019)	Feel Good, Do Good Online? Spillover and Crossover Effects of Happiness on Adolescents' Online Prosocial Behavior. In *Journal of Happiness Studies*.	Cross-sectional and repeated measures design. Home. Belgium.	Spillover (context) and crossover (person) effects of adolescents' and their parents' daily happiness on adolescents' online prosocial behavior via a daily diary.	$N = 136$ (*M*age= 13.51, SD 0.63) Boys = 67 Girls = 69	Use of digital technologies for interpersonal contact (use of social network sites, instant messaging, emailing, texting) Self-report	Cheering up, helping, comforting and supporting via mobile phone/internet Self-report	A 1-1-1 MSEM with fixed slopes to test mediation model of T1 happiness prediction T2 OPB via T2 happiness. SM as a control variable.	OPB: 5 items based on the Online Prosocial Behavior Scale (Erreygers et al., 2018a). SM use: 5 point Likert scale on digital use	A significant positive correlation ($0.39 = p < 0.001$) between online prosocial behavior and the use of digital technologies.

M, Mean; SD, Standard deviation; OPB, Online prosocial behavior; SM, Social media (use); DAM, Data analysis methodology; SEM, Structural equation model; MSEM, Multilevel structural equation model; T1, time 1 (after school/work); T2, time 2 (at adolescent bedtime); POBP, performing online prosocial behavior; ROPB, receiving online prosocial behavior.

Association Between Exposure and Outcome

Both studies reported a significant association between the use of SoMe and OPB. Erreygers et al. (2017) found that online gaming and using audiovisual and SoMe were related to OPB. Online gaming was related negatively to performing ($b = -0.217$, $p < 0.001$) and receiving ($b = -0.252$, $p < 0.001$) OPB, whereas using audiovisual and SoMe was strongly positively associated with performing ($b = 0.768$, $p < 0.001$) and receiving (b = 0.956, $p < 0.001$) OPB. Erreygers et al. (2019) found that the use of digital media (UDT) by adolescents was positively correlated with (performing) OPB (pOPB, UDT = 0.39, $p < 0.001$).

Risk of Bias Assessment

Based on NOS, one study was unsatisfactory (Erreygers et al., 2019) and one was satisfactory (Erreygers et al., 2017). Erreygers et al. (2019) was considered to be at a high risk of bias. The sample size was small and unjustified, the study used convenience sampling, a non-validated self-report measure was used to measure SoMe use, and relevant confounders for the relationship between OPB and SoMe use were not adjusted for. In summary, there is a high risk of bias in the study, and one should be careful when generalizing the results. Erreygers et al. (2017) was considered to be at moderate risk of bias. Even though no sample size justification was reported, the sample size ($n = 1{,}720$) is considered to be more than large enough to satisfy a conservative assumption about the nature of the true population value, as long as an adequate sampling technique has been applied and the response rate is satisfactory. Random sampling was used, and the sample can be considered to be representative of the average in the target population, as 13 of 29 invited schools participated. Full information maximum likelihood (FIML) was used to estimate the model and handle missing data (Enders and Bandalos, 2001); however, the missing data were not described. The study is at risk of bias because it relies on self-report in measuring both the exposure and the outcome variable and no relevant confounders for the relationship between OPB and SoMe use were adjusted for. The study used an adapted and thus unvalidated version of a validated self-report measure to measure SoMe use. However, the scale is only slightly adapted, and at face value seems to contain the same elements as the original scale. Consequently, the use of this adapted scale will not lower the overall quality of the study.

It is important to note that neither of these studies aimed to investigate the relationship between OPB and SoMe use. Both studies included SoMe use a possible confounder or mediator. Thus, the lack of control, with regards to confounders between OPB and SoMe use, is not necessarily evidence of low study quality, because the studies did adjust for confounders with regards to the relationship between their main variables of interest. However, not controlling for confounders between OPB and SoMe use indicates a risk of bias in the results reported on that particular relationship. Consequently, the results should be approached with caution. For a summary of the risk of bias assessment, see **Table 3** (for a detailed account of the risk of bias assessment, see **Appendix C**).

TABLE 3 | Summary of risk of bias assessment.

Criteria	Erreygers et al. (2019)	Erreygers et al. (2017)
Representativeness of the sample	0	*
Sample size	0	*
Non-respondents	*	*-
Ascertainment of the exposure	0	*-
Comparability	0	0
Assessment of outcome	*	*
Statistical tests	*	*
Total score	*** = Unsatisfactory	*****- = Satisfactory

Star evaluation: very good studies (9–10 points), good studies (7–8 points), satisfactory studies (5–6 points), and unsatisfactory studies (0–4 points).

Strategy for Data Synthesis

In the protocol (registered at PROSPERO), a strategy for data synthesis was described. The plan was to conduct a meta-analysis to estimate the overall association between the use of SoMe and OPB. This step was, however, only deemed viable if at least four studies were included in the review and dependent upon a similar enough design of the included studies (low heterogeneity). If a meta-analysis was not deemed possible, we planned to summarize the evidence in a narrative style. As only two studies fulfilled the eligibility criteria, a meta-analysis was not conducted and only a narrative summary of the evidence is given in the present study.

DISCUSSION

This paper aimed to examine to what extent SoMe use is related to OPB among adolescents. A review of primary studies on that relationship was conducted using a systematic and transparent approach and resulted in two studies, which met the eligibility criteria.

Although both studies included in this review reported an association between SoMe use and OPB among adolescents; it is clear that the amount of quantitative data and studies on the present relationship is scarce. In addition, the quality of the present data may not be adequate. Consequently, associations cannot be established based on the current research. However, some points from these articles will be discussed, which may aid future research directions on the topic.

The Relationship Between SoMe Use and OPB Among Adolescents

In this review, OPB was defined as voluntary behavior carried out in an electronic/SoMe context with the intention of benefitting particular others or promoting harmonious relations with others. Erreygers et al. (2017) and Erreygers et al. (2019) reported an association between SoMe use and OPB among adolescents. In other words, the more adolescents use SoMe, the more OPB they display. Studies not included in this review due to time of publication (Lister, 2007) or focusing on another age

group (Wright and Li, 2011; young adults, Kinnunen et al., 2016; adults) also support the association between SoMe use and OPB. More specifically, Lister (2007) found an association between computer-mediated communication, defined as instant messaging and visiting SoMe sites (coined as "blogging"), and OPBs among American adolescents in 7th grade (12–13 years), 9th grade (14–15 years), and 11th grade (16–17 years). Wright and Li (2011) found that time spent using electronic technologies was correlated with OPB through that particular technology, such as social networking sites, chat programs, email, and text-messages, among young adults (mean age = 20 years). Kinnunen et al. (2016) found that the use of SoMe, defined as time spent on different SoMe sites such as Facebook, YouTube, and Wikipedia, was associated with help-giving and moral courage among university students in Finland (mean age = 26 years). These studies did not fulfill the eligibility criteria and thus were not included in the review. However, they do serve as corroboratory evidence of a possible association between SoMe and OPB.

Erreygers et al. (2017) reported different associations for different subtypes of SoMe use. The authors reported a positive association between OPB and audiovisual and SoMe (i.e., visiting a social network site or vlogging site), a negative association with gaming (i.e., playing online games with others), and no significant relationship with the functional use of digital media (i.e., sending or receiving an email). These results are supported by prior research from Wright and Li (2011) who found a stronger positive association between chat programs and social networks and OPB, than between e-mails and text messages and OPB, among young adults. In other words, young adults seem to be engaging more in OPB when visiting a social network site or vlogging site (i.e., YouTube), than when they send text messages or e-mails. In sum, these studies indicate that different forms of SoMe may relate to OPB in different ways. "Classic SoMe," such as social network sites, may be positively correlated with OPB, while functional use of SoMe may be weekly correlated or not correlated with OPB, and online gaming may be negatively correlated with OPB.

Erreygers et al. (2017) measured both receiving and performing OPB, finding associations with audiovisual and SoMe use for both variables of OPB. In other words, the more adolescents visited SoMe or used audiovisual media, the more prosocially they behaved online and the more they received prosocial reactions from others. Drawing from research that indicates an association between prosocial media content and prosocial behavior (Coyne et al., 2018), it is plausible that consuming positive audiovisual media content and messages could elicit OPBs, which could, in turn, elicit prosocial reactions from peers.

The Quality of the Data in the Present Review

Erreygers et al. (2017) and Erreygers et al. (2019) found notable associations between SoMe and OPB. Erreygers et al. (2017) also indicated differences in the relationships between OPB and typical SoMe (i.e., social networking sites) and OPB and online gaming. Studies not included in this review due to being published prior to 2014 (Lister, 2007) and focusing on adults (Wright and Li, 2011; Kinnunen et al., 2016) support these findings.

Although these results are interesting, they are not enough to establish associations. First, neither Erreygers et al. (2017) nor Erreygers et al. (2019) controlled for confounding variables, thereby making it difficult to eliminate alternative explanations. For example, some studies have indicated gender differences in adolescent (offline) prosocial behavior (Eisenberg et al., 2001; Caravita et al., 2009; Van der Graaff et al., 2018). Moreover, Lister (2007) found that females reported a higher degree of OPB than males. However, Wright and Li (2011) and Wang and Wang (2008) found no gender differences in OPB. With the effects of gender remaining unclear, controlling for gender as a possible confounder in the SoMe use–OPB relationship would be beneficial.

Research on offline prosocial behavior among adolescents and children indicates several possible relevant confounding variables. Studies show a decline in prosocial behaviors during early and middle adolescence (Carlo et al., 2007; Kanacri et al., 2013; Jambon and Smetana, 2014), suggesting age as a relevant confounder. Personality has also been shown to strongly predict prosocial behaviors among adolescents, especially morally relevant personality traits and resiliency (Padilla-Walker and Fraser, 2014; Xie et al., 2016). Some studies have indicated significant links between socio-economic status (SES) and prosocial behavior (Eisenberg et al., 2007). Prosocial behavior in rural areas may be relatively low due to depleted social capital and community resources (Carlo et al., 2007), compared to adolescents from more urban areas and middle-to-high SES families (Van der Graaff et al., 2018). However, one large study (Plenty et al., 2015) indicated the importance of the school environment showing that students who experience more manageable school demands and social support from teachers and classmates are more likely to display more prosocial behaviors. Thus, both SES and school environment could be important confounders. Lastly, the recipient of prosocial behavior may be a relevant confounding factor, as evidence indicate that prosocial behaviors in adolescence increase toward friends, but not toward members of one's family (Padilla-Walker et al., 2013).

Second, the assessment of the risk of bias in the included studies revealed that Erreygers et al. (2019) were unsatisfactory and thus at a high risk of bias and that Erreygers et al. (2017) were barely satisfactory and thus with a moderate risk of bias. One of the reasons for this is the use of self-report measures in both the studies. Although highly cost-effective, self-report measures are at high risk of social desirability bias, especially relevant when measuring OPB. Social desirability can be defined as the tendency for research subjects to give answers, which will be viewed favorably by others, instead of responses reflecting their true feelings. It can take the form of overreporting "good behavior," underreporting "bad behavior," or a combination of both. Research shows that social desirability influences the results in almost half of all studies using self-report (Van de Mortel, 2008). Social desirability scales can be used to limit the effects of social desirability, however, neither of the studies in this review did so.

In addition, self-report methods in relation to SoMe use have demonstrated low-to-moderate correlations with actual use, when comparing self-reports and tracking data. This has been shown when measuring both internet use (Scharkow, 2016; Araujo et al., 2017) and social network use (Junco, 2013; Scharkow, 2016). The typical tendency is overreporting (Araujo et al., 2017).

Third, although the included studies in this review (Erreygers et al., 2017, 2019) used a validated instrument of OPB, the OPBS is a global measure of OPB. Global measures of prosocial behavior have been criticized (Padilla-Walker and Carlo, 2015; Coyne et al., 2018). The vast research base on (offline) prosocial behaviors has shown that prosocial behaviors differ in their motivations, and hence in social and psychological outcomes (see Padilla-Walker and Carlo, 2015 for a detailed account). For example, Carlo et al. (2010) found evidence for six different prosocial behaviors. The limitations of using a global measure of OPB may be numerous, but the most pressing limitation concerns the validity of the results derived from the global measures. It may be the case that one of several subtypes of OPB (e.g., helping vs. sharing or altruistically motivated vs. egotistically motivated prosocial behavior) can explain much of the variance in the OPB-SM use relationship. The researchers behind the OPBS themselves encourage the development of a more elaborate measure of OPB covering different subtypes (Erreygers et al., 2018a).

Fourth, the studies included in this review (Erreygers et al., 2017, 2019) contained similar groups of participants in terms of culture. The participants were all Belgian adolescents and thus generalizing the findings to other countries and cultures may not be warranted yet. The researchers note the need for more diversity in the samples, in terms of nationality and culture, to corroborate their results. This point is substantiated by the aforementioned research on the links between (offline) prosocial behavior and SES.

Scarcity of Eligible Studies

The present review reveals a paucity of studies related to the use of SoMe and OPB. Only four studies (Ranney, 2016; Erreygers et al., 2017, 2019; Parlangeli et al., 2019) that measured SoMe use and OPB among adolescents were identified. Further, only two of these (Erreygers et al., 2017, 2019) reported relevant data on the relationship between the variables of interest.

Two possible explanations for the scarcity of eligible studies emerge. Firstly, the eligibility criteria may have been too narrow. The criteria demanded quantitative studies reporting adequate data on the relationship between OPB and SoMe use among adolescents (13–18 years), published between 2014 and 2019. Wright and Li (2012) did refer to a number of qualitative studies on OPB in 2012, which may indicate a substantial qualitative research base on OPB, considering the increase in research concerning digital media. However, this research was deemed to be outside the scope of this review focusing on the quantitative association between SoMe use and OPB.

To investigate if more articles of relevance could be found by loosening the criteria, a thorough hand search and *snowballing* (i.e., reading articles cited in articles identified in the present review) was conducted. This search was only focused on studies containing relevant data on the relationship between SoMe use and OPB. The investigation revealed no additional articles which met the original eligibility criteria and resulted in only three studies containing relevant data on SoMe use and OPB, although in different/unwanted target groups (Wright and Li, 2011; Kinnunen et al., 2016) or which was published prior to 2014 (Lister, 2007; Wright and Li, 2011). There are therefore no strong indications that the strict eligibility criteria were mainly responsible for the low number of included studies.

Thus, the other possible explanation does not concern the eligibility criteria, but a scarcity of OPB studies in general. There is a vast base of research on media and media effects on children and adolescents (Valkenburg et al., 2021). However, some researchers (Livingstone, 1996; de Leeuw and Buijzen, 2016) note that media research traditionally has contained an imbalance in research attention. More specifically, there seems to be a bias in research attention regarding "bad content" and negative effects of media compared to positive content and positive effects. Recent studies have, however, also focused on the potential positive aspects of SoMe use (de Leeuw and Buijzen, 2016; Scott et al., 2019; Thomas et al., 2020; Hjetland et al., 2021)—for instance, recognizing how SoMe play a key role in the social lives of adolescents (Hjetland et al., 2021).

As a related issue, Erreygers et al. (2017) note the seemingly paradoxical fact that the amount of research devoted to antisocial online behavior (AOB) vs. OPB is almost opposite to the actual occurrence of this behavior. In their study, they investigated the simultaneous occurrence of AOB next to OPB and found that OPBs were much more prevalent. Those findings are supported by Lister (2007), which also found that OPBs were more prevalent than AOB. de Leeuw and Buijzen (2016) stressed the importance of balancing the research on positive and negative behavior and effects of (social) media, as there are enormous potentials for child and youth development to be explored in media, in particular SoMe.

Strengths and Limitations

A primary strength of the present study is the use of standardized guidelines to carry out a review in a transparent and robust way. It is also to the best of our knowledge the first review to investigate this area within the field of adolescent SoMe use. Finally, an additional updated literature search was performed in May 2021, which increases the likelihood of identifying any new developments within the scope of the present study.

The present review also has some limitations. First, the search may not have covered all relevant literature, and only included published peer-reviewed papers (i.e., not gray literature). Even though SoMe use was widely operationalized, the way in which OPB was operationalized may have excluded some relevant articles. "OPB" as a term is fairly new and may not necessarily be the nomenclature used in fields outside psychology or social sciences. Other kinds of OPBs were also outside the scope of this review, and online prosociality in the form of civic engagement, voluntary work, and donations to organizations have merit in their own right. This would be an interesting avenue to investigate for future reviews. However, the stringent search

with well-defined search criteria is one of the strengths of this review. The search was developed in collaboration with specialist librarians at the Norwegian Institute for Public Health, test search studies were conducted prior to the main search in order to increase sensitivity and specificity, and the search covered seven large databases in social, psychological, and health sciences.

Second, there were too few studies included in this review to establish an association and to conduct a meta-analysis. However, finding only two studies that fulfilled the eligibility criteria is a finding in itself, and as we have argued in the sections above, seems to be indicative of a research gap within the field.

Third, the search had a lower limit of papers published in 2014. This decision was based on the rapid changes in the use and type of SoMe platforms available. Findings more than 5 years old were therefore deemed to be less relevant to shed light on the contemporary association between SoMe use and OPBs.

Finally, although the NOS adapted for cross-sectional studies has proven to be quick, adaptable, and to show moderate reliability, compared to the widely used Appraisal Tool for Cross-Sectional Studies (AXIS) (Moskalewicz and Oremus, 2020), it has not been thoroughly validated. It has merely been adapted for the use of cross-sectional studies, without thorough testing and validation. Therefore, even though the risk of bias assessment in this review was thoroughly conducted, the use of NOS may have unintentionally skewed the risk of bias assessment in either a low-risk or a high-risk direction.

CONCLUSIONS AND FUTURE DIRECTIONS

The present review included two studies that met the eligibility criteria. Although both studies found an association between OPB and SoMe use among adolescents, the results are not strong enough to establish an association. Finding only two studies indicates a research gap in the field and additional research on the subject is required and warranted. To aid future research on the subject, the next section will propose possible topics of inquiry.

First, future research on the relationship between OPB and SoMe use may benefit from looking at different subtypes of SoMe in relation to OPB. It may be that functional media use, social networking and vlogging, and online gaming all relate to OPB in different ways. It would also be particularly interesting to investigate whether the negative correlation between OPB and online gaming found in Erreygers et al. (2017) could be mediated by gaming content (i.e., prosocial vs. antisocial content).

Second, future studies may benefit from including potential confounders and moderators when investigating the relationship between OPB and SoMe use, such as gender, age, personality types, SES, school environment, and the recipient of the behavior (i.e., directed at friend vs. family).

Third, to increase the validity of and accuracy in the data collected, future studies could benefit from including social desirability scales (Van de Mortel, 2008) in relation to OPB and match tracking data with self-reports in relation to SoMe use. Finally, offline prosocial behavior is considered to be a multidimensional construct (Padilla-Walker and Carlo, 2015), which eludes to the limited usefulness of a global measure of prosocial behavior. Thus, there are ample reasons to view its online counterpart as a multidimensional construct as well. Consequently, future research could benefit from looking at prosocial behavior and its subtypes (i.e., altruistically and egotistically motived prosocial behavior). Although, it should be noted that the subtypes of OPB could be quite different from the subtypes of offline prosocial behavior (i.e., online donations, online activism, and online sharing).

AUTHOR CONTRIBUTIONS

JCS and CL conceptualized the aim and designed the paper, collected the data, and reviewed the included studies. CL drafted the first version of the paper in collaboration with JCS, GJH, and TB. GJH acted to solve any conflict related to the selection of the studies. All authors contributed to further revisions of the paper. All authors contributed to the revisions of the paper after peer-review, and have approved the final version of this paper.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2021.579347/full#supplementary-material

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Adolescent Deviance and Cyber-Deviance. A Systematic Literature Review

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Deviance is a complex phenomenon that influences aspects both at the macro and micro levels, extensively studied by social scientists The main objective of this article was to conduct a systematic literature review for clustering the topics on adolescent deviance and online deviance. Grounded in Pickering's and Byrne's guidelines and PRISMA protocol, we identified the most recurrent themes, theories and predictors in the 61 most-cited articles related to the concept of deviance from the database of Web of Science, as well as in 488 abstracts of representative papers. The results emphasized four main clusters of topics, namely, predictors of deviance, online deviance, socio-constructivist theories, and research based theories of deviant behavior. The findings highlighted that researchers frequently use strain theory, social learning, self-control, and social control theories in their studies. Our systematic literature review revealed also the most encountered predictors of deviance, which we have classified into five main categories: family patterns, socio-demographic aspects, socialization, victimization, and school and individual factors. For online deviance, family patterns, socio-demographic aspects, victimization, school and individual factors, and Internet and computer use have been determined to be the main groups of predictors. The present systematic literature review makes an important contribution to the understanding of deviance by presenting an overview of the phenomenon.

Keywords: deviance, cyber-deviance, adolescents, predictors of deviance, systematic (literature) review, KH coder

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INTRODUCTION

From a multidisciplinary view, deviance is a topic of interest for social scientists as it concerns the violation of approved rules and established norms. As such, there is an abundance of published studies on this research topic, which, however, makes the process of understanding the phenomenon quite challenging.

Consistent with the age-crime curve approach (Moffitt, 1993b; Shulman et al., 2013; Farrington, 2017) which sustains that teenagers engage into deviant behaviors more often than other categories, adolescence is worth considering in studying deviance. In addition, with the spread of Internet technology, a new type of deviant behavior emerged, which is known as cyber-deviance, particularly prevalent in adolescents' lives. As such, teenagers' online deviant behavior has become a matter of grave concern for parents, educators, and researchers.

The Concept of Deviance

The phenomenon of deviance occupies a central position in social science topics. It may be linked to morality, social order, and social inequality. Its genesis has been traced to the 1940s and is credited to Merton (1938) and Sellin (1938), scholars belonging to the Chicago School of Sociology. They defined deviance as a topic of analysis of socio-criminogenesis, a field that encompasses research in criminology, psychiatry, psychology, and sociology.

The wide range of fields interested in defining and studying deviance shows the level of complexity of this phenomenon. As Parsons (1951) emphasizes, deviance affects both the individual and the macrosystem, characterized by deviation from the moral and established rules that form the mainstream culture. According to the author, on an individual level, deviance represents the motivated tendency of an actor to behave in contradiction of one or more institutionalized social rules (Parsons, 1951). The behavior at the individual level has consequences at the social level. From a macro perspective, deviance is the opposite of social control. Hence, it represents the tendency to disbalance the social system, while social control mechanisms act to reestablish social equilibrium.

Social disapproval is an illustrative example of a social control mechanism. Therefore, deviant acts are not just rule-breaking, they are also behaviors that are against the societal or communal norms, which may trigger social disapproval (Clinard and Meier, 2015; Goode, 2016). Social disapproval is expressed by a lack of acceptance, isolation in a community, and social sanctions such as shame and guilt, which end up being accepted by community members as well as the individual as legitimate (Elias, 1978).

The mechanism of internalizing shame and guilt as a disciplinary practice is also a focus of Foucault's (1971) perspective that portrays deviance as normal and regulatory in society. With regards to presenting institutionalization and confinement as instruments to impose the rules of the dominant groups, Foucault (1971, 2007) explains how the external discipline is transferred to a discipline that is imposed from within. An internalized, self-disciplinary power is under the threat of being exposed. From this perspective, deviants seem to be the marginalized ones, the ones to lose their power to hold onto their own values and are forced to accept societal norms through isolation, surveillance, and discipline. The individuals committing rule-breaking, deviants, may be disciplined harshly and, therefore, eventually become a non-deviant (Foucault, 1971, 2007; Turkel, 1990). Complementary to Foucault's view, Durkheim (1938) characterizes deviance as being inevitable, present in any society, and necessary for its functioning.

Theories of Deviance

In the quest to understand the phenomenon of deviance, the question of whether deviant acts and, therefore, deviant individuals are born or is society the one that labels them as such arises. This is a central topic in the study of deviance, with essentialist and positivist approaches arguing that deviant individuals are born with specific traits that influence their behavior, whilst constructivist scholars contend that society marks individuals as deviant (Thio et al., 2013).

To expand on their idea of the presence of deviant traits in individuals, positivists attempted to identify specific characteristics of this phenomenon, which resulted in the formulation of many theories. The most common *positivist theories* include social learning theories (Bandura, 1978; Akers and Lee, 1999; Akers, 2017), strain theory (Cohen, 1955; Cloward, 1959), anomie theory (Merton, 1938), self-control theory (Akers, 1991; Hirschi and Gottfredson, 2000), deterrence theory (Gibbs and Erickson, 1975; Warr and Stafford, 1991), differential association theory (Sutherland et al., 1992). The inclination of an individual toward engaging in deviant acts is what distinguishes a deviant from a non-deviant. This framework traces back from the sociobiological, psychological, and criminological research of Italian naturalists who attempted to identify biological features or psychological traits unique to deviants (Lombroso-Ferrero, 1911). The biological orientation has now promoted more sophisticated approaches, assuming the presence of specific genes or genomic segments as proof of inclination toward addictive and risk-taking behaviors (Shostak et al., 2009; Linnér et al., 2019; Mills and Tropf, 2020). These studies belong to sociogenomics, a discipline that connects genetics and sociology (Udry, 1995; Duster, 2006a,b; Mills and Tropf, 2020).

While positivist theorists claim that an act is seen as deviant because it breaks the norms of a particular society, constructivists notice that some acts are perceived as deviant only in a particular context but are not universally categorized as deviant and distinguished between deviance and crime. The most relevant *constructionist theorists* include labeling theories (Erikson, 1962; Lemert, 1967; Ben-Yehuda, 1990; Becker, 1995, 2008), symbolic interactionism (Clinard and Meier, 2015), phenomenological theories (Matza and Blomberg, 2017), and social conflict theories (Foucault, 1971; Jensen et al., 1978; Mills, 1981; Hagan et al., 1985; Katz, 1988; Henry and Milovanovic, 1996; Milovanovic, 1996; Hagan and McCarthy, 1998). Constructivists argue that it is not the act that is deviant but society's act of labeling it as such that makes it deviant. In this sense, one has to acknowledge the role of cultural differences in labeling an act as deviant (Goffman, 1978; Clinard and Meier, 2015), although criminal acts are universally defined as deviant. Deviance is relative as it depends on the context in which it is judged and on how society labels a particular act or individual. Moreover, deviance is the result of a subjective experience, in that each person provides a certain meaning to the acts they are involved in. At the same time, deviance is voluntary, being regarded as an expression or choice of a person (Erikson, 1962; Ben-Yehuda, 1990; Becker, 2008).

In an *integrative approach*, Thio et al. (1978) argue that the two above-mentioned frameworks are complementary. Therefore, the authors distinguish between higher consensus deviance and lower consensus deviance. Higher consensus deviance includes acts that are generally perceived as deviant and cause major losses, while lower consensus deviance relates to acts that are seen as deviant by fewer persons because those acts cause minor losses (Thio et al., 2013).

The classification of deviant theories is related to many research areas. The present study focuses on the psychological and sociological aspects as they relate to deviance in teenagers. Specifically, *psychologists* analyze deviance from the point of

individual characteristics. The main cause for deviant behavior is found strictly at the individual level and, in our case, at the adolescent stage. The most important psychological theories refer to psychoanalytic theories, such as, Freud's (2012), the cognitive development theory of Kohlberg and Hersh (1977), and the learning theory (Bandura and McClelland, 1977). Freud believes that all children are born with tendencies toward deviant behaviors, but appropriate socialization experiences can help them not become deviant. On the other hand, Kohlberg and Hersh (1977) claimed that there exist stages of moral development, with deviant adolescents being those who have failed to pass through the pre-conventional and conventional stages of moral development. According to Bandura, deviant behavior is learned by observation, imitation, and shaped by rewards and punishments (Bandura, 1971, 1978; Bandura and McClelland, 1977).

On the other hand, *sociologists* study the emergence of deviance and its impact on societies, communities, or groups and develop theories that view the phenomenon on a wide scale (Bandura, 1971, 1978; Bandura and McClelland, 1977). Hirschi's theories of social control (Hirschi, 1969, 2017; Pratt and Cullen, 2000), the theory of differential association (Sutherland et al., 1992; Ogien, 2002), and Glaser's theory of differential identifications (Erikson, 1962; Glaser, 1971; Rowitz, 1981) present deviance as a result of group socialization. Considering the ideas of these orientations, deviance in teenagers is associated with family factors, peer group pressure, and school climate. Another perspective links deviant acts to status frustration. Thus, Cohen's subcultural theory contends that teenagers' deviant behavior is a tactic used by those with low social status and unsatisfactory social conditions to attain a higher social status in a short time (Cohen, 1955, 2002; Barmaki, 2016). In addition, structural theorists view socioeconomic status as a predictor of deviant behavior, frequently encountered in middle-class teenagers (Hagan et al., 1985; Hagan, 1990; Hagan and McCarthy, 1998; Hagan and Foster, 2001). Therefore, deviance is a result of the antinomy between means and social aspirations, which is also a topic discussed by the anomie theory, with anomie being defined as the state of society characterized by a lack of norms and social values (Merton, 1938). Socio-constructivist theories that present deviance as a result of social judgment and labeling also have sociological orientations (Becker, 1995, 2008; Yoder, 2011).

Types of Deviance

Along with formulating the theories to explain the general tendency of deviance, scholars have also distinguished specific types of inappropriate behavior. Deviance behavior ranges from serious offenses, classified as delinquent acts (such as property crime, violent crime, delinquency, drug and substance-related crime, white-collar crime, etc.) to minor antisocial acts that are not sanctioned by the penal system (Gorman-Smith et al., 1998).

With regards to adolescents' engagement in deviant behaviors, scholars focused on substance and alcohol use (Durkin et al., 2005; Maimon and Browning, 2012b), marijuana use (Winfree and Griffiths, 1983; Akers and Cochran, 1985; McBroom, 1994; Ennett et al., 1997), school misconduct (Musgrave, 1980; Lepoutre, 2007; Peguero, 2011)), self-injury (Adler and Adler, 2007; Brossard, 2014; Taylor and Ibanez, 2015; Long, 2017), self-harming behaviors such as eating disorders (Sischo et al., 2006), bullying (Juvonen and Graham, 2014; Tippett and Wolke, 2014).

A particular category of deviance, increasingly common nowadays, is *cyber-deviance,* which refers to the harmful activities happening in the digital sphere (Jewkes and Yar, 2013; Graham and Smith, 2019; Yar and Steinmetz, 2019). While the current understanding of deviance is rooted in Durkheim's (2002) definition of crime, the debate on cyber deviance (online deviance) can be traced back to Wall's (2001) conceptualization of cybercrime. According to Wall (2001, p.2), it refers to an "occurrence of a harmful behavior that is somehow related to a computer, which generates a powerful response from the media, policy-makers, politicians, academics and the public." This definition outlines two main characteristics of cybercrime, namely, the electronic environment and the impact related to the increased concern for cybersecurity. Arguing that Wall's definition of cybercrime is too broad, Yar and Steinmetz (2019) conceptualized cybercrime as a range of illicit activities related to information communication technologies. Therefore, cybercrime refers to online harmful activities sanctioned by formal laws. The other types of online disruptive activities are included under the umbrella term of cyber deviance, which relates to informal violations of laws (Jewkes and Yar, 2013; Graham and Smith, 2019; Yar and Steinmetz, 2019).

Nevertheless, like in the case of crime and deviance, there is no clear demarcation between cybercrime and cyber deviance. This is because norm-breaking behaviors may be included in the formal regulations at any time and certain behaviors that are sanctioned by law may not be regarded as deviant in all contexts. In the study of cyber deviance as occurring in the adolescent stage, scholars mostly focus on digital piracy (Udris, 2016), online harassment and computer hacking (Lee, 2018), cyberbullying (Hinduja and Patchin, 2010; Holt et al., 2012; Lee, 2018), sexting and online sexual exposure (Karaian, 2012; Garcia-Gomez, 2017; Dodaj et al., 2020).

The phenomenon of deviance has an extensive volume of literature that is organized in disparate clusters of studies on various specific types that arouse social concern on the one hand and a preoccupation with in-depth accounts of theoretical approaches on the other. Although extremely rich, the existing literature is narrow in terms of its focus, and there is a need for a more structured presentation of common topics by researchers in the field from a systematic point of view. Most of the reviews that follow a perspective rooted in social sciences (psychology, sociology, criminology, communication) relate to positive deviance (Albanna and Heeks, 2019; Alzunitan et al., 2020), workplace deviance (Götz et al., 2019; Arshad and Malik, 2020), and substance use. Other types of deviance under scrutiny are different types of aggression, antisocial disorders in adolescents, sexual offenses, sexual deviance, social deviance, white-collar crimes, delinquency, and cybercrime. With regards to the reviews conducted on the topic of deviance, the main topics of interest are specific forms of offline deviance, namely, drug use, alcohol abuse, violence, dating violence, sexual aggression, deviant sexual fantasies, illicit sexual behaviors, sexual deviance, ritualistic

child abuse, pornography exposure, self-injury, etc. At the same time, researchers focus on different types of online deviance, such as cyberbullying (including adolescent cyberbullying), Internet-based radicalization, online sexual deviance, online negative user behavior, cyber dating abuse, social spamming, problematic social media usage, and problematic use of the Internet.

As far as our knowledge, there is no systematic review that covers the main theories of deviance from a psychological and sociological (including criminological) perspective. Still, comprehensive classifications of these theories are present in textbooks (Thio et al., 2013) and classical studies (Sagarin and Montanino, 1976; Short and Meier, 1981; Sampson and Laub, 1992; Birkbeck and Lafree, 1993; Moffitt, 1993b; Feinberg, 2011). Focused on examining the literature regarding the human reinforcement learning process, the systematic review of Brauer and Tittle (2012) presents the results of a comprehensive analysis of 179 experimental sources and 67 peer-reviewed journal articles. Other theories related to deviance covered in the literature reviews are social learning theory, social control theory, differential association theory, life-course perspectives, social disorganization, strain theory, subcultural theory, social concern theory, routine activities theory or situational approaches, lifestyle exposure theory, arousal theory, criminology's situational approach, rational choice, delinquent problem-solving, deviance regulation theory, interactionist conception, neo-cognitive learning theory, gene-based evolutionary theory, desistance theories, neutralization theory, frustration theory, etc. In the majority of the literature reviews, deviance was not studied as a single phenomenon, but as it related to other factors such as religiosity (Adamczyk et al., 2017), family influence (parental communication (Roisko et al., 2014), parental styles (Ruiz-Hernández et al., 2019), parental control, family processes, family history of substance use), peer-related factors (peer influence (Leung et al., 2014), peer network, peer association, motivations of dissent in social groups), individual factors (animal cruelty (Chan and Wong, 2019a,b; Longobardi and Badenes-Ribera, 2019), victimization and sexual victimization [(McGrath et al., 2011; Dennis et al., 2012; Engström, 2021), child maltreatment (Fitton et al., 2020), non-emotional callousness and impulsivity (Toro et al., 2020), motivational processes (Agnew, 1995)]. Concerning online deviance, most of the systematic reviews refer to a specific type of behavior, which is cyberbullying (Kowalski et al., 2014; Watts et al., 2017; Vale et al., 2018; Rosa et al., 2019; Zych et al., 2019). While reviews on online deviance focus on main theories of deviance, the systematic reviews in the field of online literature focus on specific online behaviors and their correlates, including the predictors of offline deviance mentioned before, Internet access, and computer use. Of particular interest is the systematic review of Estévez et al. (2020), which provides a bridge between online and cyber-deviance by revealing similar patterns in the development of bullying and cyberbullying behavior. In this sense, the authors show that risk factors and protective factors of the two problematic behaviors mostly coincide.

Grounded on the previous analyses conducted in this field, our present systematic literature review inquires the following: *How are the topics of deviance and online deviance covered in the in the field of social sciences?*

In consideration of our question, the goal of this systematic review is to collate and summarize the literature on the field of deviance and online deviance, with a particular focus on teenagers' behaviors, and to achieve this purpose, the article proposes specific *objectives* in order to go beyond a panoramic understanding of the phenomenon. They are as follows:

- ➢ Identification of the main topics addressed in articles written on adolescent online and offline deviance until 2021;
- ➢ Comparing the psychological and sociological approaches on deviance and revealing overlaps;
- ➢ Highlighting the main predictors and indicators of online and offline deviance;

By systematically and qualitatively reviewing the literature in the field of deviance, we ultimately seek to gather the relevant findings on this field in a single paper and provide a better understanding of the same.

METHODS

As the main method, the article employs the 15 steps of systematic quantitative literature review proposed by Pickering and Byrne (2014). We began by defining the topic, formulating research questions, and identifying the keywords. Then, we searched and analyzed the relevant articles. At the same time, we followed the guidelines of PRISMA Protocol (Moher et al., 2009; Page et al., 2021) for ensuring that articles are systematically and transparently reviewed.

For the comprehensive analysis carried out in this study, we implemented computational text analysis methods using KH Coder (Higuchi, 2016), which allowed us to explore almost 500 articles. We employed this software for identifying patterns in the data and comparing different datasets by constructing a coding schema, which may be further used for analyzing other datasets. The use of a reproducible review technique, followed in the present article, has the major benefit that it diminishes researchers' subjectivity in conducting a review.

Inclusion and Exclusion Criteria

The present research attempts to examine a large dataset of articles on deviance and online deviance from the Web of Science database. The rationale behind choosing Web of Science was to include only objective peer-reviewed articles from specific fields. It also facilitates the selection of articles based on the field of study using its filtering options.

The inclusion criteria were:

- Articles indexed in Web of Science
- Studies about deviance
- Language: English

The exclusion criteria used in the selection process consisted of:

- Field: at least one of the three of them should be Sociology (Web of Science filter)

– Studies that have an abstract available on the Internet in English language
– For Dataset 1: Articles' impact: top cited filter and most cited for the full-text articles
– For Dataset 2: Articles that refer to adolescent deviance (TS 2) and online adolescent deviance (TS 3) – for detail see section Stage 1 – Preparing the datasets

Considering the objective of this paper, for the analysis, we chose to include only those sources that have Sociology as one of their three focus fields. We employed this criterion in order to systematically narrow the extensive dataset while keeping focused on the impact of deviance in society. The included sources are articles, reviews, and book chapters in English, with an abstract. Furthermore, the sources belonging to the dataset have as one of their keywords "deviance" or "online deviance." In terms of timeframe, we included in our systematic review the articles that were published between January 1975 and April 2021.

For objectively selecting the articles with the highest impact, we applied the highly cited articles filter on the previous results. Parallel to this dataset, we created a second dataset that included articles, reviews, and book chapters that also contain "deviance" and "adolescence" or "online deviance" and "adolescence" as their key focuses. In addition, all the selected sources were in English and had an abstract that was available for free.

The inclusion criteria were established to ensure the objectivity of sources selection and study replicability. As the main goal of our study was to offer an overview of the phenomenon of adolescent deviance, we did not use an extensive number of exclusion criteria.

Computational Text-Analysis Using KH-Coder

Based on the analysis model proposed by Pickering and Byrne (2014), our systematic analysis, which uses KH Coder, followed three main steps:

➢ Stage 1 – Preparing the datasets (includes steps 1 to 6 according to Pickering and Byrne, 2014)
➢ Stage 2 – Identifying the coding schema (includes steps 7 and 8 according to Pickering and Byrne, 2014)
➢ Stage 3 – Analyzing the bulk set of articles (includes steps 9 to 11 according to Pickering and Byrne, 2014)
➢ Stage 4 – Presenting the main results (includes steps 12 to 15 according to Pickering and Byrne, 2014).

Stage 1 – Preparing the Datasets

Based on the above-mentioned terms, first, we made repetitive composed queries on the Web of Science database. For building our database, we chose words that referred to deviance in general, deviance as occurring in adolescence, and online deviance during teenage years.

The dataset was created by employing three main criteria (TS = Topic/Subject):

TS1 = (devian* OR disruptive behavior OR immoral OR amoral OR harming practices OR incivility OR bad behavior OR harming behavior OR deviant behavior OR moral panic OR delinquency OR anomie OR immorality OR social disorder OR antisocial behavior);
TS2 = (devian* AND adolescen*) OR TS = (devian* AND teenage*) OR TS = (devian* AND school*);
TS3 = (Online devian* AND adolesc*) OR TS = (Online devian* AND teenage*) OR TS = (Cyber* AND adolesc*) OR TS = (Cyber* AND teenage) OR TS = (Digital* AND adolesc*) OR TS = (Digital* AND teenage*);

From the obtained results, we constructed two datasets, one with the most cited articles (full text based on all three criteria) and a larger one comprising only abstracts (focused on adolescent deviance – criteria 2 and 3).

Preparing Dataset 1

Based on the mentioned queries, we selected 10% of the most cited articles from the Web of Science database by filtering the obtained results on the field. In this step, we took into consideration the top-cited articles on deviance related to the field of sociology. After applying this filter for the first criterion, 21 sources were found.

For the second criterion, three articles belonging to the highly cited articles were identified, while for the third criterion, only one article could be found. The four articles were already included from the previous stage. For completing the database with relevant articles in the field of teenagers' engagement in deviant behavior, we decided to include the 21 most cited articles that correspond to these two criteria such that the number of articles is the same as that for the first criterion. Further, we removed the duplicates and were left with 61 articles.

Preparing Dataset 2

This dataset comprises abstracts focusing on deviance and online deviance in the teenage years as found in the articles complying with the second and third criteria. In this step, we introduced 488 abstracts (from the 515 sources initially selected, we excluded 27 as they were duplicates or had no abstract).

Stage 2 – Identifying the Coding Schema

The abstracts of 61 articles were used for developing the coding schema, an extensive process that involves the following steps:

➢ Employing the preliminary word frequency, the automatic process using KH Coder software for identifying the most frequent terms;
➢ Manually organizing the most frequent words identified in the first step in thematic codes;
➢ Automatically generating self-organizing maps of words by automatically classifying them through Jaccard similarity coefficient using a multiple iteration process;
➢ Automatically generating self-organizing maps of our thematic codes and comparing them with the previously obtained automatic codes;
➢ Developing the coding schema by adding new codes based on the literature; at this stage, we manually assigned the terms of the 61 abstracts to the existing codes and created new ones.

In the end, we obtained 33 codes. The coding schema was furtherly employed for computational text analysis.

Stage 3 – Analyzing the Complete Dataset

Using the coding schema, we analyzed the full text of the most cited sources (61 articles) using the KH Coder software (through correspondence analysis).

Next, we examined the results of applying the coding schema to a new dataset, as well as the 488 abstracts on deviance and online deviance.

Before effectively applying the coding schema, we conducted a preliminary analysis. This includes making automated queries focused on terms frequencies and manual analysis of the 488 sources. The manual exploration facilitated a comprehensive understanding, thereby facilitating the acquisition of an overview of the field covered, the type of analysis, and the theories addressed, as well as additional aspects that could not be captured with the KH Coder software.

RESULTS

Stage 1 – Preparing the Dataset

At this stage, we had 250,825 articles, out of which 2,874 are clustered in potentially relevant fields (e.g., sociology AND psychology; sociology; sociology AND criminology AND penology; sociology AND social issues).

For the second criteria, referring to adolescent deviance, we obtained a total of 3,800 sources and 374 results in the same potentially relevant fields.

For the third criterion, we obtained a total of 6,221 sources and 131 results in the same potentially relevant fields. The third criterion was more specific and included articles on online adolescent deviance.

To facilitate an understanding of the process, we present the outline of the methodological approach below (**Figure 1**). The robustness of the schema was ensured by developing it based on PRISMA Protocol (Page et al., 2021); the employed PRISMA guidelines for Dataset 1 and Dataset 2 may be consulted in the **Supplementary Material** section.

Stage 2 – Identifying the Coding Schema

The creation of the coding schema started by making queries to explore the relationships between words and their co-occurrences patterns. Then, we classified relevant terms into categories.

In the first phase of the analysis, we identified the most frequent words from the 61 abstracts. The list of the most common words includes "adolescent," "health," "social," "online," "school," "family," etc.

From the word association query, we defined the thematic categories.

Consequently, the word association revealed that there are seven major themes.

Next, we presented the main themes identified in the previous step and the frequency of the terms. With reference to the occurring medium, we distinguished the terms indicating the digital environment, namely, *online* (45), *digital* (41), *Internet* (39), *technology* (15), *Facebook* (10), *ICT* (9), *computer* (7), *informational* (6), *cyber* (5), and *cyberspace* (2), and the offline context: *family* (52), *school* (47), *life* (39), *parent* (24), *neighborhood* (14), *physical* (13), *offline* (110), *country* (5), and *gentrification* (7).

One interesting finding concerns the frequency of the *health* term (59), which seems, at first sight only, indirectly connected to deviance. The associated terms in this category include *mental* (18), *stress* (9), *autism* (7), *autistic* (6), *anxiety* (5), *medical* (5), *stressor* (5), *disorder* (4), *harm* (4), *psychological* (4), *hospital* (3), and *fitness* (3). Their occurrence may be the result of including a more general query in the selection criteria, which resulted in a high number of results (2,874 articles in sociology), even after applying the field filter.

The word frequency query also revealed the population of interest in the selected studies, namely, *adolescent* (71), *child* (31), *youth* (30), *student* (14), *undergraduate* (13), *teenage* (9), *teenager* (8), *adolescence* (5).

Moreover, the abstracts included in the dataset refer to specific behaviors perceived as deviant in the online and offline context. Hence, terms such as *cyberbullying* (10), *sexting* [sext (5), sexting (4), sexter (1)], suggest deviant behaviors online, while words such as *bullying* (12), *harassment* (10), *violence* (9), *aggression* (5), *violent* (4), *grooming* (2) indicate deviant offline behaviors. Along with specific deviant behaviors, the articles refer to deviance in general, comprising terms such as *deviance* (23), *deviant* (16), and *deviancy* (2). The way terms are employed changes if they are associated with the words *digital*, *online*, or *cyber*.

The last category revealed that most frequent words consist of terms reflecting delinquency, namely, *delinquency* (25), *delinquent* (7), *crime* (17), *criminal* (14), *arrest* (7), *incarceration* (9), *imprisonment* (5), *desistance* (4), *criminological* (3), and *illicit* (3).

At this stage, we compressed the dimensions into three main clusters by employing hierarchical cluster analysis with Jaccard distance, as shown in **Figure 2**.

The first cluster included the terms related to the digital environment and online deviance. In the case of the second cluster, this included only terms related to health and mental health. The third one comprised the other codes, namely, offline context, adolescent, adolescent, offline deviance, and delinquency.

Improving the Initial Coding Schema

For assessing the reliability of the created coding schema, we prepared a self-organizing map of the words from the abstracts the created coding schema, we prepared a self-organizing map of the words from the abstracts (**Figure 3A**) and compared it with the self-organizing map of the preliminary codes (**Figure 3B**).

The self-organizing map of abstracts partially reflected the map of codes that we developed, even if the employed colors did not coincide.

In the main clusters of the self-organizing map of abstracts, we identified key terms that relate to the distinguished dimensions (a. digital environment; b. offline context; 3. health and mental health, d. adolescent; 5. online deviance; 6. offline deviance; 7. delinquency). The other emerged category consists mostly of terms related to divide and inequality, including the issue of digital divide and differential access to resources (8). The least consistent category between those created using word frequency query is related to *adolescence*. Considering the finding

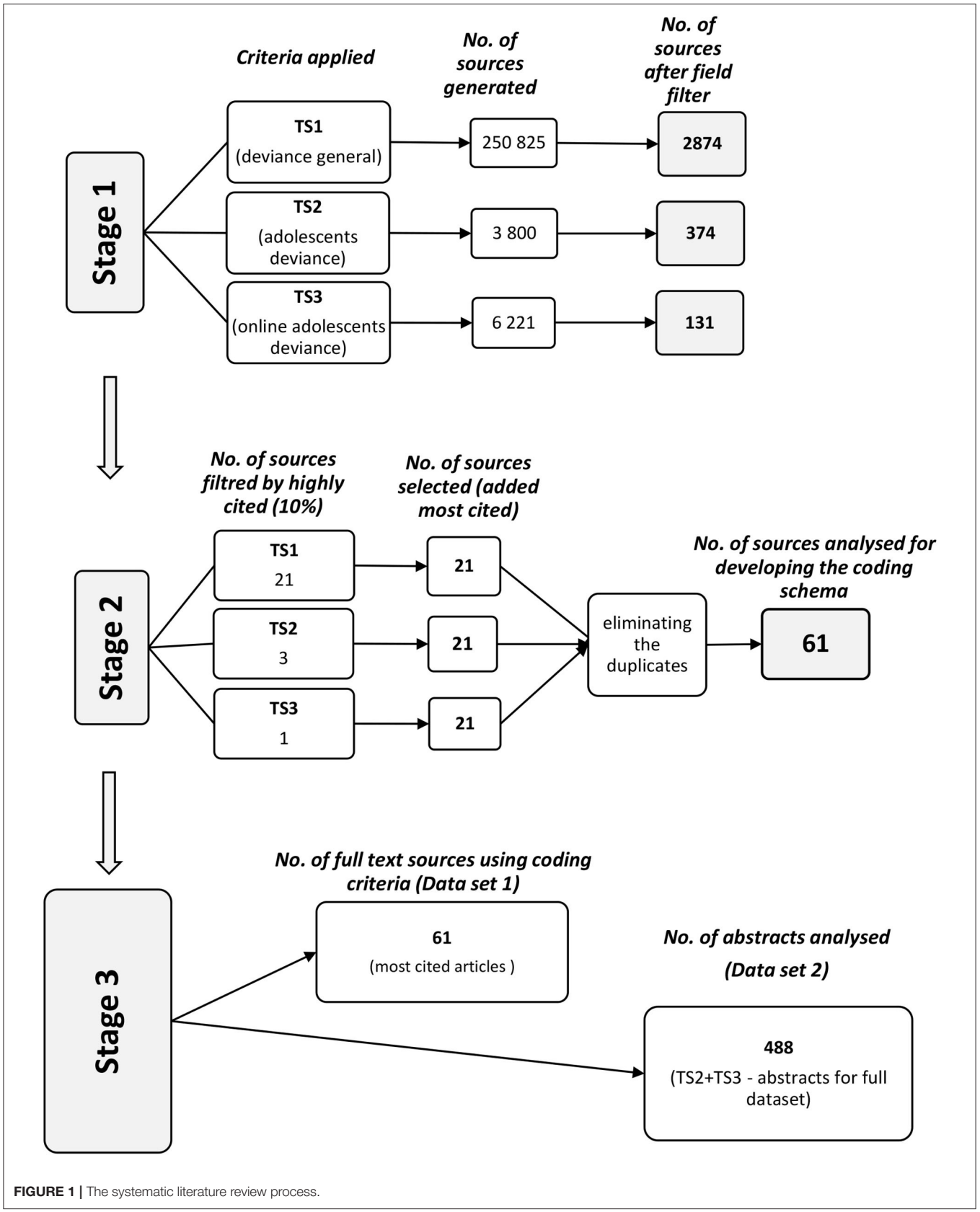

FIGURE 1 | The systematic literature review process.

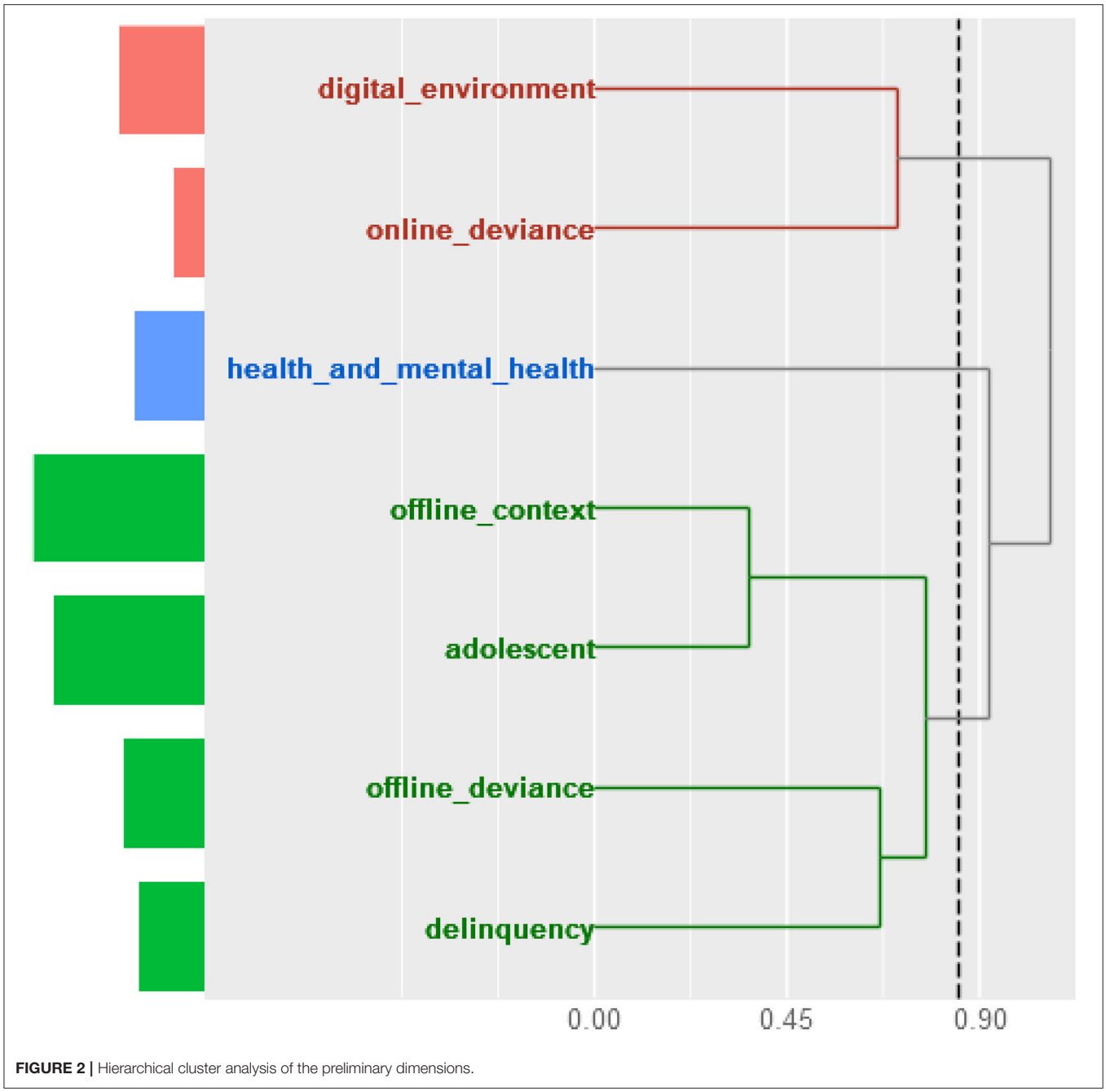

FIGURE 2 | Hierarchical cluster analysis of the preliminary dimensions.

of comparing the two figures generated from preliminary coding and self-organizing map of words, we reviewed the classification by manually coding each abstract.

The Final Coding Schema

At this stage, we added specific codes to the preliminary classification for including the predictors of deviance, as well as of cyber-deviance mentioned in the abstracts and codes that relate to the main influencing factors. In the end, the final coding schema had 33 codes, with the most recurrent being predictors of deviance, school and education, socioeconomic status, age, children and adolescents, discipline and power relations, family factors (**Figure 4**). The final codes were grouped into eight clusters using a self-organizing map with the Jaccard similarity coefficient query.

Along with the substantive categories mentioned above, we identified terms referring to the main theoretical frameworks such as *social learning*, *opportunity routine theories, differential association, normative theory, self-control, social control, strain theory, subcultural theories, life course theory, digital divide,* and *labeling theories*. Moreover, we created specific codes for terms related to lifestyle (habitus lifestyle), health, and well-being.

For a better understanding of the resulting clusters, we generated a co-occurrence network of codes, which is based on

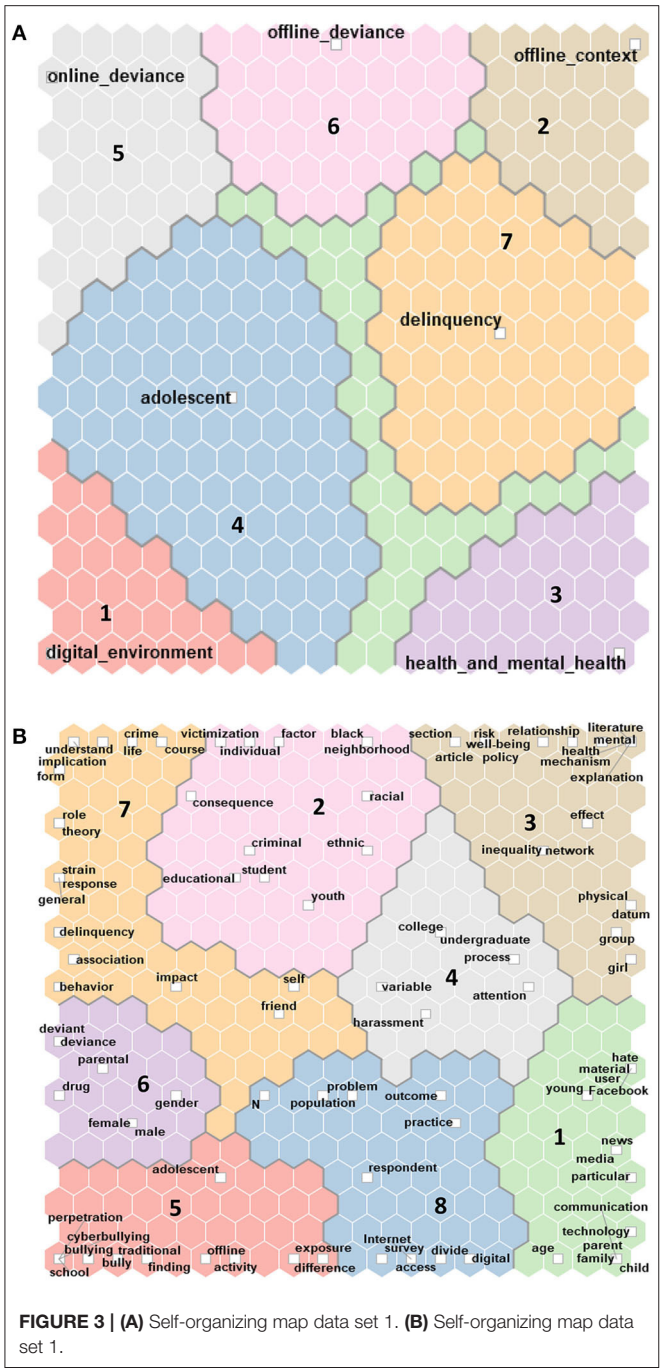

FIGURE 3 | (A) Self-organizing map data set 1. **(B)** Self-organizing map data set 1.

the probability of two codes appearing in the same abstract. The network revealed correlations between the predictors of cyber-deviance, deviance, peer influence, children, school and education, delinquency, and deviance and digital environment (**Figure 5**). At the same time, terms related to health, well-being, and neighborhood are negatively correlated to the items mentioned above. **Figure 5** also reveals the connections among identity, inequality, neighborhood, and ethnicity codes.

After inspecting the correlations among codes, we considered the coding schema as final and employed it for the following analysis procedures.

Stage 3 – Analyzing the Complete Data Sets

Stage 3 consisted of applying the coding schema to the two established datasets (61 full text and 488 abstracts) and compared the results with the hierarchical word clusters through correspondence analysis and crosstabulations.

Dataset 1 (61 in Extenso Articles)

The analysis of the first dataset was conducted in four stages, consisting of correspondence analysis and crosstabulations of hierarchical clusters and the coding schema (unit of analysis: articles). The third stage consisted of examining the associations among 33 generated codes using a similarity matrix to identify overlaps. The last procedure involved creating a detailed network between predictors of interest in the field of deviance and online deviance.

The correspondence analysis revealed co-occurrent topics. This method revealed four *latent groups of topics*, namely, online deviance, identity, and communication in the online sphere, peer influence, and explanatory theories of deviance (See **Figure 6** below). The first identified cluster mostly overlaps with the nodes related to online deviance, predictors of cyber-deviance, predictors of deviance, delinquency, and opportunity theories. At the periphery of this class, we found terms that refer to children, gender, age, and health. In total, the first *group of topics* includes 10 articles. The second *group*, which encompasses cluster 2 (3 articles) and 3 (14 articles), focuses on aspects related to identity and communication in the online sphere. The theory of the digital divide and the articles referring to well-being are also included in this group. The fourth cluster forms the *third group* on its own, and it includes 19 articles. For this cluster, the most representative codes are peer influence, ethnicity, differential association theory, and the subcultural approach. The *last group* is composed of clusters 5 (5 articles) and 6 (10 articles), and it presents an integrative view. Thus, as the main codes may show, articles that question the causes of deviance (social control, life-course theory, normative theory, and strain theory) and articles that focus on understanding deviance as a social construct (labeling theory, the relationship between lifestyle, deviance, and social inequality) belong to this category.

A more in-depth examination of the clusters is possible with the use of the crosstabulations available in KH Coder. The results of this examination allowed the identification of the most encountered codes and their statistical signification in establishing the clusters. Thus, the most frequent themes covered in the articles are predictors of deviance (61 articles), school education (60 articles), socioeconomic status (57 articles), age (55 articles), children& adolescents (55 articles**[1] – present in clusters 1, 2, 3, 4, and 5), abstraction of power (55 articles* – present in clusters 1, 3, 4, 5, and 6), family influence (54 articles), deviance (53 articles** – present in clusters 1, 3, 4, 5, and 6),

[1]** <0.01
* <0.05.

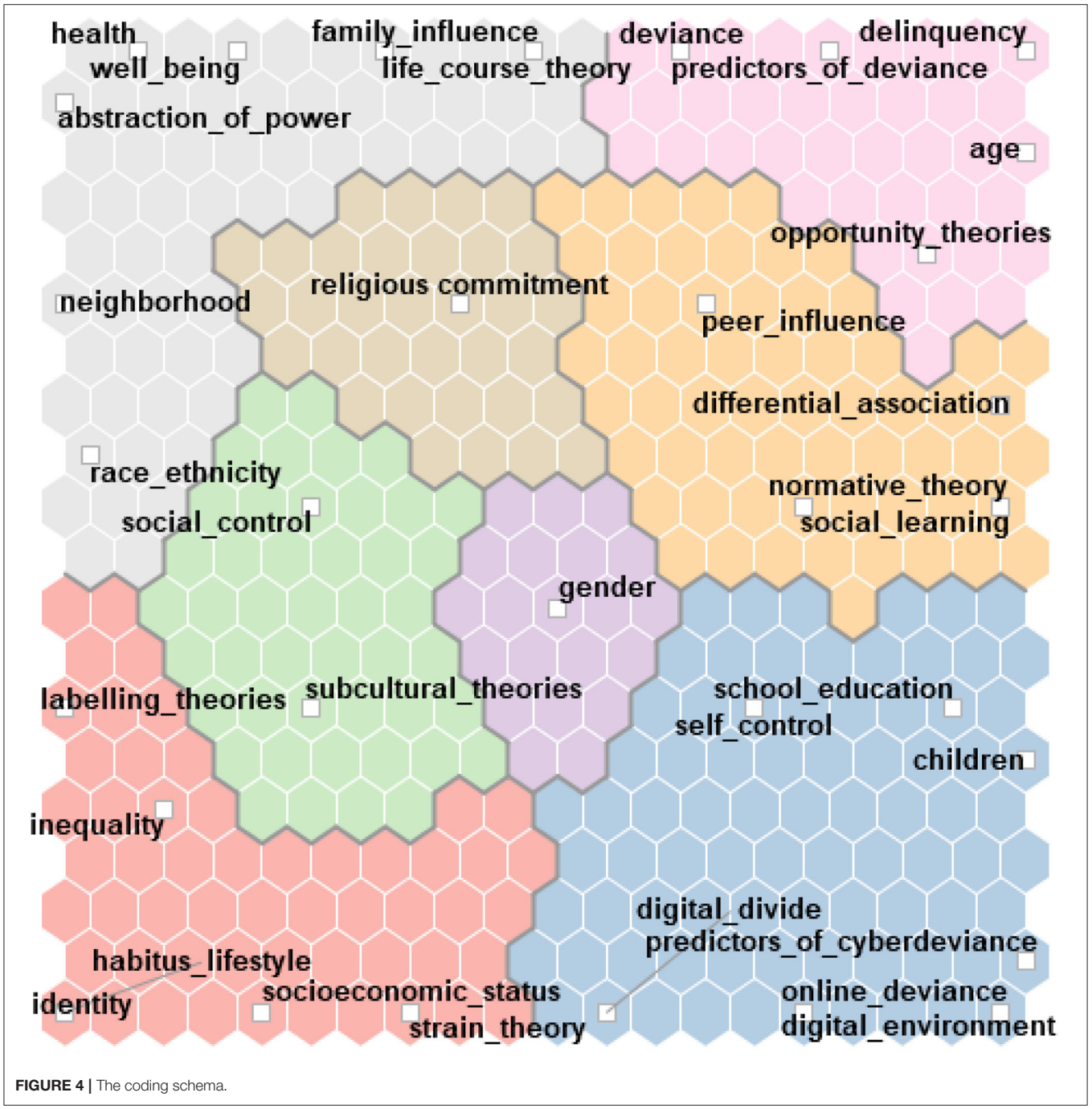

FIGURE 4 | The coding schema.

health (52 articles), gender (52 articles), and identity (51 articles), as presented in **Figure 7**.

The other codes that influenced the composition of the clusters are digital environment (46 articles** – present in clusters 1, 2, 3, 5, and 6), online deviance (10 articles** – present mostly in cluster 1), delinquency (40 articles** – present mostly in clusters 1 and 4, and to a lesser extent in cluster 3, 5, and 6), differential association (10** - present mostly in cluster 4 in 9 articles and in 1 article from cluster 1), social control (23** - present mostly in cluster 4 in 13 articles and in clusters 3, 5 and 6), life-course theory (21** – present mostly in clusters 4 and 5 and to a less extent in clusters 3 and 6), digital divide (9** – present mostly in cluster 2 and to a less extent in clusters 1, 3, 4, and 5), normative theory (36* – present in clusters 3, 4, 5, and 6) and strain theory (36* – present mostly in clusters 3, 4, and 5 and to a less extent in cluster 1).

The similarity matrix of codes shows consistent overlaps among the nodes included in the coding schema. Thus,

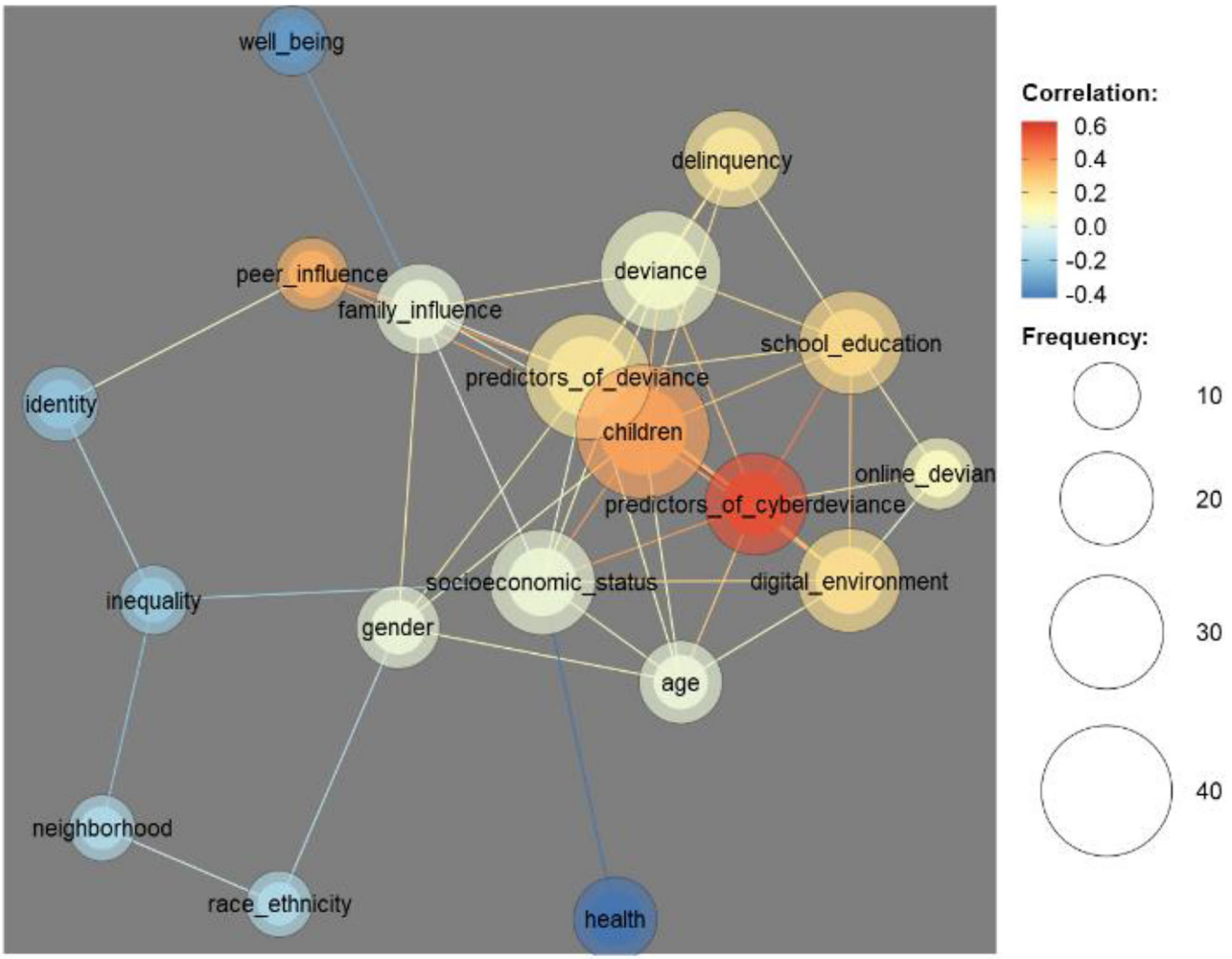

FIGURE 5 | Co-occurrence network of the most encountered codes as applied to abstracts.

terms belonging to the codes, namely, predictors of cyber-deviance, deviance and predictors of deviance, family influence, school and education, gender, age, socioeconomic status, children, identity, abstraction of power, and delinquency, have a correlation value higher than 0.5. The most distinctive nodes have fewer occurrences, including online deviance, religious commitment, opportunity theories, differential association, self-control, subcultural theories, digital divide, life-course theory, and social control.

Further, we generated two networks, including the predictors of deviance and online deviance, for a more in-depth inquiry. The resulting networks facilitate the identification of the terms that are mainly associated with them.

As revealed by the presented network, the most encountered predictors for deviance are paternal incarceration, violent victimization, socialization, selection, parental deviance, socioeconomic status, family factors, parental control, parenting practices and monitoring, school factors, self-efficacy, peer affiliation, popularity, network friendship, self-control, alcohol and substance use, educational attainment, deviant exposure, delinquent parents, aggression, neighborhood disadvantage, risk, and others.

Given the grouping of predictors based on technical modularity shown in **Figure 8**, we identified five main categories of predictors of deviance: family patterns (parental deviance, parental monitoring, paternal incarceration, parenting practices, etc.), socio-demographic aspects (SES difference, life style background and drug abuse, family background, etc.), socialization (low self-control, socialization process, selection process, etc.), victimization (violent victimization, risk, age and gender risk, life-course consequences, etc.) and school and individual factors (traditional bullying, school grades, adolescent self-efficacy, school drop-out, etc.).

In relation to cyber-deviance (see **Figure 9**), the frequent predictors for cyber deviance encompass the following: traditional bullying, offline victimization, parental abuse, alcohol

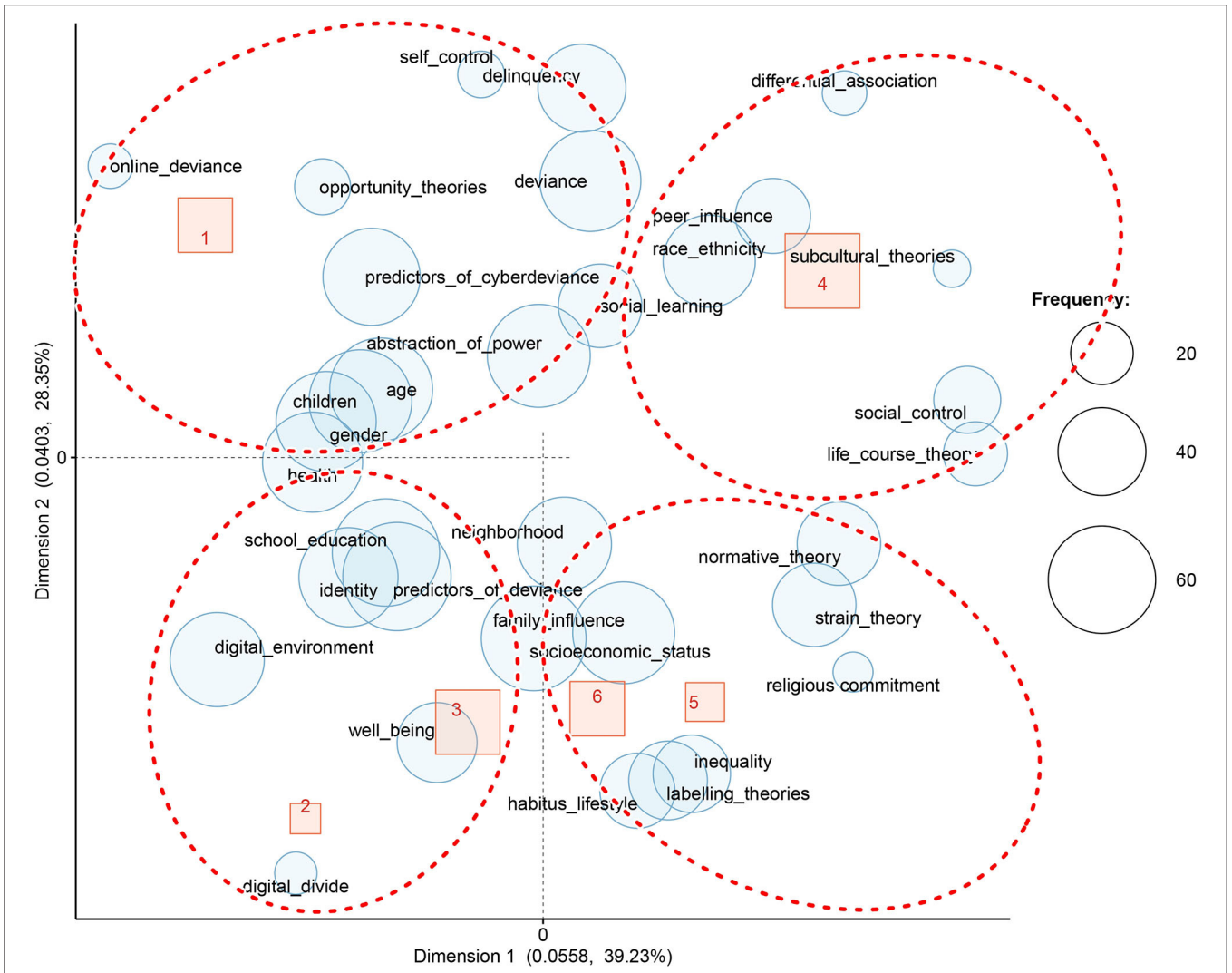

FIGURE 6 | Correspondence analysis of codes and hierarchical clusters in extenso articles.

and substance use, Internet access, Internet misuse, compulsive Internet use, substance use, online exposure, parental control, school factors, self-efficacy, socioeconomic status, parenting, digital inequality, information habitus, etc.

With regards to the most common predictors of online deviance, they can be grouped into five categories: family patterns (parental abuse, parental deviance, family history and abuse, parenting style, etc.), socio-demographic aspects (gender and age effects, demographic and socio-economic, etc.), victimization (offline victimization, traditional bullying, physical and offline activities, exposure, etc.), school and individual factors (school problems, school bonding, school involvement, empathy, school perception, school behavior, prosocial involvement, etc.) and Internet and computer use (home Internet access, digital inequality, frequency usage of Internet, technology information habitus, etc.).

Dataset 2 (488 Abstracts)

The last stage of analysis recommended by Pickering and Byrne (2014) consists of adding the whole set of articles that correspond to the searching criteria.

The exploration of the second dataset required conducting preliminary analysis, considering its extensive dimension. Consequently, we added two additional stages, a manual assessment of the study field of research methods and a frequency query. The analysis of the second dataset was conducted in five stages: manual inspection of study field and research methods, word frequency, correspondence analysis of clusters and codes, crosstabulations of clusters and codes, and similarity matrix.

As mentioned already, the preliminary review was a manual analysis of 488 articles to gain an overview of the types of the articles. Note that, our first criterion of selection was the field of sociology. Thus, all 488 articles were from the field of sociology. Along with sociology, 143 articles were also from

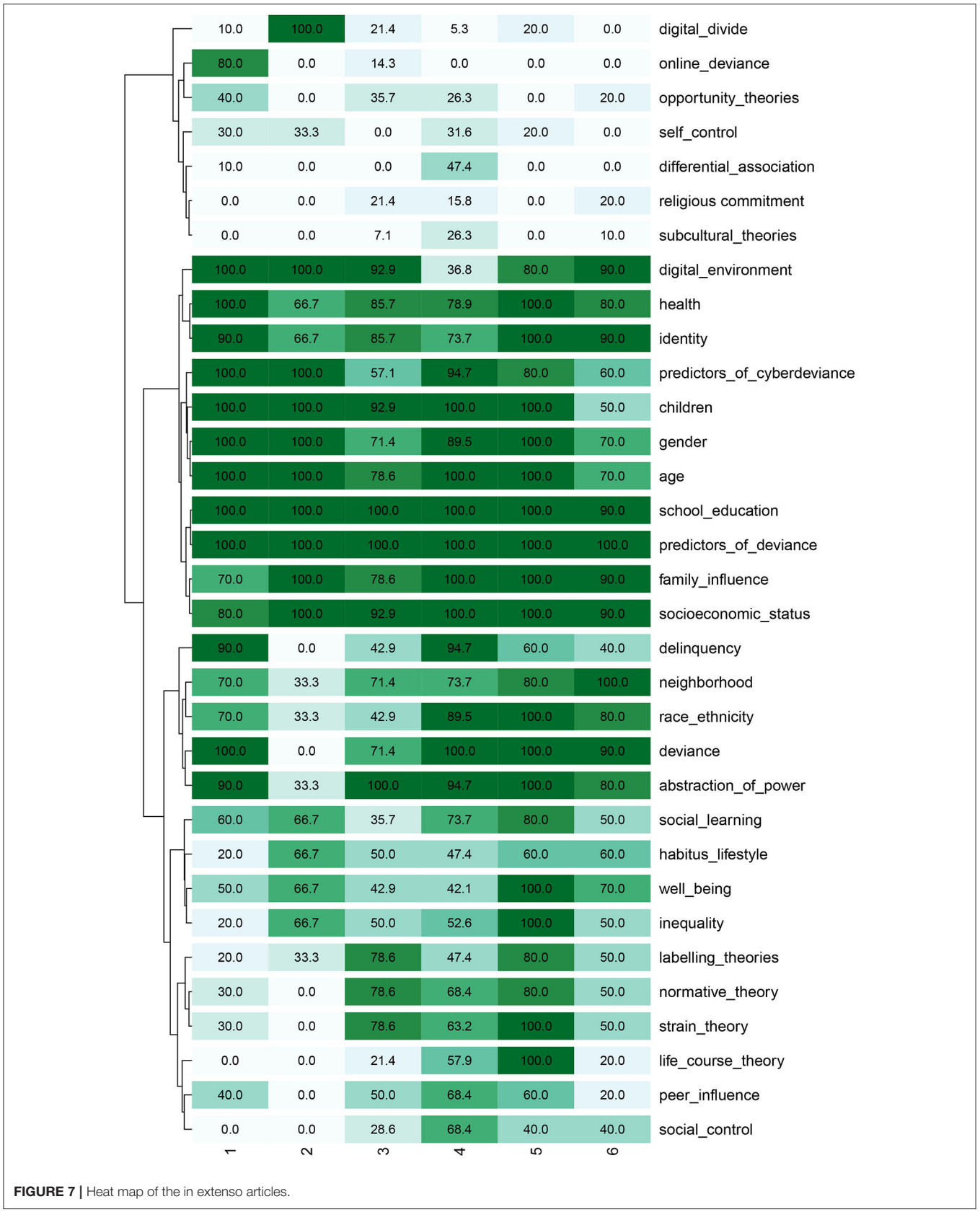

FIGURE 7 | Heat map of the in extenso articles.

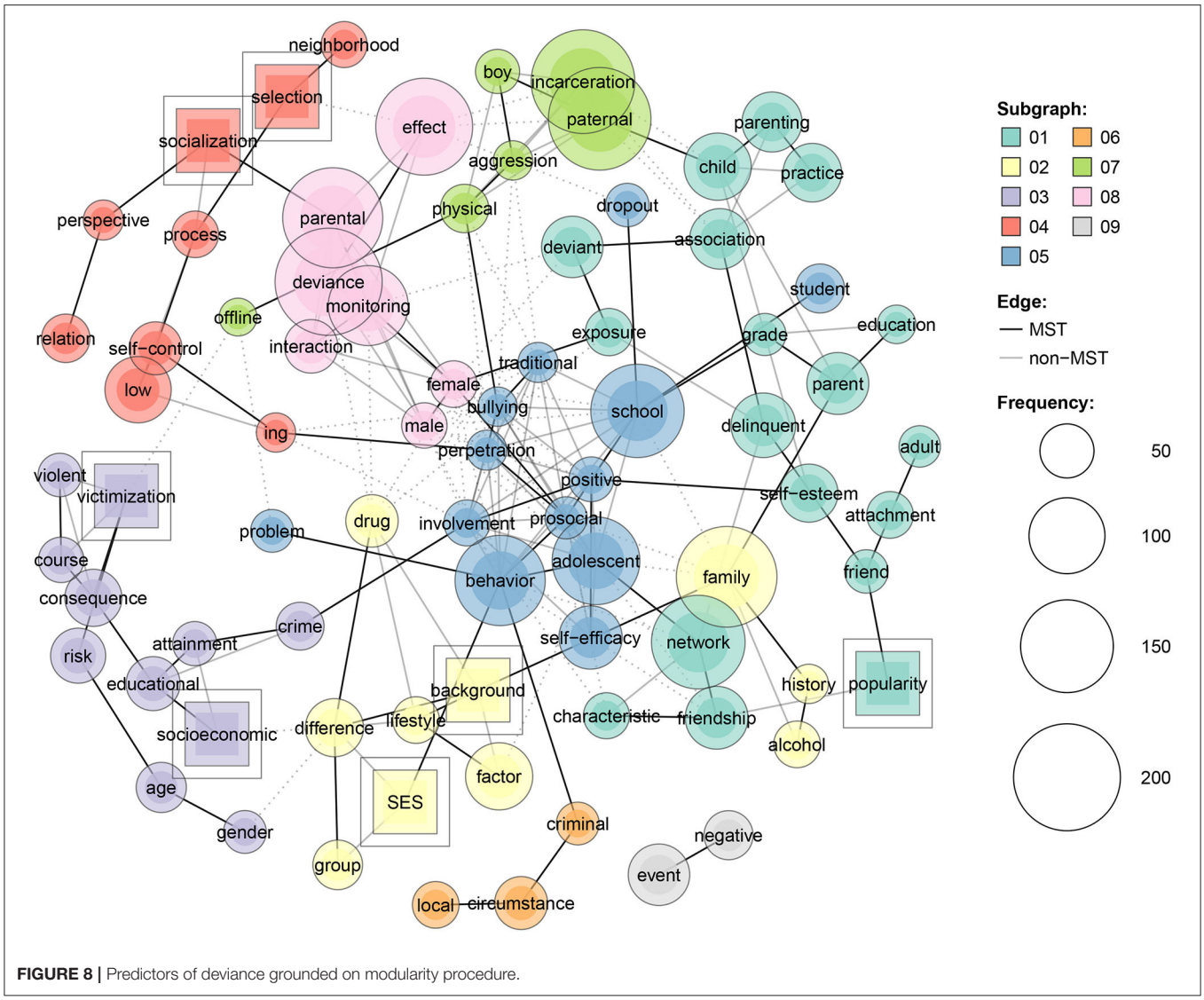

FIGURE 8 | Predictors of deviance grounded on modularity procedure.

the field of psychology, 131 from the field of criminology, and 117 published in other fields such as education, communication, religion, health, biomedical, social sciences, etc.

Of the 488 sources analyzed, only a few (**2**) were systematic analyses; **16** were literature reviews; **16** were aimed at reviewing theories or theoretical issues in general; **348** used quantitative methods, **93** qualitative methods, and **13** a mixed approach (quantitative as well as qualitative methods).

From the complete dataset, the articles mostly approached strain theories, closely followed by social learning, self-control, and social control theories. Opportunities and routine theories, bonding theory, differential association theories, reinforcement theory, life-course perspectives, and social disorganization theory are other main perspectives.

The next stage consisted of generating a self-map analysis based on the terms' frequency and cluster identification (**Figures 10A,B**)

After employing word frequency and self-map analysis for data exploration, we examined the network among hierarchical clusters generated using the Ward technique with the Jaccard coefficient and the topics defined in our coding schema.

The inclusion of a higher number of sources in dataset 2 created a clearer demarcation between the observed categories. The classification suggests a structure of four *groups of topics*, similar to those identified in the first dataset. The specificity of the current classification makes it better at distinguishing socio-constructivist theories and the predictors of deviance. Thus, the main groups consist of predictors of deviance and cyber deviance (clusters 1 and 2), online deviance and digital environment (clusters 3 and 6), post-positivist and integrative theories of deviance (cluster 5), and a smaller group related to a constructional approach of deviance focused on identity, inequality, and power relations (cluster 4).

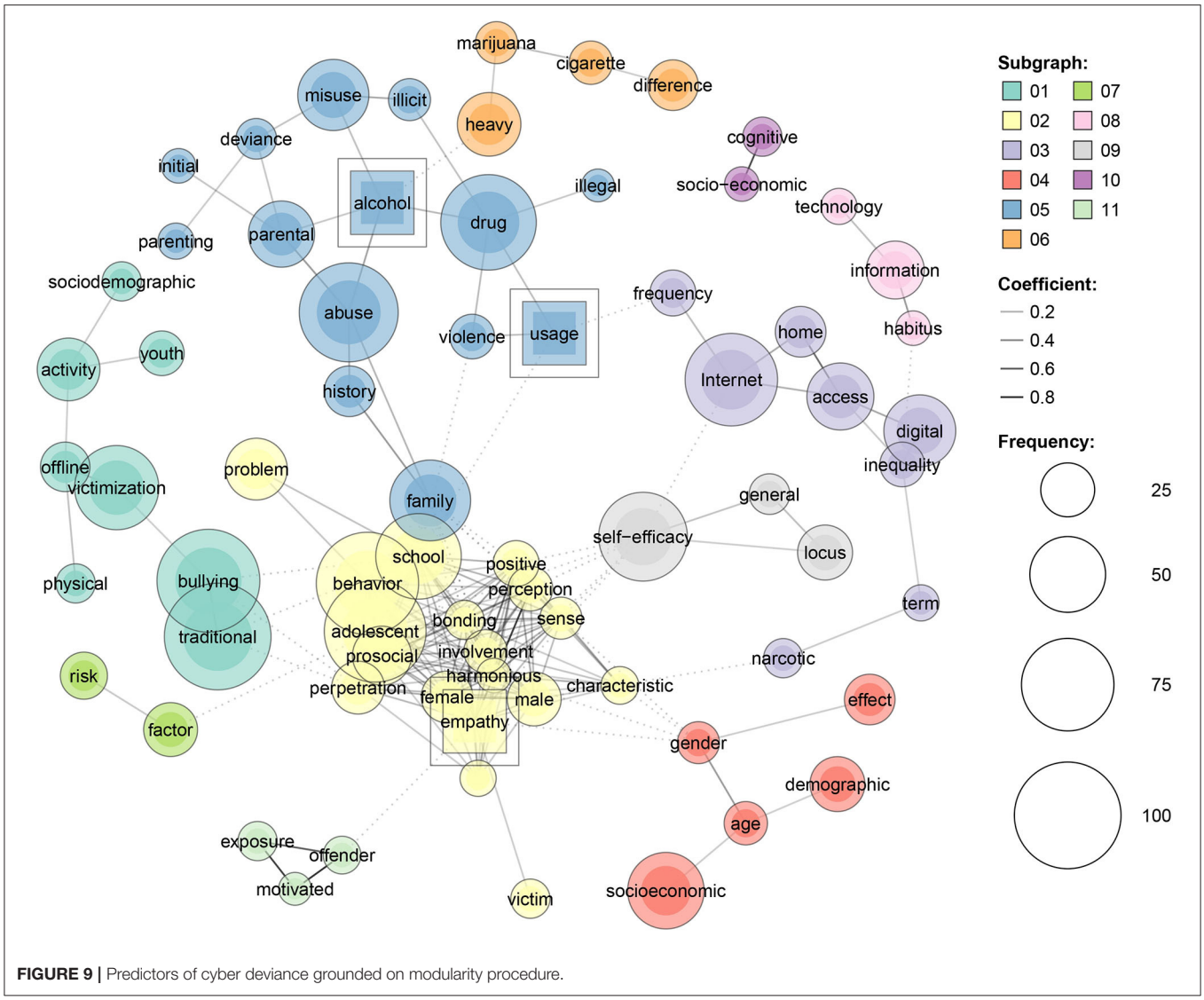

FIGURE 9 | Predictors of cyber deviance grounded on modularity procedure.

As **Figure 11** illustrates, the first category, composed mostly of cluster 1 (116 abstracts) and cluster 2 (124 abstracts) data covers the codes, namely, family influence, peer influence, school and education, predictors of cyber-deviance, predictors of deviance, strain theory, religious commitment, self-control, social control, gender, social learning, differential association, opportunity theories, health, well-being, and socioeconomic status.

A second category, which encompasses cluster 3 (23 abstracts) and cluster 6 (92 abstracts) data comprises terms related to online deviance, digital divide, digital environment, and age. It emphasizes aspects related to patterns of online communication and deviant behaviors in the cyber-environment.

The third class (72 abstracts of cluster 5) presents an integrative post-positivist approach to deviance and includes main theories such as social control, strain theory, life-course theory, subcultural theory, and social disorganization perspective (creating inequalities among neighborhoods as a cause of deviance). Considering that the main nodes of this class represent deviance and education, it may be assumed that this class investigates the relationship between deviance and education.

The last class presents a constructivist approach, including the following codes: labeling theories, inequality, identity, abstraction of power, habitus lifestyle, and normative theory (norms/normative theory). This class is weakly associated with the automatically constructed hierarchical clusters (a part of cluster 4 that is composed of 61 abstracts). As the figure shows, the categories of lifestyle and identity are located far from the main center, moving closer to class 2.

We proceed with inspecting the associations among hierarchical clusters with crosstabs, which allow us to indicate the recurrent themes (**Figure 12**).

The most frequent nodes in the 488 abstracts are children and adolescents (357** abstracts – present in all clusters, but in only a few abstracts in cluster 4), deviance (326** – present mostly in clusters 1, 2, 4, and 5 and in a few abstracts from the other clusters), school education (226** – present mostly in clusters 1, 2, 4, and 5), predictors of deviance (203** – present mostly in

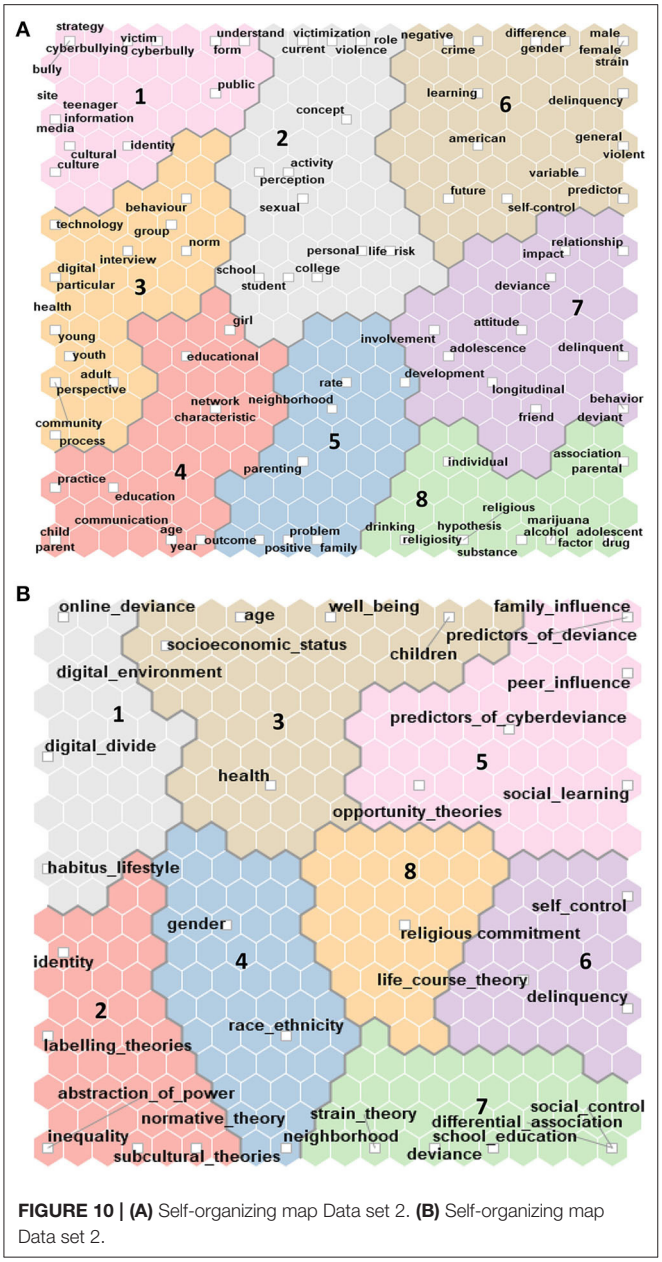

FIGURE 10 | (A) Self-organizing map Data set 2. **(B)** Self-organizing map Data set 2.

clusters 1, 2, and 6), family influence (140* – present in clusters 1, 2, 4, 5, and 6), peer influence (138** – present in clusters 1, 2, 5, and 6), digital environment (135** – present mostly in clusters 3 and 6 and to a less extent in clusters 1, 2, 4, and 5), delinquency (134** – present mostly in clusters 1, 2, and 5 and to a less extent in clusters 3, 4, and 6), predictors of cyber-deviance (119** – present mostly in clusters 1, 2, and 6 and to a less extent in clusters 3, 4, and 5), gender (107 – present in every cluster), and health (101 – present in every cluster). The structure of clusters is also significantly influenced by the following topics: online deviance (13** mostly present in cluster 6), identity (87** – mostly present in clusters 3, 4, and 6 and to a less extent in clusters 1, 2, and 5), social learning (69** – mostly present in clusters 1 and 2), abstraction of power (73** – mostly present in clusters 3, 4, and 6 and to a less extent in clusters 1, 2, and 5), digital divide (8** – present in cluster 6), labeling theories (42** – mostly present in clusters 4, 5, and 6), lifestyle (36** – mostly present in clusters 3, 5 and 6 and to a less extent in clusters 1, 2, and 4), social control (35* – mostly present in clusters 1 and 2), differential association (11* – mostly present in cluster 1), neighborhood disadvantage (53* – mostly present 2, 4, 5, and 6). While for the first dataset, the similarity matrix shows consistent overlaps among the codes included in the coding schema, the second dataset reveals consistent differences among the codes. Thus, the highest similarity values are between deviance – children and adolescents (0.535), children and adolescents – predictors of deviance (0.414), deviance – predictors of deviance (0.381), and peers influence – predictors of deviance (0.375).

Predictors of Deviance and Cyber-Deviance in Social Sciences

Given the high concern of researchers for the predictors of deviance and online deviance, we have provided a more detailed review of them predictors. Therefore, the present review attempted to provide more clarity on the most encountered predictors of deviance. To provide an understanding and an overview of this field, we considered it necessary to categorize these predictors, which are widely presented in the literature. The analyses presented show that the most common predictors of deviance relate to family patterns, socio-demographic aspects, socialization, victimization, and school and individual factors. Family, peer group, and school are the main social spaces of adolescents. In addition, considering the impact of the Internet and Web 2.0 technologies on socialization, identity formation, and leisure, we explored the predictors of offline and online deviance.

Family Patterns

Family relationships have a major influence on teenagers' level of engagement in deviant acts by loosening social constraints - Loeber and Stouthamer-Loeber (1986), Thornberry (1987). Centered on the impact of parents' deviant behavior and attitudes on children's delinquency, deviant behaviors and attitudes paradigm analyzes family deviance, which includes family disorganization, parental involvement in lawbreaking acts and parental deviant values, and tolerating attitude related to dishonesty and criminality, as major risk factors of engagement in deviant conducts. According to the disruption paradigm, conflicts between parents, the absence of a parent, parent separation, and divorce affect children's conduct directly and indirectly. Variables such as inappropriate parenting practices and parental supervision (Sampson and Laub, 1992, 1994; Zhang and Messner, 1995; Wiesner and Shukla, 2018) and family structure aspects including broken home, household size, sibling rank, and family environment (LeFlore, 1988) are worthy to be taken into consideration while studying deviance in general and teenagers' deviance, in particular. The relationship between parents is considered a very important factor in adolescents' engagement in deviant acts. The better the parents' relationship and the more they provide a peaceful environment for their

FIGURE 11 | Correspondence analysis of codes as hierarchical clusters abstracts from the whole dataset.

child to grow up in, the less likely they are to engage in deviant acts (Lu et al., 2020). Harsh parental discipline (Hong et al., 2017), depression, and school engagement are other risk factors of deviance in teenagers (Lin and Yi, 2016) related to family deviance and family functioning.

Socio-Demographic Aspects

Researchers indicate a link between living in a certain area of a city and deviance. Grounded on the seminal work of Wilson (2012) regarding the criminalization process of people living in poor neighborhoods, *the underclass*, sociologists have noticed that there is a high rate of crimes and delinquency in such disadvantaged neighborhoods, which are inhabited by jobless people. The link between deviancy and the neighborhood context represents a factor that mediates the link among peer influence, family context, and deviance (Sampson and Laub, 1997; Sampson et al., 2002; Hwang and Sampson, 2014; Billings and Hoekstra, 2019). In addition, the structural inequality mirrored by urban topology is amplified by network effects (DiMaggio and Garip, 2012). Recently, network research scientists also demonstrated that income inequality is correlated to network fragmentation, which implies that an increase in social and income inequality is visible when social network fragmentation interacts with neighborhood distribution (Tóth et al., 2021).

Socialization

Association with deviant peers is related to the engagement in deviant and delinquent behavior (Agnew, 1991; Warr and Stafford, 1991; Sutherland et al., 1992; Matsueda and Anderson, 1998; Haynie and Osgood, 2005; Akers, 2017). The inquiry of whether one is deviant because one belongs to a deviant group, encompassed in the *socialization theories* (Agnew, 1985, 1991; Warr and Stafford, 1991; Dishion and Tipsord, 2011; Lin and Yi, 2016; Akers, 2017; McGloin and Thomas, 2019; Schwartz et al., 2019), or whether one chooses to be a part of a

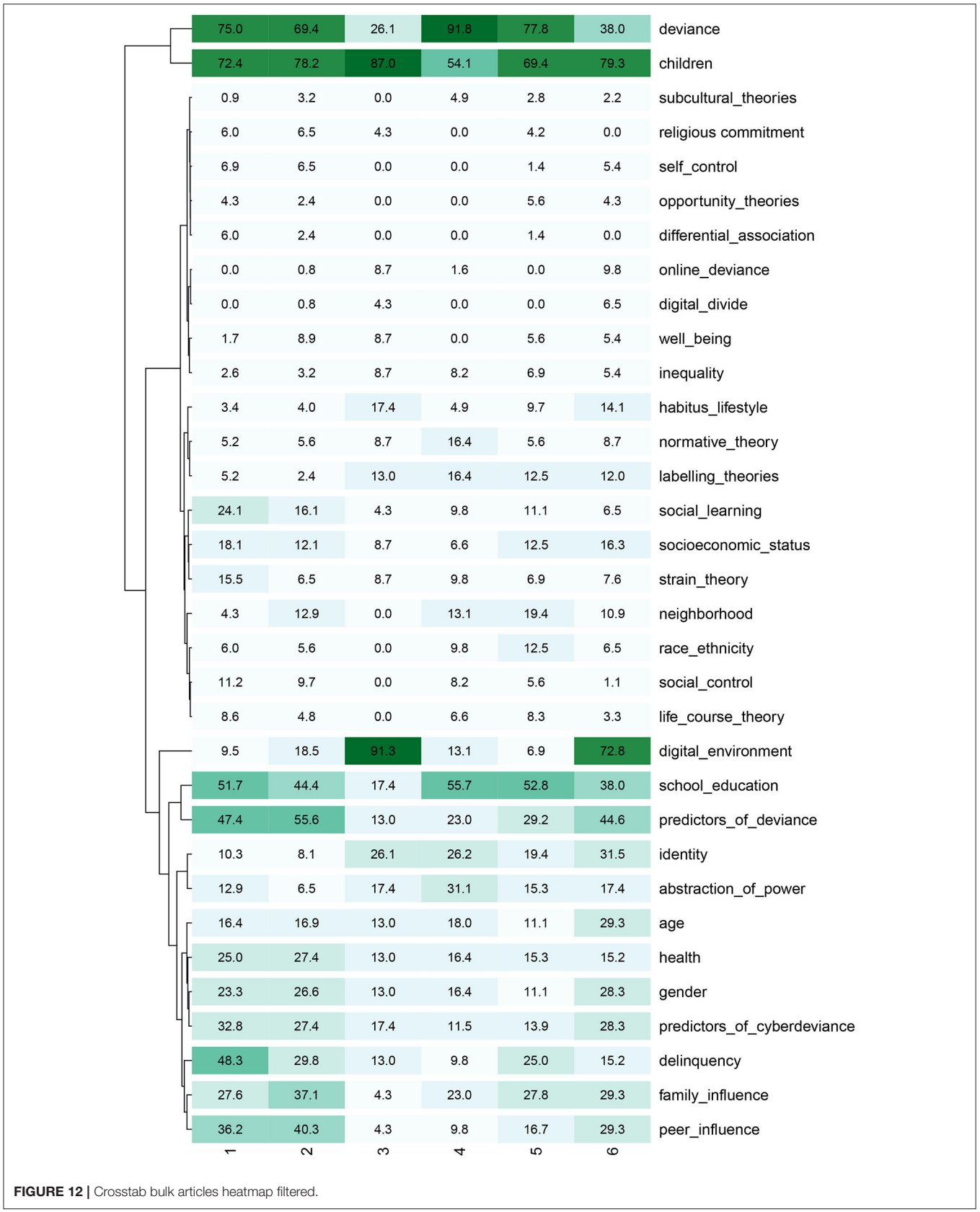

FIGURE 12 | Crosstab bulk articles heatmap filtered.

group with antisocial behavior because of a personal inclination for deviance, known as *selection mechanism* (Matsueda and Anderson, 1998; Haynie and Osgood, 2005; Barnes et al., 2006; Schwartz et al., 2019; Gallupe et al., 2020), helps capture this causal relationship.

Contrary to the perception of social learning theorists that deviance is a result of socialization with peers that have antisocial behavior, social control theorists hold that getting involved in crimes is a process that does not require any learning (Hirschi, 1969; Hirschi and Gottfredson, 2000; Costello and Zozula, 2016). A slightly different approach is taken by routine activity theorists who hold that deviant friends provide more opportunities to engage in norm-breaking and law-breaking activities (Osgood et al., 1996; Haynie and Osgood, 2005; Boman et al., 2019; Hoeben et al., 2021). Considering Giordano's observations regarding the need to explain peer relations from a multidimensional perspective (Giordano, 2003), researchers assess the impact of conflict (Boman and Mowen, 2019) and friendship quality (Poulin et al., 1999; Boman et al., 2019) on deviant behaviors of individuals.

Victimization

Researchers (Gorman-Smith et al., 1998) have established that there are significant associations among the profiles of offenders and patterns of family involvement, with non-offenders being more likely to have families with minimal problems, with serious chronic offenders belonging to families with many problems, such as issues of neglect, and with escalating offenders having a conflictual family background that is characterized by disruption. In the case of escalating offenders, the influence of family functioning toward engaging in deviant acts seems to be corroborated with peer deviance, the authors conclude. Researchers proved that peer offending represents a more powerful predictor of cyber-deviance, in general, and cyberpiracy, in particular, than low self-control (Lee, 2018; Lee et al., 2018). In the case of cyberbullying, exposure to risky online content and cyberbullying victimization, along with gender, school grade, school control, and perception of cyberbullying factors have significant impacts (Bae, 2021).

School and Individual Factors

As Davies (1995, 1999) emphasizes, the socio-economic background is a weak predictor of deviance, while difficulties with school, operationalized as lower grades and the likeness to drop out of school, strongly predict engagement in deviant acts. Despite the way the causal relationship between academic failure and deviance is questioned (Phillips and Kelly, 1979), there is no doubt that school deviance correlates to academic underachievement. Researchers have found that socioeconomic status, cultural capital, and social capital have an impact on academic results, even after controlling for family characteristics (DiMaggio, 1982).

Regarding school success and academic achievements, (Hatos, 2010a,b; Hatos and Bălţătescu, 2013) identified socioeconomic status, school engagement, and leisure style as individual-level predictors. The authors also identified classroom level – the proportion of students with fathers with higher education – and school-level predictors – average achievement of the school students and school type. As the author explained, school-level variables account for the largest variance (Hatos, 2010b). In this sense, the differences between schools concerning students' backgrounds and teachers correlate with educational achievements. Consequently, students with lower grades are nested together with low satisfaction with regard to school and lower socioeconomic status. These groups are mostly composed of boys (Hatos, 2010b).

Welsh et al. (1999) present evidence of school deviance predictors at multiple levels, namely, age, race, gender, school involvement, belief in rules, and positive peer association at the individual level and school size, student perception of school climate, and school at the community level. A recently published analysis (Dullas et al., 2021) shows that adolescent boys are more likely to engage in delinquent behavior or more serious deviant acts, while adolescent girls are more often perpetrators of minor deviant acts.

Internet and Computer Use

Lee (2018) identifies two main theoretical frameworks that explain the occurrence of online deviant behaviors: self-control and social learning theory. Rooted in the general theory of crime, self-control theory asserts that individuals with low-level control have a higher chance of engaging in online deviant acts such as computer piracy, online exposure to sexually explicit materials, online harassment, and cyber deviance in general (Holt et al., 2012, 2015). Moreover, teenagers who have a higher sensation-seeking attitude have a positive attitude toward risk-taking and most often indulge in illegal downloading of music, games, and sexual content (Weisskirch and Murphy, 2004). Deviant peer affiliation partially mediates the link between adolescent sensation seeking and internet gaming addiction (Tian et al., 2019).

Association with deviant peers, including online interaction with virtual peers, is the main predictor of cyber-deviance (Bossler and Holt, 2009; Burgess-Proctor et al., 2009; Bossler et al., 2011; Holt et al., 2012; Lee, 2018). Subcultural theorists explain the mechanisms through which cyberspace assists in justifying engagement in deviant acts such as computer hacking and digital piracy, transferring social relationships from offline to online, and creating communities and shared norms (Holt, 2007, 2020; Holt and Copes, 2010; McCuddy and Esbensen, 2020).

Rooted in Bourdieu and Weber's theories, the theory of digital divide holds that the Internet amplifies the existent social inequalities, with people lacking digital skills (second-level digital divide) and the opportunities for making effective use of them if they acquired (third-level digital divide) left behind (DiMaggio and Hargittai, 2001; DiMaggio et al., 2001; Van Dijk and Hacker, 2003; DiMaggio and Garip, 2012; Barbovschi and Balea, 2013; Van Deursen and Van Dijk, 2015; Van Deursen et al., 2015; Scheerder et al., 2017; Hatos, 2019; Van Dijk, 2020).

Computer proficiency and technology use correlate with cyber deviant acts, including hacking, digital piracy, and online harassment (Lee, 2018). Therefore, we can conclude that the digital world is a field where actors attempt to gain social,

symbolic, and digital capital to ensure and justify their power (Ragnedda and Muschert, 2013; Lindell, 2017; O'Neil and Ackland, 2020).

DISCUSSION

Starting from the question how the topics of deviance and cyber-deviance are covered in social sciences, the present review gathers the relevant findings on the field in order to create a comprehensive account of the phenomenon. As we have presented in the results section, our systematic literature review involved the analysis of two databases, namely 61 sources in extenso (Dataset 1) and 488 abstracts (Dataset 2). We chose to review the 61 articles in extenso in order to understand in more detail the most common themes and the main predictors of deviance. These issues could not be reflected so accurately by only the abstract analysis. The articles in extenso give us detailed information with a smaller number of sources, and in addition, the extrapolation of the analysis to the database of 488 abstracts allows us a holistic understanding of the phenomenon of deviance. The analysis of a higher number of articles in dataset 2 also facilitated the inclusion of more recent articles that do not have a consistent number of citations yet, with articles addressing more specific aspects of deviance. It may be noticed that the most cited articles are those that deal with classical theories of deviance.

A more detailed assessment of the results of in extenso articles highlights that the main themes in the 61 most cited articles published in the Web of Science database on the topic of deviance among adolescents refer to the predictors of deviance (61 articles), as a category in which all predictors are included such as school education, socioeconomic status, as well as two important categories that also represent predictors but taken as separately.

By holistically examining the two datasets, we provided an overview of the field. As compared to other systematic reviews focused only on a specific field of deviance (McGrath et al., 2011; Brauer and Tittle, 2012; Longobardi and Badenes-Ribera, 2019; Estévez et al., 2020), we analyzed the deviance in a general manner. This was possible by using computational text analysis, method which allowed an accurate screening of nearly 500 sources. As related to this aspect, **a first objective** consisted of identifying the main topics approached in the literature on deviance. From our knowledge, this objective was not addressed by any other systematic reviews. This method revealed four latent clusters of topics: *explanatory* theories of the causes of deviance (social learning, social control, subcultural theories), *socio-constructionist* theories (labeling theory, power theory, conflict theory), *predictors of deviance* (gender, socioeconomic status, family influence, family background, peers' affiliation) and *online deviance* (frequency of Internet use, digital divide).

With regards to the objective of revealing the most frequently encountered themes, our review shows that the phenomenon of deviance is explained grounded on the classical theories. The researchers choose between *explanatory theories* such as: differential association, routine activities and opportunities theories, social learning, social control, social disorganization, anomie and strain theories, subcultural theories, power relations, and neutralization and deterrence theories (Benda and Corwyn, 1997; Wagner et al., 2004; Wallace et al., 2007; Dolliver and Rocker, 2017; Meldrum et al., 2020), or *socio-constructionist* - symbolic interactionism, labeling theory, phenomenological theory, critical discourse analysis, cultural theories, framing theory, convenience theory, and post-modernist theories (Giordano et al., 2009; Herman-Kinney and Kinney, 2013; Gottschalk, 2018, 2020; Barmaki, 2021) or even the integrative ones, respectively social disorganization theory and life-course theories (Apel and Sweeten, 2010; Peguero, 2011; Payne and Welch, 2016; Gostjev and Nielsen, 2017). Consequently, our review showed that most of the analyzed studies centered on the *predictors and correlates of deviance*. It highlights their focus on revealing and characterizing the predictors of deviance, mainly using *strain theory* (Aseltine et al., 2000; Cheung and Cheung, 2010; Adamczyk, 2012; Bruno et al., 2012; Scheuerman, 2019), *social control* (Free, 1992; Woodward et al., 2001; Jang, 2002; Byrd et al., 2015), *social learning theories* (Barnes and Farrell, 1992; Benda, 1994; Winfree et al., 1994; Terrell, 1997; Regnerus, 2002), or routine opportunity theories (Osgood et al., 1996; Marcum et al., 2010; Maimon and Browning, 2012b; Ragan et al., 2014; Yuan and McNeeley, 2018). As we observed from the manual analysis of the 488 articles, this is mainly done through quantitative analysis; 348 articles out of 488 were examined using quantitative methods. Furthermore, there is a significant concern for *online deviance and online deviant behaviors* (Marcum et al., 2010; Oksanen et al., 2014; Rafalow, 2015; Vejmelka et al., 2017; Mesch, 2018; Tomczyk, 2018; Chester et al., 2019; Granic et al., 2020; Semenza, 2021). The extensive number of identified studies focused on online deviance and adolescents is connected to the popularity of Internet among teenagers and compulsive use of it (Wachs et al., 2015; Kapoor et al., 2017; Ohannessian and Vannucci, 2020). In addition, with the spread of Internet technology, teenagers' online deviant behavior has become a matter of grave concern for parents, educators, social workers and researchers.

As related to the **second objective**, we observed an overlap between psychological and sociological approaches, with researchers making use of predictors at individual and social levels to explain deviance. Hence, theories such as differential reinforcement, social learning, problem-behavior, social bond theory, self-control theory, rational choice theory, differential social support, terror management theory, theories of maturation, and psychanalytic theories represent interdisciplinary perspectives that are of interest both for sociologists and psychologists. At the same time, our research revealed theories developed both by sociologists and criminologists to explain the nature of deviant behavior, including differential association, routine activities and opportunities theories, social control, social disorganization, anomie and strain theories, subcultural theories, power relations, and neutralization and deterrence theories. In addition, the dataset contained articles concerning the social construction of deviance, encompassing theories, such as: symbolic interactionism, labeling theory, phenomenological

theory, critical discourse analysis, cultural theories, framing theory, convenience theory, and post-modernist theories.

Consistent to the literature, our review identified five main categories of *predictors* (**the third objective** addressed) that influence the engagement of teenagers in online and offline deviant behaviors, namely: family patterns, socio-demographic aspects, victimization, school and individual factors, Internet and computer use. The most employed predictors for explaining deviance include: family characteristics, family background, peer affiliation, school factors, school results, religion, risk attitude, religion, risk factors, victimization (Dukes and Lorch, 1989; Bahr et al., 1993; Aseltine, 1995; Benda and Corwyn, 1997; Amato and Fowler, 2002; Bjarnason et al., 2005; Haynie and Osgood, 2005; Chapple et al., 2014; Corkin et al., 2015; Buehler, 2020). At the same time, most of the longitudinal studies that we analyzed deal with the topic of delinquency follow a life-course perspective (Uggen and Kruttschnitt, 1998; Macmillan, 2001; Giordano et al., 2002; Kirk and Sampson, 2013; Salvatore and Markowitz, 2014; Pratt et al., 2016). As the papers analyzed show, online deviance has similar predictors with offline deviance, fact that suggests a continuity between the two. Still, the engagement into online deviance has some specific predictors, such as: frequency of internet use, patterns of internet use, computer skills, with digital divide theory as a main paradigm (Broos and Roe, 2006; Hinduja and Patchin, 2008; Clark, 2009; DiMaggio and Garip, 2012; Lindsay and Krysik, 2012; Chen et al., 2017; Chan and Wong, 2019a,b). Moreover, the articles analyzed on online deviance focus on the influence of lifestyle and the issue of identity (Zhao, 2005; Robinson, 2009; Karaian, 2012; Harvey et al., 2013; Barmaki, 2021).

Taking everything into consideration, our results show that social scientists employ classical theories of deviance for understanding the nature of the phenomenon and are particularly concerned with identifying the predictors and the interactions between them as related to online and offline deviance.

Limitations

The results of this study need to be interpreted with caution. In this sense, we recommend future researchers conduct more in-depth systematic text review analyses based on other search queries that permit the identification of relevant articles on the study of deviance and cyber-deviance in the period of adolescence. Considering the present research, we state some limits related to the number of analyzed texts, code creation, and interpretation and computational constraints. First, in the last stage of analysis, we decided to select only the articles that responded to the second and third criteria as the number of articles that fit the first criterion was consistently large. We chose to use this approach because of computational limits as employing text searches on 488 articles exceeds the capacity of our computer memory.

Considering that for the last two criteria, the in extenso articles were selected only on the basis of the number of citations; the studies selected in the first dataset include a higher number of classical sources and, therefore, possibly excluded some recent impact articles.

Another limit relates to subjective code creation. However, the data was automatically clustered for diminishing the potential bias. The revealed clusters were compared to the data that are classified based on the designed codes.

Conclusion

This paper presents a systematic review of the literature on the phenomenon of online and offline adolescent deviance grounded in the main findings reported in the studies published in the Web of Science database until April 2021.

For the analysis, we decided to use a validated methodology – the systematic quantitative literature review method described by Pickering and Byrne (2014), with additional tools from the PRISMA model. For reliability and systematic inquiry, the reviews were performed using the KH Coder software.

Our systematic literature review provides a clearer picture of adolescent deviance. At the same time, the differences and overlaps among the sociological and psychological approaches to the phenomenon were clarified. Psychologists and sociologists often take an interdisciplinary approach to explain the phenomenon of deviance. The most employed theories consist of strain theory, social learning, self-control, and social control theories.

The results of the research analyzed showed that the most frequently encountered themes in the area of deviance, can be grouped in four main topics: predictors of deviance, online deviance, socio-constructivist theories, and explanatory theories of the nature of deviant behaviors.

The present systematic literature review emphasized that the main categories of predictors in the case of deviance consist of family patterns, socio-demographic aspects, socialization, victimization, and school and individual factors. The study of online deviance needs to consider the existing digital divides. Along with the digital divide, the study of online behavior must examine the types of online capital and their interdependence with the offline world. Specific to online deviance, in addition to the predictors related to the above-mentioned offline context, the use of the internet and computer skills also have a significant impact in explaining the deviance phenomenon.

The paper asserts that deviance and online deviance are interrelated phenomena that can be explained by distinct theoretical approaches. As the study may show, the online sphere does not represent just the medium where activities or behaviors take place. Rather, it deepens the existing social inequalities, amplifying the differences attributed to social status. Moreover, deviance in the online environment is mostly studied in relation to children, teenagers, and youth, since the Internet is quite popular among these age groups.

We believe that the present systematic literature review makes an important contribution to the understanding of deviance by presenting an overview of the phenomenon. The findings of this literature review are useful for experts in the fields of psychology, sociology, and other related fields. The methods and software used for source analysis (Pickering and KH Coder) allowed us to identify the most

relevant predictors of deviance and the most common themes for approaching the phenomenon. Our methods may also be applied to the research of experts of other fields who are interested in studying a specific phenomenon, as it allows a significant number of sources to be included in the analysis.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/**Supplementary Material**, further inquiries can be directed to the corresponding author.

AUTHOR CONTRIBUTIONS

SC and AH were responsible for designing the research. AH and CB supervised the data analysis and the manuscript writing. SC contributed to the data coding and analysis. SC and AL wrote the first draft of this manuscript. CB and AL contributed to the conceptualization of the study, to editing, and to revising the manuscript. All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2021.748006/full#supplementary-material

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Improving the Sustainable Usage Intention of Mobile Payments: Extended Unified Theory of Acceptance and Use of Technology Model Combined With the Information System Success Model and Initial Trust Model

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Under the background of global cross-border mobile commerce (m-commerce) integration, the importance of cross-border payment research is becoming increasingly prominent and urgent. The important value of this study is to empirically research the influence power of key elements in using two different mobile payment (m-payment) platforms in Korea. The extended unified theory of acceptance and use of technology (UTAUT2) has been widely applied in various studies because of its strong interpretive power. In Korea, there are a few empirical studies on Chinese users. Based on a survey of 908 Chinese participants (486 WeChat Pay's Chinese users and 465 Kakao Pay's Korean users) in Korea, this study is one application extending UTAUT2 by incorporating multi-group and multi-model constructs: UTAUT2, information system success (ISS) model, and an initial trust model (ITM), considering a multi-group analysis with some mediating variables (payment difference). By comparing the two different payment platforms' characters, this manuscript provides a set of targeted measures to ensure Chinese WeChat Payment platform decision-makers create effective long-term strategic policies for cross-border m-payments in Korea, and eventually, benefit cross-border m-commerce and economic cooperation in Southeast Asia.

Keywords: information system success model (ISS), extending the unified theory of acceptance and use of technology (UTAUT2), sustainable usage intention, mobile payment, initial trust model

INTRODUCTION

Under the background of the global mobile commerce (m-commerce) integration, mobile payments (m-payments) have become increasingly popular in Southeast Asia. Compared to traditional cash payment means such as credit cards, mobile digital payment systems can help consumers to complete various types of online payments through digital terminal devices without

having to be restricted by time and location (Liébana-Cabanillas et al., 2018). As innovation in payment technology, m-payments are defined as "any payment method that uses a digital device to activate, authorize, and confirm the exchange of transaction values in exchange for products and services" (Kim et al., 2009). For example, the rapid expansion of m-payment transactions in China has been attributed to WeChat Pay, and the Korean m-payment market has benefited from "third-party m-payment platforms" such as Kakao Pay (Shao et al., 2019).

Mobile payment has brought about a historic technological revolution in the field of financial payments, with far-reaching social and economic impacts on the payment ecosystem in Southeast Asia and the world at large. With the high growth level of m-payment penetration in many economic entities, m-payment not only brings convenience to consumers but also increases the volume of business for many companies and improves the overall transaction payment level of the relevant economic entities (Fan et al., 2018).

Despite the numerous benefits described above, consumers are still limited by significant trust factors in accepting m-payment usage scenarios. For example, many traditional consumers continue to worry about the security and reliability of m-payment usage scenarios, because m-payment involves privacy information such as the user's property account, credit card number, ID number, and account flow amount (Kim et al., 2010b). Previous relevant studies mainly analyzed the influence of various quality factors and initial trust (IT) on user behavior in m-payment scenarios (Liebana-Cabanillas et al., 2015). But, few studies empirically analyzed the antecedents of both various quality factors and IT.

Previous studies investigated the different factors affecting users' adoption of m-payments, but there are still deficiencies to be filled. First, the research on m-payments is mainly concentrated in the financially developed countries, such as China and the United States (Fan et al., 2018), South Korea and the United States (Jung et al., 2015), China and South Korea (Lin et al., 2019), and India and the United States (Queiroz and Wamba, 2019), but these studies are still unsystematic and scattered. Second, globally, m-payment is a new technology. Relevant studies mainly focus on empirical analysis of consumers' early willingness to adopt this technology, and few studies examine the stage after the use of new technology (Lin and Wu, 2021; Lin X. et al., 2021; Lin X. C. et al., 2021). Third, m-payment can be divided into two categories: short-range payment system (to pay for products or services by connecting electronic digital terminals to 4G network) and short-range payment system (to pay for products face to face in physical stores through payment technologies such as short-range communication and near-field communication (NFC), and short-range payment through mobile phones (Gerpott and Meinert, 2017). Previous relevant manuscripts either only studied the willingness to adopt m-payment with no difference between the two technologies (de Kerviler et al., 2016) or only studied the willingness to use a proximity payment system (Khalilzadeh et al., 2017; Verma et al., 2020).

Among the above-mentioned major e-commerce marketplaces, China's e-commerce market was valued at USD 633.9 billion in 2018, with m-payments being one of the most popular payment modes. By 2023, total revenue is expected to grow by 11.6%, reaching total revenue of USD 10,945 billion. This means China's e-commerce area is the fastest growing economic region and will remain in a leading position until 2023. Clearly, the trend of the transfer of e-commerce purchasing power from the European Free Trade Area, the United States Economic Area to Asia-Pacific Economic Cooperation (APEC) has begun. Due to the growth of APEC's e-commerce purchasing power and the popularity of the Internet, especially gaining access to mobile devices, more consumers are utilizing m-payments (CNNIC, 2019).

The continuous growth of Korea's m-payments is the main driving force for the continued growth of Korea's, and even the world's economy. Faced with Chinese m-payment consumers' exponential growth and driven by the geographical advantages and high e-commerce penetration of APEC and China, Korean m-payment service providers are gradually realizing simply retaining existing Korean customers is not enough. To improve the Chinese users' usage attitude effectively and rapidly toward Korean m-payment platforms, it is essential to concentrate on vital elements affecting the usage intention of Chinese consumers in using Korean m-payment systems.

Considering the above research gaps, this study developed the extended unified theory of acceptance and use of technology (UTAUT2) theoretical model integrating information system success (ISS) model and ITM for m-payment usage attitudes in China and Korea and tested the relationship between the constructs of the related models with a sample of 486 Chinese and 465 Koreans. This theoretical model not only studies the antecedents such as trust, quality, and payment conditions but also assumes the relationship between these constructs and their impact on use intention. The main purpose of this study is to fill the deficiencies in the following three aspects. First, this study focuses on several key antecedents to enhance the willingness to use third-party m-payment systems in China and South Korea. Second, this study examines the mediating effect between various antecedents and continuous intention of PE in the third-party m-payment platforms of China and South Korea. Finally, this study empirically analyzes the differences in the impact of cross-cultural comparison between the UTAUT2 integrated ISS model and ITM. The expected results of the manuscript can effectively fill the shortcomings of the existing literature and provide a more comprehensive theoretical and practical contribution to the development of the third-party m-payment system in China and South Korea.

The rest of this article is organized as follows: the second part comprehensively introduces the concept of m-payments and the existing research literature of the three information system models (ISMs) in the article; the third part expounds on the research theory and methods, research assumptions, puts forward the corresponding UTAUT2 integration model, and theorizes as to the potential relationship between facets; the fourth part introduces the research methods, data collection, analysis, and results, and discusses the results of statistical analysis; and the

fifth part summarizes the research results, research contributions, practical impact, and suggestions for future research directions.

BACKGROUND AND LITERATURE REVIEW

Mobile Payment

Mobile payment refers to any online transaction explicitly initiated, granted, registered, and confirmed through mobile terminal equipment (Venkatesh et al., 2012; Dahlberg et al., 2015). Worldwide m-payment has stimulated a subversive revolution in the socio-economic field and has had a profound historical influence on the global payment system. The m-payment transactions are usually completed over long distances *via* network terminal electronic devices in the form of short message delivery, wireless billing, cellular networks, user-operated bills, and credit cards. As a result, m-payment systems can efficiently process m-economical transactions by various wireless technologies. The m-payment has a high penetration rate around the world, not only allowing convenient payment by consumers but also bringing economic returns to reduce transaction costs for companies that provide products and services and rapidly improving the overall national service levels for financial transactions (Phonthanukitithaworn et al., 2016).

According to the relevant literature, m-payment transactions contributed 4.6% toward global GDP in 2018, with a specific economic value of USD 3.9 trillion (CNNIC, 2019). Wang et al.'s (2017) research showed that cross-border m-payment between different countries played a significant role in promoting international trade integration. In particular, the development of cross-border m-payment platforms helped promote m-payment transactions and payments in APEC. In 2020, China's cross-border transactions' revenue is expected to be USD1.71 trillion, accounting for 37.6% of China's foreign trade import and export volume. In 2023, global m-payment technology will grow to USD 4.8 trillion (4.8% of global GDP) (CNNIC, 2019). The integration of m-payment businesses even makes the sustainable development of the Southeast Asian cross-border consumer market in the process of rapid integration possible.

From what has been mentioned above, it is not difficult to make the following observations. First, in the context of the large-scale popularization of global m-payment platforms and rapid preemption of multinational markets, Korean m-payment platform service providers increasingly feel simply maintaining existing Korean customers is not enough. Second, a comprehensive analysis of the elements affecting the Korean users' usage intention of Korean m-payment systems can increase the willingness of more consumers to use Korean m-payment platforms. Consequently, scholars have been trying to determine the elements influencing the willingness to use different m-payment systems. In the performance comparison process between Kakao Pay and Naver Pay, Lee and Kim (2017) revealed Kakao Pay showed limited applicability due to insufficient alliance merchants and also revealed a lack of reliability due to payment errors. The results showed Naver Pay also needed to improve reliability and greatly reduce errors in the early use and later payment process of the Naver Pay program. Due to the need for a tedious payment operation and a large amount of consumer personal information, it is easy to make users feel weary. By analyzing the response of the international cross-border consumer market of Kakao Pay and Samsung Pay, Son and Kim (2018) discovered management strategies can ensure the sustainable development of rapid technology. By comparing the conversion intention between Samsung pay and Kakao Pay, Lee et al. (2017) firmly believed the more benefits obtained after the conversion of different m-payment platforms, the stronger the convenience experience brought by the conversion of different m-payment platforms, the safer the conversion process, the stronger the conversion intention of consumers between different m-payment tools will be.

Additionally, similar to Kakao Talk, WeChat Pay binds the WeChat account to the user's bank card and uses NFC or QR for payment services. This can be easily viewed online at any time through the APP *via* WeChat's official account. Other previous studies indicated some scholars used various representative structural equation models as the basic structure of the research, including technology acceptance model (TAM2), UTAUT, and UTAUT2, and any element that might influence the willingness to use m-payments (Alalwan et al., 2018; Liébana-Cabanillas et al., 2018). This study's conclusion further confirms the research significance of this manuscript. In other words, it is necessary for this manuscript to integrate the models and analyze the Chinese and Korean m-payment platforms and to better promote the win-win cooperation of Chinese and Korean m-payments.

Extended Unified Theory of Acceptance and Use of Technology Model

How to classify and explain the influencing elements affecting the consumers' voluntary usage intention of new m-payment platforms has become the most important study area of information technology systems (Swanson, 1988). Davis (1989) and Venkatesh and Davis (1996) successively put forward some theoretical structures of information technology, for example, the TAM and UTAUT model, to explain the elements directly affecting the willingness of a new m-payment platform. Venkatesh et al. (2012) expanded UTAUT from a perspective of new technology perception of users by absorbing price value (PV), hedonic motivation, and habit and finally proposed UTAUT2 that further improved the interpretation ability of UTAUT. Correspondingly, other researchers (Martins et al., 2014) also suggested in future research, a more complete UTAUT2 model must be used for further analyzing the relevant factors affecting the consumer usage intention of m-payment.

The UTAUT2 model has been applied to analyze and test influencing elements of m-commerce (Chopdar et al., 2018), m-transactions (Farah et al., 2018), and m-banking (Khan et al., 2017) usage intention. Studies also showed UTAUT2 was an effective model for understanding the usage intention of m-payment (Wu and Lee, 2017). The existing research focused on the integration of various theoretical structures to study the usage willingness of new information technology. Particularly,

numerous studies on the application of m-banking integrated UTAUT2 with other theories (Lin et al., 2019), showing the necessity and importance of using other theories to make up for the theoretical gaps in information technology.

Although the majority of the literature mostly used age, gender, and experience as moderating variables, few academics attempted to improve the model with other structures to improve its accuracy in the m-payment area (Baptista and Oliveira, 2015). Therefore, recent research analysis (Oliveira et al., 2014) suggested integrating distinctive models to obtain a more complete view to accomplish their research goals. This research will use UTAUT2 in combination with other important information technology models as a theoretical framework to evaluate the elements influencing consumer acceptance of the m-payment platform in Korea. Consequently, the next study should research integrating various information technology models into UTAUT2 and then analyze which factors can influence the m-payment platform users' usage willingness.

DeLone and McLean's Information System Success Model

Information system success explains how system and information qualities affect users' usage willingness and user satisfaction (US), leading to the influence of individual willingness (DeLone and McLean, 1992). Moreover, DeLone and McLean (2003) improved an upgraded model that incorporated quality of service. From then on, the upgraded ISS was extensively applied to assess the usage willingness of dissimilar m-payment systems. In our article, ISS is applied to confirm some promoters of usage willingness in the m-payment system. Tam and Oliveira (2017b) proposed ISS moderated by the cross-cultural dimension, revealing the relationship between personal performance and m-banking is mediated by diverse-cultural effects on the usage of m-banking. Hence, mobile bank managers were provided new insights from the mediating influence of cultural effects, which is very important to recollect former users and further attract potential users by applying strategies.

Mobile payment is an advanced information payment technology, which has rarely been studied by researchers, especially the different groups of WeChat Pay's and Kakao Pay's customers in Korea. Accordingly, ISS should be utilized and generalized as a theoretical model of m-payment with other information models.

Initial Trust Model

Initial trust emphasizes the "usage intention of the customer to take advantage of trust in satisfying a demand without pre-experience, or reliable, profound information" (Kim and Prabhakar, 2004). Accessibility, adaptability, and potential profits (the function of service utility) can be attributed to the foundation of IT (Koufaris and Hampton-Sosa, 2004). Therefore, Kim et al. (2009) found a model using ITM, whereby the IT of the mobile bank could be explained by a structural guarantee, trust tendency, and corporate reputation.

Some scholars (Kim, 2012; Zhou, 2014) contended IT has been proven to be an important factor influencing the first adaptation decision of consumers because the stable usage intention can be formed only after the IT is established. Three categories of the element are classified as follows: the first element is linked with the features of m-payment. The usage intention of consumers will depend on IT to a certain extent. Of course, structural factors are effective in influencing IT (Lin, 2011). The second element is closely related to the reputation of the company. Corporate reputation is also an important factor affecting IT because it reduces the risk of potential price information asymmetry and forms an after-sales guarantee after completing the m-payment transaction process (Li et al., 2008). The third element is combined with users' trust tendency. Personal trust tendency reveals a psychological trend of users, which also has an important impact on IT.

The initial trust model was used in various researches to judge or predict the usage intention of the m-payment system, for instance, m-shopping, m-banking, m-commerce, and m-payments (Shankar and Jebarajakirthy, 2019).

Research Model

As mentioned above, originally suggested by DeLone and McLean (1992), system quality is interpreted as the quality expressed in the complete function of the system, therefore it can be perceived by individuals (DeLone and McLean, 2003). Furthermore, Venkatesh et al. (2012) interpreted performance expectation (also performance expectancy, PE) as "the extent to which technology will assist customers when completing certain tasks." Obviously, powerful navigation, a clear outline, and a responsive interface may be crucial for adopting m-payments. Thus, system quality directly affects PEs.

Bhattacherjee (2002) pointed out if consumers can experience better system performance, it will significantly increase US and thus generate continuous use intent. Notably, the better the system quality, the greater it can markedly improve US, and the more it can make up for the limitations of mobile device size. Pyo and Kim (2014) found Kakao Talk users are more interested in ease of use and high-speed accessibility, and system quality significantly impacts satisfaction. Sharma (2019) pointed out users may not trust the m-payment platform's ability to provide high-quality system services, which may make it harder to use the device, according to a group of users who are not able to meet the user's expectations. The following hypotheses are given:

H1a: System quality significantly influences user satisfaction.
H1b: System quality significantly influences performance expectancy.

Information quality (IQ) includes comprehensibility, accessibility, sufficiency, accuracy, feedback report, and other characteristics (Sharma, 2019). Clearly, information quality is a vital element to determine the usage intention toward information mobile technology. DeLone and McLean (2003) pointed out that information quality was also a crucial part of the m-payment information platform, which was the most basic communication ability of Internet buyers and sellers. Interpreted as the inherent quality of the information itself,

such as accuracy, reliability, and completeness, information quality significantly influences PE (Tam and Oliveira, 2016). The m-payment consumers always want to gain the whole transaction records, accurately, and timely. After all, users will also be concerned with the m-payment transaction is complete. If there is no receipt, the payer cannot obtain proof of the payment transaction, so it is difficult to ask for a refund when the goods are not ideal. The m-payment consumers generally believe a lack of transaction-related information is risky. They are not sure whether the payment has occurred or not, and they are not sure about the payment (Mallat, 2007). This extra difficulty of tracking past payments may additionally make consumers feel service suppliers do not provide sufficient functional investment in m-payments. The m-payment consumers' PE of consumers will be influenced.

Information quality, on the other hand, may also affect customer satisfaction. Existing studies reported how IQ affected US, m-banking, and the virtual community (Elliot et al., 2013). The following hypotheses are given:

H2a: Information quality significantly influences user satisfaction.
H2b: Information quality significantly influences performance expectancy.

Service quality (SQ) refers to some features of service aids (such as responsiveness, credibility, simplicity, and technical ability, etc.) obtained by consumers from the information transfer department and technical support department (DeLone and McLean, 2003). In addition, service quality will also affect the US wireless business transactions (Gounaris et al., 2010), virtual travel societies, and mobile instant messaging (Elliot et al., 2013).

Clearly, information systems cannot be fully evaluated effectively without reference to the quality of service. All quality factors, including SQ, will help users to evaluate their PE correctly. The following hypotheses are given:

H3a: Service quality significantly influences user satisfaction.
H3b: Service quality significantly influences performance expectancy.

DeLone and McLean (2003) defined US as "the degree to which an application platform can create value for internal or external consumers." This means US reflects consumers' subjective feelings accumulated in full cooperation with mobile suppliers (San-Martín et al., 2013). Furthermore, prior research proposed satisfaction is a decisive determinant of the willingness to use continuously (Zhou, 2014; Lee et al., 2015).

The US of the ISS model reveals the positive correlation between PE and usage willingness (Au et al., 2008). According to previous literature, PE is positively correlated with the relevant models (DeLone and McLean, 1992). UTAUT2 also explained that the influence of enhancing US to user's usage willingness was clearly significant, and US was also affected by PE. Therefore, the increased PE will positively increase US and ultimately influence the acceptance intention.

On this basis, Tam and Oliveira (2016) revealed an affirmative correlation between US and m-banking service intention is established by integrating UTAUT2 into ISS. They also confirmed service quality directly affects the performance, and US by confirming satisfaction is the consumers' feeling from the total qualities provided by m-payment provider qualities in the wireless economic commerce environment. The following hypotheses are proposed:

H4a: Performance expectancy significantly influences user satisfaction.
H4b: User satisfaction significantly influences usage intention.

Structural assurance (SA) refers to the trust structure framework based on institutions, which is determined by laws, credit guarantees, and the industry regulations existing in a certain environment (McKnight et al., 1998). Judged by the above views, we conclude that IT comes from people's sense of security in the process of online banking transactions under the dual effects of relevant social institutions, industry laws, government supervision, contract and offer, and the online structure of online banking. If the information of the counterparties is incomplete, the role of these structural security measures is essential to consumers' IT.

In the m-payment transaction environment, a structural guarantee ensures the reliability of financial transactions, the protection of personal privacy, and transaction confidentiality. With promises, deals, rules, contracts, laws, managed services, and other forms of structural guarantees, the IT in a transactional relationship can be enhanced (McKnight et al., 2004). It can improve the user's IT, considering that the user wants to be guaranteed and avoid the risks and uncertainties affecting information, finance, etc. (McKnight et al., 2002).

Of course, the structural guarantee has been proven to affect the trust of the bank (Moin et al., 2015), electric commerce (Alqatan et al., 2016), and m-banking (Yu and Asgarkhani, 2015), which regards manuscript reports as structural guarantees. The following hypothesis is suggested:

H5a: Structural assurance significantly influences initial trust.

Personal propensity to trust (PPT) refers to users' natural tendency to trust new technology. Consumers with a natural trust tendency have a greater tendency to trust mobile banks (McKnight et al., 2002). Personal trust tendency is an attribute characteristic and experience formed by one's cultural background and psychology (Lee and Turban, 2001). When people make judgments about services without prior knowledge, those who are more inclined to trust may think services are reliable. Many studies on the IT of online banking transactions show the individual's trust tendency may positively influence the establishment of trust in m-banking (Gefen, 2000).

Therefore, personal trust often does not have the experience of dealing with the trustee and relies on trust expectations. In the IT situation, personal trust significantly impacts IT. Personal trust tendency is a kind of trust formed from small to large. This kind of personal trust is generally

considered to be direct and dependent behavior (Kim and Prabhakar, 2004). Research by Wu and Lee (2017) reveals the personal trust tendency of customers will positively influence adoption willingness when a company offers reliable and accurate services. The following hypothesis is stated as follows:

H5b: Personal propensity to trust significantly influences initial trust.

Firm reputation (FR) refers to a company's ability to provide an effective service to its customers and the reliability of customers' participation in the company's business (McKnight et al., 1998). The company's reputation improves consumers' trust in its new services and helps to comprehensively improve the trust of potential consumers in new service transactions (Kim et al., 2009). Therefore, enterprise reputation is one important element of IT. It directly influences users' willingness to adopt related services.

The existing research shows that the most important thing is customers initially trust the reputation of the enterprise, rather than taking trust behavior according to the actual scale of the enterprise (Wu and Lee, 2017). Therefore, many well-known enterprises actively provide after-sales support for customers, timely publicize, and improve the high-tech image of the enterprise, and persuade consumers to believe that the well-known enterprise has sufficient technical strength and core competitive advantages, thus greatly improving the consumer trust of the enterprise's mobile operation platform. The following hypothesis is submitted:

H5c: Firm reputation significantly influences initial trust.

Initial trust points out the user's intention to bear unexpected losses to meet the demand, without the use of experience or reliable and referential information (McKnight et al., 1998; Kim and Prabhakar, 2004). IT guarantee consumers eventually reach the desired outcome (Pavlou et al., 2003). Especially in the m-payment environment, the trust of consumers strengthens the individual's expectation of the product's usefulness or performance (Bock et al., 2012). Prior research also indicated that trust would promote volunteering that influences the perceived usefulness of the web platform (Saura et al., 2020). If the service provider is not trusted to provide dependable m-payment services, the positive adopters are more likely to suffer losses after adopting m-payments because the service supplier is speculative. Therefore, the IT factor may positively affect the PE of consumers (Dishaw and Strong, 1999). The following hypothesis is submitted:

H6a: Initial trust significantly influences performance expectancy.

Kim et al. (2010a) studied the impact of IT on m-payment usage acceptance. They confirmed the elements of IT, together with the relative benefits of m-payments, structural guarantees, corporate reputation, and users' propensity to trust. Hung et al. (2012) showed that trust played a critical role in mobile shopping's persistent intention. Due to the mobile networks' vulnerability, the mistrust of mobile providers, and m-payment systems, m-commerce has greater doubt and hazards. Viruses and Trojans can also infect mobile platforms. Under the background of m-payments, a purchase is influenced by safety and trust issues, so more risk and more mistrust should be considered (Chen, 2013). M-payment consumers have reason to worry whether the m-payment platform can safely transfer and store their own credit card accounts, passwords, location privacy, and other privacy information (Mamonov and Benbunan-Fich, 2015). Therefore, we believe that IT may influence the sustainability of m-transactions and thus make the hypothesis as follows:

H6b: Initial trust significantly influences usage intention.

Performance expectancy refers to the degree to which a user considers adopting an m-platform contributes to his work performance (Venkatesh et al., 2003). In previous literature, if individuals figure out that the profit of using new technology outweighs the disadvantages, they will be more inclined to accept and continue to adopt the technology (Venkatesh et al., 2012). Unambiguously, in a large number of m-payment scenarios, PEs are found to directly affect the user's usage intention of the relevant information system (Baptista and Oliveira, 2015).

In the m-commerce environment, consumers will judge the effectiveness of using the m-payment application platform to help complete their business transactions. Clearly, PE is one critical element in the process of consumer evaluation. Many previous studies (Faqih and Jaradat, 2015) explicitly support the positive influence of the willingness to use m-commerce. In addition, more research results show that PE plays a critical role in affecting the willingness to use m-payment platforms (Morosan and DeFranco, 2016). The hypothesis is:

H7: Performance expectancy significantly influences usage intention.

Effort expectancy's (EE) definition (Venkatesh et al., 2003) is "the degree of ease associated with using the system." In a large number of studies involving UTAUT2, the expected workload has been generally considered a vital precondition for the expected work (Venkatesh et al., 2003, 2012; Slade et al., 2015). That is, the influencing factors of consumers' willingness to accept a new platform are not only the benefits of the platform itself, but also the difficulty and effort of using the system. The ease of access to a system tends to stimulate users to adopt it (Oliveira et al., 2014; Dwivedi et al., 2019). Under the background of m-payments, the EE will be regarded as the capability to carry out a certain mobile business function with the least amount of work. Reasonable work expectations can make consumers feel very comfortable when they carry out the m-commerce transaction.

In addition, the particularity of m-banking also forces system operators to have some basic finance knowledge and related operational skills. Therefore, efforts are expected to effectively influence determining customers' willingness to use an m-payment platform system (Alalwan et al., 2016). Many m-banking studies demonstrated the factors captured by effort expectations positively affect measuring customers' usage intention of m-banking (Gu et al., 2009). The interaction

interface, function design, and computing power of m-banking can directly influence the consumers' willingness to adopt. The interaction interface, function design, convenient navigation, and the computing power of m-banking can directly affect the user's willingness to adopt (Venkatesh et al., 2003; Kim et al., 2009). Therefore, the following hypothesis is given:

H8: Effort expectancy significantly influences usage intention.

Social influence (SI) indicates some extension to which platform users' important social relations (e.g., family, friends, or leaders) have faith in the new m-payment system should be adopted (Venkatesh et al., 2012; Tam and Oliveira, 2016). Social impact reveals the impact of individuals on the adaptation of technology by their social relatives. Users often consider the opinions of others when choosing a new technology. Supposing the attitude of his social relatives is active, users will accept it; on the contrary, negative attitudes will affect users' decision not to adopt.

The social preferences and values coming from family relatives, friends, and neighbors often profoundly change users' views and opinions (Rana et al., 2017). Especially when the present user intends to change from using one technical service to another technical service, the user's willingness to change will be easily influenced by peers and influence of family members (Baptista and Oliveira, 2015; Dwivedi et al., 2019). Under the background of mass media dominating the online world (Kapoor et al., 2018), the impact of social relations may not only continue the usage intention of old technology but also guide users to new technologies recognized by social relations (Williams et al., 2015). Through multicultural surveys between Australia and Thailand, Mortimer et al. (2015) found that even in different cultures, social impact can become a significant element in the usage intention of a new platform. Moreover, under the background of Saudi Arabia's electrical commerce, prior research also proves the active influence of SI on the adoption willingness of m-banking (Al-Husein and Asad Sadi, 2015). The hypothesis is given:

H9: Social influence significantly influences usage intention.

Facilitation (FC) reflects a positive and significant impact of the infrastructure related to organization and technology on the use of online banking, such as consumer expertise, related operational skills, and platform resources (Venkatesh et al., 2003). In fact, the enhancement of the willingness to use m-payments requires online banking to train users to have specific operation skills, provide service resources and basic hardware and software conditions of high matching financial systems (Alalwan et al., 2015). The necessary knowledge reserve and skill accumulation play many roles in adopting m-banking services, thus affecting the usage intention. Previous literature studies pointed out convenience significantly impacts usage willingness (Alalwan et al., 2016). The hypothesis is:

H10: Facilitating conditions significantly influence usage intention.

Hedonic motivation's (HM) definition mentions a degree of enjoyment in the process of adopting m-banking, which is a vital pretest factor affecting consumer willingness to use a new technology (Van der Heijden, 2004); hedonic behavior is essentially a non-functional and personality emotional variable, which is completely based on consumers' emotional cognition (Malik et al., 2013). In other words, the pleasure gained from using new technologies significantly promotes usage intention (Alalwan et al., 2015). The higher the degree of entertainment the mobile platform brought, the greater willingness customers will have (Zhang et al., 2012).

In addition, many previous studies revealed hedonic motivation was positive in predicting usage intention in various m-payment technology application scenarios (Morosan and DeFranco, 2016; Alalwan et al., 2017). When consumers find the existing m-payment technologies bring enough effective comfort, satisfaction, and pleasure, they often do not switch their use intention to other competitive payment platforms (Karjaluoto et al., 2010). Therefore, many research conclusions have revealed the satisfaction or pleasure obtained by consumers from using a specific m-payment platform is an extremely vital element of the willingness to use the technology (Morosan and DeFranco, 2016; Alalwan et al., 2017; Dwivedi et al., 2019). Accordingly, the hypothesis is submitted:

H11: Hedonic motivation significantly influences usage intention.

The price value is a cognitive balance comparing the profits from m-banking platforms and the financial price of adopting m-banking services that consumers experience (Venkatesh et al., 2012), including m-payment service operator costs, equipment costs, after-sales costs, purchase and sale costs, and other factors. PV is optimistic because the profits of adopting m-banking outweigh the associated currency costs.

Since the profits of adopting m-bank are larger than related economic value, the PV is positively correlated. As Alalwan et al. (2017) indicated, the higher the PV level, the more motivated customers are to continue to adopt a certain technology. Further, after UTAUT2 introduced PV, prior research pointed out that there was an important positive correlation between PV and behavioral intention (Alalwan et al., 2017). Therefore, considering the potential profits of adopting the electrical commerce apps, consumers may reassess whether the relevant transaction costs are reasonable. If the potential revenue is significantly greater than the foreseeable cost of adopting m-payment applications, consumers are more inclined to adopt m-commerce solutions. Otherwise, users who cannot afford to continue using the upgraded technology will not express interest in continuing to adopt it. Given the above situation, this hypothesis can be given:

H12: Price value significantly influences usage intention.

Habit (HA) reveals various outcomes of past practice, and the frequency of previous acceptance behavior is reflected to be one main element of current behavior (Ajzen, 2002). The empirical research of Eriksson et al. (2008) reveals that a positive correlation between online banking and customer habits is an important factor for US users to accept online m-commerce.

Pavlou and Fygenson (2006) contended habits could be the principal determinants of prior behavior.

Consumers are less likely to change acquired habits and may resist any new and unfamiliar interactions with m-banks (Chemingui, 2013); this research further leads consumers to hesitate to adopt new apps or platforms, for instance m-payments (Antón et al., 2013). Actually, as an unconscious factor, previous experience, and habits largely hinder consumers' intention to use a new platform, because they tend to depend on past experience rather than cognitive reasoning when making decisions (Zhang et al., 2017). In this research, following the structure of UTAUT2, habits have taken a positive role in motivating online banks to take actions. Therefore, the hypothesis postulates:

H13: Habit significantly influences usage intention.

Khan et al. (2017) finally determined the moderating effect of cultural factors by revealing a certain relationship between UTAUT2 variables. Through an adjustment analysis and segmentation test, Zhang et al. (2012) argues the use intention model of m-payment and divides it into two cultures to determine the regulatory role of different ethnic PVs in m-commerce. The results reveal UTATU2 is in good agreement with the data. Lee et al. (2017) found in the UTAUT model, the role of government has an adjusting effect on the determinants of adoption willingness. According to the above results, we examined the moderating effect of different ethnic consumers in an integrated UTAUT2 model. We assume there are some dissimilarities, which adjust the influence of these determinants on users' intention to use. In the empirical investigation of this manuscript, it is necessary to compare and analyze WeChat payment in China and Kakaopay, the largest m-payment platform in South Korea to study the subjective and objective factors affecting the sustainable development of Kakao Pay as comprehensively as possible. In the near future, Kakao Pay and WeChat payment will provide remote payment services, respectively, to support the m-commerce payment of up to 450 million Chinese and Korean consumers. Facing the growing Chinese consumer group, the successful survival of the Korean m-payment system is mainly affected by important core factors, such as US, PE, compatibility between technical characteristics and task requirements, etc. The cultural differences between China and Korea will certainly affect the usage intention of m-payment services by different consumers to some extent. In the process of globalization of m-payment technology, the importance of cross-cultural research is obvious. Thus, we test the hypotheses:

H14: The impact of initial trust on usage intention differs between WeChat Pay and Kakao Pay Chinese consumers.

H15: The impact of user satisfaction on usage intention differs between WeChat Pay and Kakao Pay Chinese consumers.

H16: The influence of performance expectancy on usage intention differs between WeChat Pay and Kakao Pay Chinese consumers.

H17: The influence of effort expectancy on usage intention differs between WeChat Pay and Kakao Pay Chinese consumers.

H18: The effect of social influence on usage intention differs between WeChat Pay and Kakao Pay Chinese consumers.

H19: The impact of facilitating conditions on usage intention differs between WeChat Pay and Kakao Pay Chinese consumers.

H20: The impact of hedonic motivation on usage intention differs between WeChat Pay and Kakao Pay Chinese consumers.

H21: The impact of price value on usage intention differs between WeChat Pay and Kakao Pay Chinese consumers.

H22: The impact of habit on usage intention differs between WeChat Pay and Kakao Pay Chinese consumers.

According to the above hypotheses development, we proposed the research model for this study (as shown in **Figure 1**).

DATA COLLECTION AND RESULTS

The constructs in this study are measured using 7-point Likert scales drawn and revised from existing studies (e.g., DeLone and McLean, 2003; Venkatesh et al., 2003, 2012; Koufaris and Hampton-Sosa, 2004). We employed the back-translation procedure suggested by Brislin (1970), using focus groups to ensure a match between the original wordings and their translation. Subsequently the measurement items were translated into English and double-checked for veracity of meaning from Chinese to English by two native English speakers.

From the beginning of July to the end of August 2019, through face-to-face interviews with experienced users coming from Chinese students in Seoul University and local Kakao Pay's Korean experienced users, the survey was conducted for 8 weeks.

We used the two-process method (Anderson and Gerbing, 1988) to evaluate the collected data. In the first step, convergence and discriminant validity are examined. Second, the measurement model between the integrated structures is evaluated. To test the fitting of the measured values and structure modeling, the integration structure was tested using all of the WeChat Pay and Kakao Pay's Korean consumer data. Hooper et al. (2008) offered model fitting cooperation as a fitting index and proposed the following indexes as fitting indexes.

As the m-payment industry of the Seoul cultural business circle and many universities is far more mature than other regions in South Korea, we quickly obtained ideal samples. Meanwhile, to ensure the measurement followed the direct behavioral practice of the object, some participants not using WeChat Pay and Kakao Pay were strictly excluded. Moreover, by modifying the ambiguous part of the questionnaire, this research guarantees each respondent can fully comprehend every question of the questionnaire.

A survey of 1,200 questionnaires was issued and 1,143 copies were collected (response rate 86.46%). After 192 responses

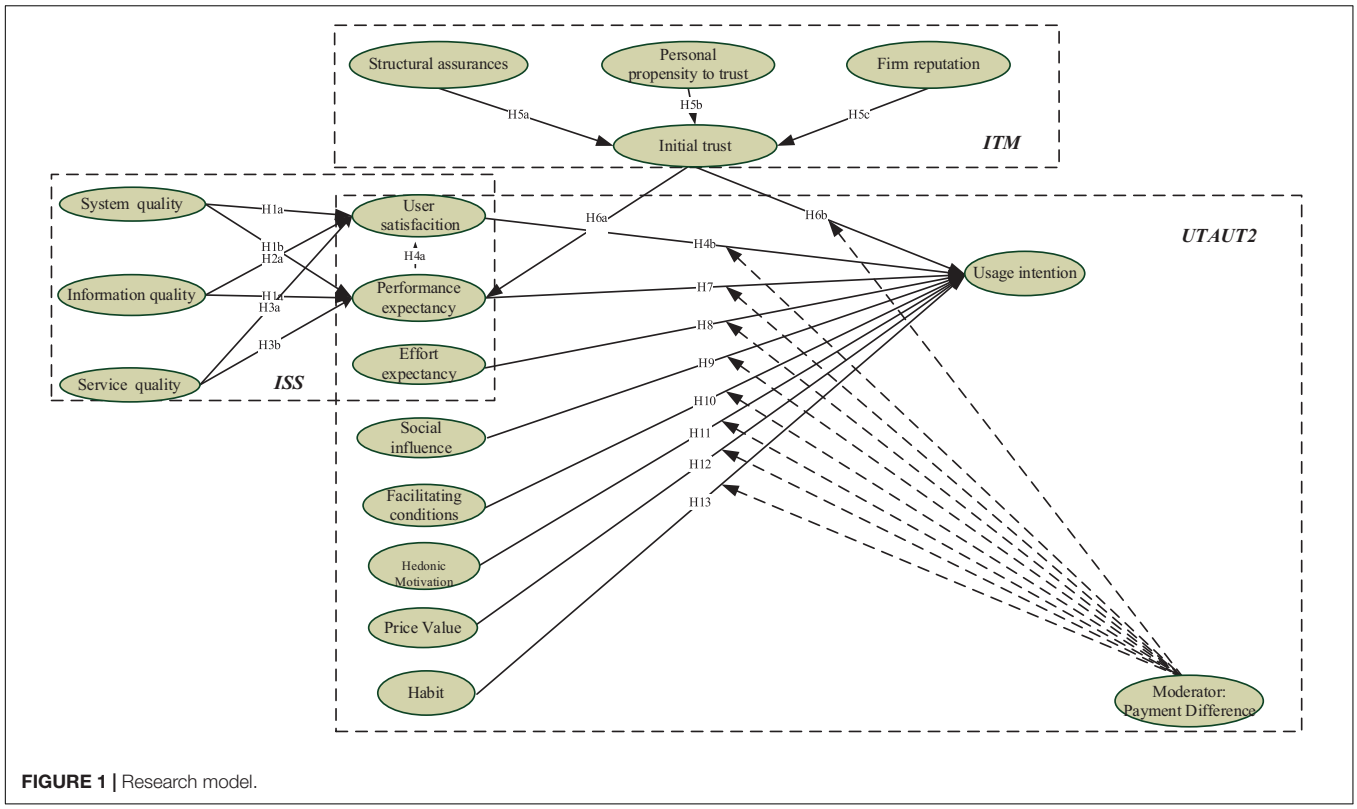

FIGURE 1 | Research model.

were discarded, 951 samples (85.33%) were eventually used for deterministic analysis (486 WeChat Pay's Chinese consumers 465 and Kakao Pay's Korean consumers) because of missing key data or lack of corresponding m-payment experience. The final data is sufficient to define the difference in the middle of the two object groups, although the sample sizes are not identical.

Every item was asked on a five-point Likert's scale (**Table 1**). For instance, "strongly reject" to 5, "strongly agree." In the subsequent empirical analysis, Cronbach's α was applied to calculate the reliability of the measurement method using IBM SPSS 24.0 (IBM Corp., Armonk, NY, United States), and construct validity was evaluated by examining the factor structure and intrinsic relevance of each construct. To test the research hypotheses, we used IBM Amos 24.0 (IBM Corp., Armonk, NY, United States) and determined the causal relationship between core variables through a significance value and standard coefficient. For testing each hypothesis, the entire sample is used to analyze the integration model before the hypothesis verification test.

Reliability, Validity, and Measurement Model

Three steps are required to evaluate the convergence effectiveness of a measurement object against its related structures. First, the reliability of each index is evaluated by means of standardized load. Second, as a measuring item, Cronbach's α and CR are used to measure the reliability of composites. Third, extracted average variance (AVE) measures the variance of variables caused by measurement error relative to the variance.

According to **Table 2**, Cronbach's α and CR are above 0.70 (Nunnally, 1994), indicating the optimal validity measures explain the structure and higher level of comprehensive consistency. Moreover, convergent validity was measured by three dimensions of indicators: the standardized loadings signifying the relationship between some underlying elements and every indicator was statistically above 0.7, the Cronbach's α values were significant at greater than 0.7 for the reliability of the integrated construct (Nunnally, 1994; Hair et al., 1998); each AVE value was greater than 0.5 (Fornell and Larcker, 1981).

In **Table 3**, discriminant validity indicates the difference between one principle and its related indicators and the second principle and its related indicators (Bagozzi et al., 1991). Fornell and Larcker (1981) found discriminant validity must be tested by evaluating the square root of each variables' AVE in each construct and their correlation coefficients among other models.

Table 3 shows for each data compared with the correlation between one structure and another, the variance between structures and each AVE's square root is larger than any related correlation coefficient, pointing to good discriminant validity of each criterion (Fornell and Larcker, 1981). The correlation between constructs was exceeded by the diagonal values, proving the satisfactory construct validity of our measurement tool.

The IBM Amos 24.0 program (IBM Corp., Armonk, NY, United States) was utilized to evaluate the measurement and structural models of this research. The $\chi 2$/d.f.s are 1.299 and 1.408, GFIs are 0.927 and 0.919, AGFIs are 0.917 and 0.910,

TABLE 1 | Sample characteristics (entire samples).

Characteristics		Frequency	Percentage (%)	WeChat Pay's		Kakao Pay's	
Gender	Male	433	45.53	219	45.06%	214	46.02%
	Female	518	54.47	267	54.93%	251	53.98%
Age	Below 20	93	9.80	55	11.30%	38	8.20%
	20–30	391	41.11	183	37.65%	208	44.73%
	30 –40	351	36.90	182	37.45%	169	36.34%
	40 –50	65	6.80	35	7.20%	30	6.50%
	Over 50	51	5.40	31	6.40%	20	4.30%
Education	High school student/resident	91	9.60	51	10.50%	40	8.60%
	College student/student	417	43.80	207	42.60%	210	45.20%
	Graduate school or higher	443	46.60	228	46.90%	215	46.20%
Experience	Yes	951	100.00	486	100.00%	465	100.00%

NFIs are 0.949 and 0.943, CFIs are 0.988 and 0.983, IFIs are 0.988 and 0.983, RFIs are 0.944 and 0.939, PGFIs are 0.816 and 0.824, PCFIs are 0.898 and 0.910, PNFIs are 0.862 and 0.873, RMRs are 0.050 and 0.061, and RMSEAs are 0.018 and 0.021. The results from the measurement and structural models support this association for each model. Twenty research hypotheses presented in this manuscript were tested by scanning electron microscope (SEM). For the parsimonious fitting index, the acceptable fitness minimum is exceeded here, which is a standard value. All the fitting indexes show the fitting results of the analyzed samples and the integrated model are satisfactory.

Hypothesis Verification

After determining the measurement suitability and organization of the combined model, the structure was analyzed with Chinese samples and the Chinese path coefficient was evaluated as shown in **Table 4**. Judging by the *p*-value, 4 paths of the 20 paths (H3a, H3b, H6b, and H8; *p*-value of > 0.05) were rejected, and the other 16 paths proved statistically positive.

TABLE 2 | Convergent validity and reliability (entire samples).

Construct	Indicators	Standardized loading	Cronbach's α	Composite reliability	AVE
SYQ	SYQ 1-4	0.768–0.888	0.889	0.890	0.669
IQ	IQ 1-4	0.821–0.858	0.900	0.901	0.694
SEQ	SEQ 1-4	0.799–0.866	0.903	0.904	0.702
US	US 1-4	0.805–0.861	0.899	0.900	0.691
PE	PE 1-4	0.777–0.865	0.894	0.896	0.683
EE	EE 1-4	0.810–0.871	0.905	0.906	0.706
SI	SI 1-4	0.772–0.873	0.901	0.902	0.699
FC	FC 1-4	0.802–0.862	0.898	0.899	0.690
HM	HM 1-4	0.808–0.848	0.894	0.896	0.683
PV	PV 1-4	0.809–0.853	0.897	0.897	0.686
HA	HA 1-4	0.810–0.864	0.896	0.897	0.686
SA	SA 1-4	0.816–0.862	0.906	0.907	0.710
PPT	PPT 1-4	0.807–0.868	0.903	0.904	0.701
FR	FR 1-4	0.818–0.836	0.900	0.901	0.696
IT	IT 1-4	0.844–0.890	0.918	0.926	0.757
UI	UI 1-4	0.760–0.860	0.889	0.889	0.667

Chinese consumers' usage intention revealed by ITM (β = 0.057), US (β = 0.351), PE (β = 0.291), EE (β = 0.020), SI (β = 0.189), FC (β = 0.107), HMM (β = 0.269), PV (β = 0.079), and HA (β = 0.285) explain 75.1% of the variance in adoption willingness. The influence on Chinese users shows the antecedent variables of the ITM, ISS model, and UTAUT2 model account for 61.7, 62.6, and 68.1% of the variance, respectively, which are related to the 75.1% explanatory ability of the comprehensive structure on use willingness. The measurement and structural model results are given, and a comprehensive model analysis is carried out with Kakao pay's experience consumers sample as an example. Kakao Pay path coefficient between the basic hypotheses of the comprehensive model was properly evaluated. Judging by their respective *p*-values, 5 paths of these 15 paths (H3a, H3b, H4b, H7, and H8; *p*-value > 0.05) were unqualified, and the rest of the paths are statistically positive.

Kakao Pay consumers' usage intention predicted ITM (β = 0.509), US (β = 0.061), PE (β = 0.050), EE (β = 0.040), SI (β = 0.213), FC (β = 0.278), HMM (β = 0.099), PV (β = 0.330), and HA (β = 0.097) explain Kakao Pay's Korean consumers' usage willingness for 76.7% of the explained variance. The influence of Kakao Pay's Korean consumers shows the prerequisites of ITM, ISS, and UTAUT2 can explain the variance of 60.0, 64.1, and 66.8%, respectively, and the explanatory power of these three variables for the comprehensive model is 76.7%.

The analysis outcomes of the whole dataset are shown in **Table 5**. There are four paths (H3a, H3b, H6b, and H8), *p*-value > 0.05) not supported, and the other paths are significantly below the 0.05 level. **Table 5** lists the features of the causal path, including the coefficients of this integrated model and the hypothesis test results. **Table 5** demonstrates the entire dataset supports this integrated structure.

In **Table 4**, the comprehensive structure was examined by WeChat Pay's Chinese consumer samples in Korea, showing the integrated model is supported. According to the result of **Table 4**, four paths (H3a, H3b, H6b, and H8; *p*-value > 0.05) are not supported, and the rest of the paths are significant below the 0.05 level. **Table 4** normalizes the path coefficients, lists the causal path's characteristics, and confirms the results of the hypothesis model. Moreover, the comprehensive model

TABLE 3 | Discriminant validity (entire sample).

	SYQ	IQ	SEQ	US	PE	EE	SI	FC	HM	PV	HA	SA	PPT	FR	IT	UI
SYQ	0.82															
IQ	0.29	0.83														
SEQ	0.27	0.37	0.84													
US	0.54	0.62	0.36	0.83												
PE	0.56	0.55	0.32	0.69	0.83											
EE	0.11	0.19	0.14	0.19	0.11	0.84										
SI	0.14	0.19	0.12	0.20	0.14	0.44	0.84									
FC	0.16	0.20	0.17	0.25	0.16	0.46	0.42	0.83								
HM	0.16	0.16	0.11	0.19	0.13	0.41	0.41	0.49	0.83							
PV	0.08	0.18	0.10	0.19	0.15	0.39	0.40	0.48	0.38	0.83						
HA	0.11	0.24	0.16	0.22	0.17	0.44	0.42	0.50	0.40	0.45	0.83					
SA	0.22	0.28	0.22	0.32	0.37	0.22	0.24	0.27	0.20	0.22	0.30	0.84				
PPT	0.16	0.17	0.16	0.22	0.30	0.22	0.20	0.24	0.20	0.20	0.24	0.51	0.84			
FR	0.21	0.23	0.18	0.26	0.34	0.21	0.24	0.26	0.23	0.23	0.29	0.53	0.50	0.83		
IT	0.26	0.26	0.22	0.36	0.55	0.23	0.23	0.28	0.25	0.25	0.30	0.70	0.67	0.68	0.87	
UI	0.22	0.28	0.14	0.44	0.45	0.38	0.45	0.48	0.44	0.49	0.47	0.28	0.25	0.25	0.44	0.82

TABLE 4 | Results of hypotheses tests (WeChat Pay's Chinese consumer's sample in Korea).

Hypothesis	Route	*T*-Value	Path coefficients
H1a	SYQ → US	5.237	0.260***
H1b	SYQ → PE	10.498	0.482***
H2a	IQ → US	6.525	0.324***
H2b	IQ → PE	10.269	0.459***
H3a	SEQ → US	0.641	0.025
H3b	SEQ → PE	0.213	0.008
H4a	PE → US	7.006	0.415***
H4b	US → UI	5.589	0.351***
H5a	SA → IT	7.597	0.347***
H5b	PPT → IT	7.719	0.360***
H5c	FR → IT	7.410	0.338***
H6a	IT → PE	10.417	0.438***
H6b	IT → UI	1.350	0.057
H7	PE → UI	4.162	0.291***
H8	EE → UI	0.535	0.020
H9	SI → UI	5.168	0.189***
H10	FC → UI	2.645	0.107**
H11	HM → UI	7.023	0.269***
H12	PV → UI	2.148	0.079*
H13	HA → UI	7.082	0.285***

*p-value < 0.05; **p-value < 0.01; and ***p-value < 0.001.

TABLE 5 | Results of hypotheses tests (all samples).

Hypothesis	Route	*T*-Value	Path coefficients
H1a	SYQ → US	7.400	0.237***
H1b	SYQ → PE	13.084	0.392***
H2a	IQ → US	10.469	0.351***
H2b	IQ → PE	12.512	0.377***
H3a	SEQ → US	1.609	0.042
H3b	SEQ → PE	−0.270	−0.007
H4a	PE → US	10.129	0.395***
H4b	US → UI	2.351	0.108*
H5a	SA → IT	12.539	0.375***
H5b	PPT → IT	11.623	0.332***
H5c	FR → IT	11.217	0.331***
H6a	IT → PE	13.441	0.370***
H6b	IT → UI	2.549	0.087*
H7	PE → UI	4.332	0.225***
H8	EE → UI	−0.122	−0.004
H9	SI → UI	5.144	0.168***
H10	FC → UI	2.330	0.088*
H11	HM → UI	4.246	0.143***
H12	PV → UI	6.257	0.211***
H13	HA → UI	3.858	0.136***

*p-value < 0.05; **p-value < 0.01; and ***p-value < 0.001.

was analyzed with Kakao Pay's Korean consumer samples in Korea (**Table 6**).

Table 6 normalizes the path coefficients, lists the causal path characteristics, and confirms the results of the hypothesis model. The empirical analysis results of Kakao Pay's Korean consumer samples are shown in **Table 6**, confirming the existence of the comprehensive model. Taking Kakao Pay's Korean consumers' samples as an example, five paths (H3a, H3b, H4b, H7, and H8) are not supported, and the rest of the paths are significant below the 0.05 level.

Analysis of the Differences in Path Coefficients Between WeChat Pay's and Kakao Pay's Korean Groups

The research also studies the mediating effect between WeChat Pay's Chinese users and Kakao Pay's Korean users' groups in Korea. There are two advantages in comparing these two consumer groups. First, WeChat Pay's Chinese consumers (Chinese tourists in Korea) and Kakao Pay's Korean consumers (Local Korean in Korea) represent two distinct and distinct demographic features according to income levels, purchasing

TABLE 6 | Results of hypotheses tests (Kakao Pay's Korean consumers sample in Korea).

Hypothesis	Route	*T*-Value	Path coefficients
H1a	SYQ → US	5.007	0.233***
H1b	SYQ → PE	9.275	0.387***
H2a	IQ → US	7.319	0.357***
H2b	IQ → PE	9.704	0.417***
H3a	SEQ → US	1.154	0.045
H3b	SEQ → PE	1.284	0.048
H4a	PE → US	6.989	0.381***
H4b	US → UI	1.171	0.061
H5a	SA → IT	7.888	0.369***
H5b	PPT → IT	7.602	0.332***
H5c	FR → IT	6.677	0.304***
H6a	IT → PE	11.099	0.460***
H6b	IT → UI	11.203	0.509***
H7	PE → UI	0.854	0.050
H8	EE → UI	1.053	0.040
H9	SI → UI	5.520	0.213***
H10	FC → UI	6.747	0.278***
H11	HM → UI	2.568	0.099*
H12	PV → UI	8.161	0.330***
H13	HA → UI	2.566	0.097*

*p-value < 0.05 and ***p-value < 0.001.

power, and total accepted qualities of Chinese users. Second, Chinese users play an extremely vital role in m-payments. While Kakao Pay consumers are made up of local Korean users who are more familiar with Kakao Pay than their Chinese tourists' counterparts, WeChat Pay's usage model is quite different. Therefore, comparing the comments of Chinese users and local Korean users may lead to a better understanding of usage intention. Based on this manuscript, PE, EE, SI, FC, and ITM are the elements directly determining user willingness, so we studied them further. The different roles of WeChat Pay's and Kakao Pay's Korean consumer groups should mitigate the influence of these elements on usage willingness.

The empirical results of hypothesis regulation (H4–H13) are shown in **Table 7**. First of all, judged by the p-values of SI and EE on usage intention, the moderating effects of WeChat Pay and Kakao Pay groups are not significant. Second, the other seven p-values show differences in the regulatory effect between the WeChat Pay and Kakao Pay groups. In the WeChat Pay's Chinese user groups, US ($\beta = 0.351$, $p < 0.01$), PE ($\beta = 0.291$, $p < 0.01$), HM ($\beta = 0.269$, $p < 0.01$), and HA ($\beta = 0.285$, $p < 0.01$) positively influence usage intention at a 5% basic level, unlike the Kakao Pay's Korean groups. In contrast, IT ($\beta = 0.509$, $p < 0.01$), FC ($\beta = 0.278$, $p < 0.01$), and PV ($\beta = 0.330$, $p < 0.01$) positively affected the basic level of usage intention at 1% in Kakao Pay's Korean consumer group, unlike in the WeChat Pay's Chinese users' group.

DISCUSSION

This study took WeChat Pay and Kakao Pay as the research objects and completely analyzed most elements influencing the sustainable growth of Korean m-payments. Thus far, there has been no theoretical framework comprehensively examining the common influence of various qualities, IT, and technology elements on customer acceptance of m-payment platforms. Additionally, most previous studies (Afshan and Sharif, 2016; Baabdullah et al., 2019) treated customers as an indivisible whole sample group, and few studies examined the regulatory role of different cultural platform features in the trust construction process of the m-payment market. Embracing the concept of integration models will help refine the present literature, since there is no recent research that has been able to combine the successful ITM and D&M models into UTAUT2 to form a combined model to examine the elements affecting the mpayment's usage intention. After the empirical analysis of the path results proposed in the model, through the multi-group comparison between China and South Korea, we conduct a multi-group test on the cultural effect of the model. In other words, the cultural impact on the path coefficient is tested according to the pairwise parameter comparisons test between the structural loads of two countries.

Hypothesis 14 maintained the influence of IT on usage intention was less for WeChat Pay than for Kakao Pay. The results show initial trust has little positive impact on the intention to use WeChat Pay ($\beta = 0.057$, $p = 0177$) than Kakao Pay ($\beta = 0.509$, $p < 0.001$). Thus, H14 was supported.

In Hypothesis 15, for Kakao Pay, US on usage intention ($\beta = 0.061$, $p = 0.241$) does not significantly affect the intention to use, and in WeChat Pay, satisfaction ($\beta = 0.351$, $p < 0.001$) significantly affects the intention to use. Therefore, it is verified that satisfaction in WeChat Pay positively influences usage willingness. Still, for Kakao Pay, US does not affect usage intention. Thus, H15 was supported.

Hypothesis 16 contended that the influence of PE on usage intention would be greater for WeChat Pay users than for the Kakao Pay users. To test H16, the path coefficient between PE and trust was first checked and proved to be statistically significant in the two m-payment systems (shown in **Table 7**). As stated in H16, the impact of PE on usage intention for WeChat Pay ($\beta = 0.291$, $p < 0.001$) was stronger than for Kakao Pay ($\beta = 0.050$, $p = 0.393$). This result means the perceived PEs of the technology may affect usage intention. Thus, H16 was supported.

Hypothesis 17 also assumed that there are differences in the relationship between EE and usage intention. Both countries used the same analytics program: effort expectations had a small positive impact on users' trust for WeChat Pay ($\beta = 0.020$, $p = 0.593$) than for Kakao Pay ($\beta = 0.040$, $p = 0.292$). As predicted in H17, although the EE of technology's adoption becomes an important component of trust formation, the relationship between them can be influenced by culture. Thus, we failed to demonstrate the influence of culture on effort expectations and usage intention. Even if the effect of EE on usage intention might vary across cultures, the extent of the difference is too weak to support the expected cultural effect. To some extent, these findings are consistent with previous studies (Bandyopadhyay and Fraccastoro, 2007; Im et al., 2011). Thus, H17 was rejected.

TABLE 7 | The difference of path coefficients between WeChat Pay's and Kakao Pay's different consumers.

Hypothesis	Route	WeChat Pay		Kakao Pay		Pairwise parameter comparisons	
		β	*P*	β	*P*	*T* value	*p*-Value
H6b	IT → UI	0.057	0.177	0.509	***	7.854	0.000
H4b	US → UI	0.351	***	0.061	0.241	−2.879	0.004
H7	PE → UI	0.291	***	0.050	0.393	−2.704	0.007
H8	EE → UI	0.020	0.593	0.040	0.292	0.564	0.573
H9	SI → UI	0.189	***	0.213	***	1.470	0.142
H10	FC → UI	0.107	0.008*	0.278	***	3.106	0.002
H11	HM → UI	0.269	***	0.099	0.010*	−2.536	0.012
H12	PV → UI	0.079	0.032*	0.330	***	5.193	0.000
H13	HA → UI	0.285	***	0.097	0.010*	−2.951	0.003

*p-value < 0.05 and ***p-value < 0.001.*

In Hypothesis 18, the influence of SI on use intention is less significant in WeChat Pay than in Kakao Pay. However, as shown in the analytical results in **Table 7**, the SI on usage intention is significant for WeChat Pay (β = 0.189, $p < 0.01$), whereas it is also significant for Kakao Pay (β = 0.213, $p < 0.01$). That is, for Kakao Pay Korean consumers who are more sensitive to social pressure, SI appears to be an important factor in developing behavioral intentions, whereas, for WeChat Pay Chinese consumers who are more focused on personal goals, the opinions or pressures of others may not be important in their decision-making. Thus, H18 was supported.

In Hypothesis 19, for Kakao Pay, the facilitating condition on the usage intention (β = 0.278, $p < 0.001$) significantly affects the usage intention, and in WeChat Pay, the facilitating condition (β = 0.107, $p = 0.008$) does not significantly affect the usage intention. Therefore, Kakao Pay's FCs are considered to significantly affect the usage intention, and WeChat Pay's FCs are verified not to affect the usage intention. Thus, H19 was supported.

In Hypothesis 20, for Kakao Pay, the hedonic motivation on usage intention (β = 0.099, $p = 0.010$) does not significantly affect the intention to use, and in WeChat Pay, hedonic motivation (β = 0.269, $p < 0.001$) significantly affects the intention to use. Therefore, Kakao Pay's hedonic motivation was considered to affect usage intention significantly, and WeChat Pay's hedonic motivation was verified to not significantly affect the usage intention. Thus, H20 was supported.

In Hypothesis 21, for Kakao Pay, the PV on usage intention (β = 0.330, $p < 0.001$) significantly affects the intention to use, and in WeChat Pay, the value of the price (β = 0.079, $p = 0.032$) does not significantly affect the intention to use. Therefore, the PV of Kakao Pay is considered to affect the intention to use significantly, and the PV of WeChat Pay is verified to not significantly affect usage intention. Thus, H21 was supported.

In Hypothesis 22, for Kakao Pay, habit on usage intention (β = 0.097, $p = 0.010$) cannot positively affect the usage intention, and in WeChat Pay, habit (β = 0.285, $p < 0.001$) positively affects the usage intention. Therefore, Kakao Pay's habit is considered to affect usage intent significantly, and WeChat Pay's habit is not verified to significantly affect usage intention. Thus, H22 was supported.

CONCLUSION

Our research conclusions are valuable to researchers and practitioners in the m-payment industry. For the former, this research provides a basis in systematically improving the theoretical model of acceptance, and is a new basis for the theoretical research of new technology acceptance in the future. For practitioners, focusing on the key aspects of the research model is very important for designing, upgrading, and implementing m-payment technologies that can produce high acceptance.

Theoretical Contribution

Integrating several models and different theories into a comprehensive model, used as an operational framework, it may be helpful to identify potentially important variables between behavior and intentions. We think D&M ISS and ITM are critical elements of UTAUT2, and different researchers have looked for factors that determine usage intention. However, these models are seldom integrated into an integrated model. To solve the shortage of research in related fields, a successful information system model (D&M ISS and ITM) is combined with UTAUT2, and the integration model is used as the conceptual model in this manuscript. The integrated model makes up for the shortcomings of the three separated construers, as well as fully considers the subjective and objective elements of usage intention for two different m-payment apps. Therefore, the contribution is trifold.

First, the above results reveal the integrated model provides a stronger interpretation of usage intention than the ISS model, ITM, or UTAUT2, separately. In other words, we believe that the integrated model offers more demonstrative insights than using a single model view. Consequently, future SEM studies should take a comprehensive viewpoint to test the usage intention of any m-payment platform. This manuscript combined D&M ISS and ITM with UTAUT2 to confirm the influencing factors of the usage intention for m-payments. We found ISS and ITM not only directly affect usage intention, but also through US and PEs alone. The PE's influence can be the basis and important starting point of future research.

Second, few academics have concentrated on the willingness of potential Chinese users to choose either of the WeChat Pay and Kakao Pay. This is an m-payment research gap which has not been studied at all. This comparison technique increases the effectiveness of several scenarios testing between China and Korea, and also fulfills new specific blanks in m-payment research. We also considered the moderating variables and multi-group analysis of the Chinese and Korean m-payment platforms' differences to improve the multi-model integration method. The limitation of m-payment knowledge is increased by checking the adjustment variables with the Chinese and Korean payment difference regulators.

Third, attributable to the limited research on the UTAUT2 model for m-payment technology, this study is one attempt to improve UTAUT2 in a multi-model and multi-group integration perspective. In particular, it should be noted that UTAUT2 was originally improved only to examine the use intention of new technology and extended the application of the core variables in the UTAUT2 model to other theoretical fields, such as the cross-cultural background research of consumers, which is composed of many technology platforms and application apps.

Managerial Implications

Judging by a large amount of m-payment literature, it is clear in different business environments, the factors influencing m-payment adoption intentions vary, so it is necessary to study m-commerce adoption intentions and treat them differently, judged by different countries (Zhang et al., 2012). Under the background of global economic integration, different m-payment providers tend to operate in multiple countries, so it is very important to adopt appropriate strategies to promote m-payment solutions. In general, given the extensive cooperation between WeChat Pay and Kakao Pay, which originally began in early 2017, the two sides have a very broad space for cooperation. By comparing the two m-payment users' usage intentions, this manuscript aims to focus on vital elements that significantly influence the elements of the two countries' respective consumers and also provides a necessary theoretical basis and practice for large-scale sustainable cooperation in the m-payment markets of China and Korea.

According to the results of UTAUT2, we offer some practical guidelines for m-payment platform operators and developers. On the one hand, Kakao Pay's Korean consumers' IT (H6b), convenience (H10), and PV (H12) are more sensitive, which Chinese mobile operators should focus on, such as establishing transaction privacy protection, business reputation promotion (IT), providing free Wi-Fi (facilitating conditions), and professional Korean after-sales consulting (PV). On the other hand, when Korean m-payment providers enhance China's consumer usage intention, the focus should be placed on the sensitive factors of Chinese users. For example, Chinese customers are more sensitive to customer satisfaction (H4b), expected performance (H7), hedonic motives (H11), and habits (H13). Therefore, if Korean m-payment providers employ red envelope incentives (US), developing some entertainment functions, such as QR code, radar, and radio to friends (hedonic motivation), and daily special purchase rights (habit) to stimulate the sensitive elements affecting Chinese users, the usage intention of Kakao Pay will be immediately increased. Chinese students in Korea only pay tuition in the form of currency exchange and international remittance. Problems such as money exchange and poor language communication also affect the payment process and efficiency. By stimulating the corresponding sensitive factors affecting use intention, Chinese and Korean m-payment platforms will be able to efficiently improve the usage intention of their respective users and even benefit cross-border m-payments and economic cooperation in APEC.

Limitations and Future Work

Although this research has theoretical and managerial contributions, it also has other limitations, which are worthy of further study. Future study directions to be discussed are as follows. First, the questionnaire of this manuscript is collected in Korea, and all the answers are in Korea. Future research could be conducted in some more countries to further test the universality of this proposed integrated model. Future research could apply innovative data science and marketing algorithms (Saura, 2021) to evaluate the age, experience, and gender factors of customers into the theoretical model as moderators to survey whether some differences among different consumer samples can be classified according to these features. Therefore, follow-up studies are needed. Second, we focused on only one Korean m-payment provider in Korea. While Kakao Pay is a representative provider of m-payments in Korea, it does not include every area of worldwide m-payments. To enhance the systematic nature of this study, we aim to compare the results from different countries. Last, we combined D&M ISS and ITM with UTAUT2 to determine the elements affecting the m-payment's usage intention. Future research can use other theories. Research should test the impact of other elements (perceived value, ease of use, and behavior willingness, etc.) on stimulating users' continued usage intention of m-payment platforms.

DATA AVAILABILITY STATEMENT

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

ETHICS STATEMENT

Ethical review and approval were not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent from the patients/participants or patients/participants legal guardian/next of kin was not required to participate in this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

XL, Y-TL, and S-CC: conceptualization. XL, KS, AR, and S-CC: methodology and writing—review and editing. XL and S-CC: formal analysis. XL: investigation. XL, AR, Y-TL, and S-CC: writing—original draft preparation. KS and AR: visualization and supervision. All authors have read and agreed to the published version of the manuscript.

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Measurement Invariance of the Bergen Social Media Addiction Scale Across Genders

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Social media addiction has been a hot issue in scientific research in recent years, its antecedents and consequences have been extensively studied. Among these studies, Bergen Social Media Addiction Scale (BSMAS) is one of the most commonly used instruments. However, little is known about whether this scale has the equivalent psychometric properties for men and women. The purpose of the current study is to examine the measurement invariance (including configural invariance, metric invariance, scalar invariance, and error variance invariance) of the BSMAS across genders. In total, 1,120 participants were recruited from 5 universities. R program was applied to conduct the single-group and multiple-group confirmatory factor analysis (CFA) based on the social media addiction symptom ratings. The results demonstrated that BSMAS was a valid and psychometrically robust instrument for assessing the risk of social media addiction among university students, and that the four types of measurement invariance of the BSMAS across genders were confirmed. Consequently, gender differences in the BSMAS scores are likely to reflect the genuine differences between men and women, and comparisons on the level of social media addiction of university students between gender groups can be interpreted meaningfully.

Keywords: measurement invariance, Bergen Social Media Addiction Scale, social media addiction, gender difference, college students

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INTRODUCTION

Social media has brought great convenience to our daily life. It integrates many interesting and useful functions such as instant messaging, games, music, short video, and so on. These services not only allow individuals to connect with others irrespective of the constraints of time and space; but also provide numerous leisure activities, and make life rich and colorful. Therefore, many people tend to spend lots of time on social media, under this circumstance, they may be very likely to develop the problematic behavior–social media addiction. Social media addiction refers to the behavior characterized by being excessively concerned about social media activities and spending too much time and effort on these activities, at last, the work, study, interpersonal relationship relationships, mental health, and other important life areas were impaired (Schou Andreassen and Pallesen, 2014). At present, social media addiction has attracted the attention of both social scientists and the general public. In 2021, a meta-analysis across 32 countries revealed that the average prevalence rate of social media addiction had reached 24% (Cheng, 2021). The detrimental consequences of this addictive behavior have been confirmed as well. Previous studies indicated that social media addiction was positively associated with anxiety, depression, and other forms

of psychological distress (Keles, 2020). Researchers have found that problematic social media use is related to sleep disturbances (Wong et al., 2020). Moreover, evidence also suggests that overreliance on social media brings about the impoverishment of social skills, short-term attention, and the decrease of the ability to keep information (Kuss and Griffiths, 2017). Therefore, it is of significant importance and has been an urgent problem to conduct in-depth research and seek feasible coping strategies on social media addiction.

In order to assess individuals' levels of social media addiction, some measurement instruments have been developed by scholars, such as Risk of Addiction to Social Networks Scale (Vilca and Vallejos, 2015), Social Media Disorder Scale (van den Eijnden et al., 2016), Addictive Tendencies Scale (Wilson et al., 2010), and Bergen Social Media Addiction Scale (BSMAS) (Andreassen et al., 2016). Among these instruments, BSMAS has been the most widely used. Up to now, this scale has been translated and applied in different languages, for instance, English (Andreassen et al., 2016), Italian (Monacis et al., 2017), Persian (Lin et al., 2017), and Chinese (Leung et al., 2020; Luo et al., 2021), the reliability and validity has been supported in these cultural contexts as well. BSMAS was adapted from the Bergen Facebook Addiction Scale (BFAS) (Andreassen et al., 2012), and the latter was developed based on the six core components (including salience, mood modification, tolerance, withdrawal, conflict, and relapse) of addictive behavior (Griffiths, 2005), and each item of BSMAS reflected one of these components. The higher the sum score of BSMAS, the greater the severity of being a social media addict.

By using BSMAS, researchers surveyed teenagers and draw the conclusion that the level of addiction in women were higher than men (Andreassen et al., 2016; Bányai et al., 2017; Chae et al., 2018; Su et al., 2020). The reason may lie in the fact that social interaction and cooperation are the main activities of their social media use (Andreassen et al., 2016), compared with men, women tend to seek feedback from social media, spend more time managing their online image, and soliciting assistance from their friends (Yau and Reich, 2019; Twenge and Martin, 2020), besides, women are more prone to acquire social media addiction when they experience empty and depression (Chae et al., 2018; Su et al., 2020). In this way, they are more likely to excessively use social media and ultimately develop social media addiction. Some scholars also applied this instrument to conduct their study in adolescent samples, the results demonstrated that males were more likely to be addicted in social media (Altin and Kivrak, 2018; Azizi et al., 2019; Shibli and Akhtar, 2020; Luo et al., 2021; Gao and Eissenstat, 2022). In these scholars' opinion, men may experience more negative effects and be more likely to have a poor academic performance, which will lead men to use social media for longer time as opposed to their female counterparts and contribute to their vulnerability of social media addiction (Shen, 2019; Bhandarkar et al., 2021; Gao and Eissenstat, 2022). Moreover, some studies also contended that there was no significant association between gender and the severity of social media addiction (Kirik et al., 2015; Ahmed et al., 2021; Cheng, 2021; Mahmood et al., 2022). This indicates that on average, men and women may have the identical level of social media addiction or exhibit the similar addictive symptoms, regardless of the motivations and justifications of their usage behavior.

However, these conclusions may be doubtable, because the perquisite of the comparison between men and women is that the measurement of the construct is equivalent in both the genders. In previous studies, due to the fact that measurement invariance tests of the BSMAS had not been conducted, the differences between men and women may come from the measurement bias, for example, the meaning of the BSMAS items may be different between genders. Therefore, researchers cannot draw the conclusion that gender disparities in social media addiction represent the real differences between men and women before establishing the measurement invariance, as they may be the result of systematic biases that men and women reply to the BSMAS items. From what has been mentioned earlier, it is necessary to examine the cross-gender measurement invariance of the BSMAS.

Measurement invariance refers the degree to which the contents of the scale are being perceived and interpreted in the identical way across different samples (Byrne and Watkins, 2003). Other scholars also indicated that measurement invariance could be considered as the extent to which measurements performed under different circumstances exhibit the same psychometric properties (Meade et al., 2008). Although there are some distinctions between the definitions, measurement invariance is regarded as the premise for comparing the differences across genders, ages, ethnicities, cultures, and so on (Chen, 2007). Because inference problems may occur and conclusions resulted from a study may be inaccurate or invalid if the measurement instruments we depend on do not have the identical meanings across different groups (Chen, 2007). In practice, measurement invariance is conducted *via* an iterative process, a series of hierarchically nested models is examined across meaningful participant groups, or across time, to determine to what extent the proposed factor structure fits across these populations (Collison et al., 2021). The procedures for assessing the measurement equivalence in the CFA framework has been classified into two parts: measurement invariance and structural invariance (Byrne et al., 1989; Vandenberg and Lance, 2000; Mengcheng, 2014). Measurement invariance tests the relationships between the observed variables and the latent constructs, this part includes four processes: configural invariance, metric invariance, scalar invariance, and error variance invariance; structural invariance examines the latent variables themselves; this part includes three processes: factor variance invariance, factor covariance invariance, and latent mean invariance (Byrne et al., 1989; Vandenberg and Lance, 2000; Mengcheng, 2014). Due to the fact that structural invariance represents very strict criterion that are often hardly to be satisfied in practice, therefore, measurement invariance is the most frequently examined part of equivalence (Chen, 2007). According to this, in the present study, we will test the four processes of measurement invariance in the statistical analysis part as well.

Previous studies examined the cross-culture and cross-time invariance of the BSMAS in university students (Chen et al., 2020a; Leung et al., 2020), results of these studies confirmed the

measurement invariance of this inventory, in terms of cross-gender invariance of this scale, one study had verified the measurement equivalence of BSMAS between genders in primary school students (Chen et al., 2020b). Nevertheless, because there was a high-prevalence rate of social media addiction among college students (Tang and Koh, 2017), they had been the focus group of social media addiction (Ya-li et al., 2021), moreover, participants enrolled in most studies were college students (Cheng, 2021). Therefore, the aim of the present study is to test the cross-gender measurement invariance of BSMAS in college student populations.

METHOD

Participants

Participants were recruited from five universities in Inner Mongolia China. In total, 1,500 questionnaires were sent out during the participants' spare time, and 1,260 were returned. In total, 140 invalid ones were removed because these participants failed to complete their questionnaires or they did not provide their age or genders. Finally, data from 1,120 participants were used for the final analysis. There were 513 men and 607 women, the average age of the participants was 20.89 ± 1.40 years, ranging from 18 to 26 years of age.

Measurement

Bergen Social Media Addiction Scale (BSMAS) was administered to assess the level of one's social media addiction. Participants were asked to report their experiences in the use of social media within a 12-month period. The BSMAS consisted of 6 items (e.g., "How often during the last year have you tried to cut down on the use of social media without success?"), each item reflected one of the core addiction components (salience, mood, modification, tolerance, withdrawal conflict, and relapse) proposed by Griffiths (Griffiths, 2005). A 5-point Likert scale was adopted for rating (from 1 = "very rarely" to 5 = "very often"), a higher sum score obtained from the BSMAS indicated a higher likelihood of being addicted to social media. In the present study, the Cronbach's alpha coefficient for the scale in the overall sample was 0.822, in male sample was 0.828; and in female sample was 0.817.

Procedure

The current study was performed in accordance with the Declaration of Helsinki and was approved by the Ethics Committee of the College of Psychology Inner Mongolia Normal University. All the participants were randomly selected from five universities in Inner Mongolia; they should be older than or equal to 18 years and they should have at least one social media account (such as WeChat, QQ, Weibo, and other social media platform). Before sending out the questionnaires, all the participants were informed that the data were only used to conduct scientific research, they were not compelled to participate in the study; their responses were anonymous; they could drop out at any moment they would like and this would not impact their life and their performance in the final examination. Finally, after acquiring the informed consent of the participants and their teachers or supervisors, questionnaires were merely distributed to the students who were willing to participate in this study.

Statistical Analysis

Microsoft Excel 2016 was employed to input the data, SPSS 25.0 was applied to conduct descriptive statistics, test the normality of the data, and calculate the Cronbach's alpha coefficient for the overall sample and each gender group. RStudio with the packages "lavaan" (Rosseel, 2012) and "semTools" (Jorgensen et al., 2018) was applied to perform the confirmatory factor analysis (CFA) and assess the measurement invariance. The normality of the data was evaluated by the values of skewness and kurtosis, the absolute values of the two indices smaller than 2 indicated that the scores of the items are normally distributed (Pituch and Stevens, 2015). Due to the ordinal nature of the BSMAS, according to the suggestions of the previous scholars, weighted least squares with mean and variance adjusted (WLSMV) estimator was employed to assess the model fit indexes (Wu and Estabrook, 2016). The goodness of model fit of CFA was estimated by multiple indices: χ^2 statistic, Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI) and Standardized Root Mean Square Residual (SRMR). For RMSEA, a value smaller than 0.05 represented a close fit; a value ranging from 0.07 to 0.08 indicated a fair fit; a value in the range of 0.08 to 0.10 denoted a mediocre fit (Browne and Cudeck, 1992; MacCallum RC, 1996). For CFI, the value above 0.90 was considered as acceptable (Hu and Bentler, 1999). For SRMR, the value smaller than 0.05 signified acceptable fit (Hu and Bentler, 1999; Shi and Maydeu-Olivares, 2020). Multiple-group CFA was conducted to test the measurement invariance of the social media addiction scale across groups of men and women. Four increasingly constrained multiple-group CFA processes were performed in an iterative manner. First, the configural invariance model was established as the baseline model to investigate whether the same factor structure was equivalent across groups. Second, the metric (or "weak") invariance model was established to test whether the factor loadings of the items were the same for both men and women. Metric invariance is an important prerequisite for the meaningful comparison between gender groups (Bollen, 1989). Third, the scalar (or "strong") invariance model was established to estimate whether the factor loadings and the intercepts were equivalent across men and women. Forth, the strict invariance model was established to test whether the items have the same factor loadings, intercepts, and residual variances in both gender groups. Because the four models mentioned earlier were nested hierarchically within the previous ones, measurement invariance was assessed by the overall model fit for each model and the changes in fit indices between the nested models. Due to the ordinal nature of the BSMAS, according to the recommendations of previous studies, measurement invariance was supported if the comparison between the two models fulfilled these criteria: a non-significant $\Delta\chi^2$, ΔRMSEA < 0.050, ΔCFI < 0.004, and ΔSRMR ≤ 0.01 (Rutkowski and Svetina, 2017; Clark, 2020).

TABLE 1 | Descriptive statistics of the BSMAS.

Sample	Item	Mean	SD	Skewness	Kurtosis
Total ($n = 1120$)	1	2.95	1.093	−0.013	−0.583
	2	2.69	1.082	0.210	−0.532
	3	2.93	1.072	0.135	−0.541
	4	3.00	1.028	−0.036	−0.465
	5	2.88	1.012	0.011	−0.361
	6	2.52	1.079	0.531	−0.303
Male ($n = 513$)	1	2.91	1.132	0.023	−0.692
	2	2.65	1.085	0.184	−0.566
	3	2.92	1.089	0.222	−0.577
	4	2.96	1.055	−0.021	−0.533
	5	2.86	0.994	−0.015	−0.330
	6	2.50	1.072	0.457	−0.417
Female ($n = 607$)	1	2.99	1.058	−0.036	−0.474
	2	2.72	1.080	0.235	−0.505
	3	2.93	1.057	0.056	−0.501
	4	3.04	1.004	−0.040	−0.402
	5	2.90	1.027	0.028	−0.385
	6	2.54	1.086	0.591	−0.216

RESULTS

Descriptive Statistics

Results of descriptive statistics for the total sample and both gender groups were presented in **Table 1**. In the overall sample, the ranges of means and SDs for the BSMAS item scores ranged from 2.52 to 3.00 and 1.012 to 1.093, separately. In the male group, the means and SDs ranged from 2.50 to 2.96 and 0.994 to 1.132, separately; in the female group, the means and SDs ranged from 2.54 to 2.99 and 1.004 to 1.086, separately. All the absolute values of skewness and kurtosis were smaller than 2, this suggested the scores of the items approximately normally distributed (Pituch and Stevens, 2015). Because the maximum likelihood estimation was robust when the data followed an approximately normal distribution (Finney and DiStefano, 2006; Kaplan, 2008), therefore, the maximum likelihood estimation would be employed in the (multiple-group) CFA.

Single-Group Confirmatory Factor Analysis

Single-group CFA was conducted for the overall sample and individually for each gender. The unidimensional model was tested in the overall sample, male and female groups separately. Results of single-group CFA in the overall sample and each subsample were presented in **Table 2**. In the overall sample, the results indicated that the model fitted the data adequately, the fit indices were as follows: $\chi^2 = 39.016$, RMSEA = 0.055 (90% CI, 0.038–0.073), CFI = 0.994, SRMR = 0.018, the standardized factor loadings ranged from 0.637 to 0.753. In the male sample, fit indices of CFA suggested the model was appropriate: $\chi^2 = 10.837$, RMSEA = 0.020 (90%[CI], 0.000–0.056), CFI = 0.999, SRMR = 0.013, the standardized factor loadings ranged from 0.653 to 0.770. In the female sample, the outcomes also showed an acceptable model fit: $\chi^2 = 51.820$, RMSEA = 0.089 (90%[CI], 0.066–0.113), CFI = 0.983, SRMR = 0.030, the standardized factor loadings ranged from 0.629 to 0.735. In summary, results of CFA indicated the unidimensional model of BSMAS was acceptable for both gender groups.

Measurement Invariance Across Genders

Multiple-group CFA was performed to examine the measurement invariance across genders. Fit indices for the four models and the differences between the pairs of nested models were displayed in **Table 3**.

First, configural invariance was conducted by estimating the two gender groups with no equality constraint. The results indicated the configural invariance model (M1) fit the data well ($\chi^2 = 64.947$, RMSEA = 0.068 (90%[CI], 0.051–0.087), CFI = 0.991, SRMR = 0.023). Therefore, the configural invariance of the BSMAS was confirmed.

Second, metric invariance was performed through constraining the factor loadings to be the same between male and female groups. The fit indices suggested an acceptable model fit. Compared with M1, the metric invariance model (M2), $\Delta\chi^2$ was not significant, value changes of RMSEA (ΔRMSEA), CFI (ΔCFI), and SRMR (ΔSRMR) were $-0.026 < 0.050$, $0.002 < 0.004$, $-0.001 < 0.01$, respectively, this indicated that the metric invariance of the BSMAS held across genders.

Third, scalar invariance was evaluated by restricting the factor loadings and intercepts of the items to be equal across the two gender groups. The results of the scalar invariance model (M3) demonstrated that the model fitted the data well ($\chi^2 = 71.020$, RMSEA = 0.037 (90%[CI], 0.023–0.051), CFI = 0.994, SRMR = 0.023). Compared with M2, the values of ΔRMSEA, ΔCFI, and ΔSRMR were all smaller than the recommended cutoff values for rejecting measurement invariance. The satisfaction of scalar invariance implied that the factor loadings and item intercepts were invariant for men and women.

Forth, strict invariance estimated through forcing the factor loadings, intercepts, and residual variances of the items to be the same across genders. The strict invariance model (M4) provided satisfactory fit indices (χ^2/df = 71.681, RMSEA = 0.032 (90%[CI], 0.016–0.045), CFI = 0.995, SRMR = 0.023). Compared with M3, the values of ΔRMSEA, ΔCFI, and ΔSRMR were all within the recommended guidelines for supporting the strict invariance. Therefore, the strict invariance of the BSMAS across genders was confirmed.

DISCUSSION

Bergen Social Media Addiction Scale has been one of the most frequently used instruments for estimating the level of individuals' social media addiction. However, the cross-gender measurement invariance of this scale still needed to be investigated by the researchers. The present study examined the equivalence of psychometric properties of the BSMAS between men and women. The main findings and implications are presented as follows.

Outcomes from single-group CFA for the total sample, male and female sample all suggested that the unidimensional model of BSMAS provided a relatively good fit to the data. Similar to what

TABLE 2 | Results of single-group confirmatory factor analysis.

	Robust Model Fit Indices						Standardized Item Factor Loadings					
Sample	χ^2	**df**	**RMSEA**	**RMSEA(90%CI)**	**CFI**	**SRMR**	**Item1**	**Item2**	**Item3**	**Item4**	**Item5**	**Item6**
Total ($n = 1120$)	39.016	9	0.055	0.038–0.073	0.994	0.018	0.656	0.736	0.637	0.753	0.693	0.698
Male ($n = 513$)	10.837	9	0.020	0.000–0.056	0.999	0.013	0.667	0.753	0.653	0.770	0.697	0.694
Female ($n = 607$)	51.820	9	0.089	0.066–0.113	0.983	0.030	0.648	0.722	0.629	0.735	0.691	0.702

TABLE 3 | Fit indices for measurement invariance tests.

	Robust Model Fit Indices						Model Difference					
Model	χ^2	**df**	**RMSEA**	**RMSEA (90%CI)**	**CFI**	**SRMR**	**ΔM**	**$\Delta\chi^2$**	**Δdf**	**ΔRMSEA**	**ΔCFI**	**ΔSRMR**
M1	64.947	18	0.068	0.051–0.087	0.991	0.023	–	–	–	–	–	–
M2	70.005	35	0.042	0.028–0.057	0.993	0.022	M2 VS. M1	5.058	17	−0.026	0.002	−0.001
M3	71.020	40	0.037	0.023–0.051	0.994	0.023	M3 VS. M2	1.015	5	−0.005	0.001	0.001
M4	71.681	46	0.032	0.016–0.045	0.995	0.023	M4 VS. M3	0.661	6	−0.005	0.001	0.000

M1, configural invariance; M2, metric invariance; M3, scalar invariance; M4, strict invariance. All the $\Delta\chi^2$ was not significant.

has been reported in previous two studies (Leung et al., 2020; Huang et al., 2021), evidences yielded by the current research still indicated that the unidimensional factor structure of this scale was robust across genders. However, participants in one previous study were restricted to be university students from Hong Kong and Taiwan, understanding and writing Chinese traditional characters was one of the inclusion criteria (Leung et al., 2020). Although all of them are Chinese, there might still be some cultural differences between Hong Kong, Taiwan, and mainland China. Therefore, it was necessary to test the factor structure of BSMAS with participants who resided in mainland China. In fact, in the other previous study, researchers enrolled adolescents in mainland China to assess the factor structure of BSMAS. Nevertheless, when they performed CFA, they added the residual covariance path of item 1 and item 2 (Huang et al., 2021). From the viewpoint of statistics, this operation was not appropriate, because there was no theoretically defensible reason, and allowing correlated residuals might mask the latent pattern of the data (Landis et al., 2009). Therefore, the results of the present study still have significant importance.

In terms of the measurement invariance, results of single-group CFA and configural invariance analysis suggested that the BSMAS assessed the equivalent construct across genders. Findings from the multiple-group CFA demonstrated that the metric invariance of BSMAS between men and women was also held, this indicated that one unit change of the latent variable would be translated into the equivalent change of the particular observed variable in both the male and female groups (Widaman and Grimm, 2014). In practice, this meant that the differences of the severity of social media addiction between men and women could be interpreted directly, the same scores represented the identical meaning across genders (Fen, 2019). Scalar invariance of BSMAS was also supported across the two gender groups, this not only demonstrated that the item thresholds were invariant for men and women; but also indicated that a score of the latent variable would be converted into the same score on a particular observed variable in the two gender groups (Widaman and Grimm, 2014). Strict invariance of BSMAS was acceptable as well, this suggested that the residual variances of the manifest variables were homogeneous between the two groups. In other words, this meant that when predicting a given observed variable from the latent variable, the items of BSMAS had the identical error terms across the gender groups.

Results of the current study indicated that the unidimensional structure of the BSMAS was gender-invariant, and evidences of measurement invariance (including configural, metric, scalar, and strict invariance) of the BSMAS also suggested that the psychometric properties of this instrument were equivalent in both male and female groups. The same scores of the BSMAS reflected the identical severity of social media addiction across genders, and this might not be affected by the artifacts of measurement bias. Therefore, in Chinese college student populations, it is acceptable to use the BSMAS to compare the levels of social media addiction in different genders. This conclusion was similar to one previous study in which primary school students were enrolled as the participants (Chen et al., 2020b), although there are differences between the ages of the participants, the two studies all demonstrated the measurement invariance of the BSMAS across genders; and this further indicated that the discrepancies between men and women came from the differences of the latent construct, rather than the measurement bias of the BSMAS items. Besides, BSMAS was developed on the basis of the "components" model of addiction, therefore, results of the present study provide empirical evidence for this theory as well. On one hand, this study confirmed that social media addiction indeed shared these commonalities proposed by this theory, and these symptoms together with the structure of this model were shared and verified robust in mainland Chinese university students as well; on the other hand, these components were identical in both male and

female genders, demonstrated that both groups had parallel interpretations on the item content in the BSMAS. The current study also had practical implications for researchers, clinicians, and the general public. They could compare the severity of social media addiction between the two gender groups directly without concerning about the measurement deviation.

CONCLUSIONS

In the present study, the factor structure and the cross-gender measurement invariance of the BSMAS were examined, results indicated that the unidimensional structure and the measurement invariance of the BSMAS were supported. The differences of the BSMAS between gender groups are due to the differences of the latent construct, rather than the measurement bias of the items. Gender differences in the BSMAS are likely to reflect the genuine differences between men and women, and comparisons on the level of social media addiction of university students between gender groups can be interpreted meaningfully. Results of the current not only provides the empirical evidences for the structural validity of the BSMAS and for the "components" model of addiction in Chinese mainland culture, but also makes the researchers and the clinicians be more confident in the diagnosis, treatment and the related scientific research works of the addictive behavior between male and female university students.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by College of Psychology Inner Mongolia Normal University. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

HY, XZ, and HB: funding acquisition. XZ, XC, and BL: investigation. HY: writing—original draft. HB: writing—review and editing. All authors contributed to the article and approved the submitted version.

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The Impact of Adolescent Resilience on Mobile Phone Addiction During COVID-19 Normalization and Flooding in China: A Chain Mediating

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Natural disasters cause long-term psychological problems and increase substance use in some adults. However, it is unclear whether disasters also lead to these problems in adolescents. We hypothesized the influence of adolescent resilience on mobile phone addiction during the normalization of COVID-19 and flooding. We tested the mediating role of coping style and depression, anxiety, and stress (DASS) on phone addiction among 1,751 adolescents in the Henan Province in China. The adolescents were surveyed *via* an online questionnaire, and we used structural equation modeling to examine the correlations and moderation effects. The results show that coping style and DASS could mediate the relationship between adolescent resilience and mobile phone addiction among Chinese adolescents. A chain of coping styles and DASS mediated the relationship between adolescent resilience and mobile phone addiction in Chinese adolescents.

Keywords: adolescent resilience, coping style, mobile phone addiction, China, DASS-21, chain mediating, COVID-19, flood

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INTRODUCTION

Due to the COVID-19 outbreak, mobile phones have become increasingly important for online teaching and learning in China. According to the 48th China Statistical Report on Internet Development, by June 2021, there were 1.07 billion mobile phone users in China, accounting for 99.7% of the total number of internet users (China Internet Network Information Center, 2021). Furthermore, internet users spend an average of 26.9 h online per week, and the number of internet users aged 6–19 years reached 158 million, accounting for 15.7% of the total percentage of adolescents (China Internet Network Information Center, 2021). As part of normal adolescent psychological development, this age group develops susceptibility to peer influences. In addition, they tend to have low risk perception. These factors increase risk-taking behavior and poor self-regulation (Patton et al., 2016).

Many studies indicated the predictors of mobile phone addiction, such as physiological health (Shoukat, 2019), experiences of childhood abuse (Ma et al., 2020), and self-esteem (Li et al., 2019). Although some studies revealed the relationship between psychological resilience and addiction (Alim et al., 2012; Jebraeili et al., 2019; Shen, 2020; Calpe-López et al., 2022), whether adolescent

resilience affects mobile phone addiction remains unclear. Therefore, the present study proposes to test the relationship between adolescent resilience and mobile phone addiction, and the role of coping style and mental health during the normalization of COVID-19 and flooding. The relationships between the variables mentioned above are described in the following sections.

Psychological Resilience and Mobile Phone Addiction

According to resilience framework theory, psychological resilience is the ability to cope with a crisis or quickly return to a pre-crisis status mentally or emotionally (de Terte and Stephens, 2014). Previous studies found that psychological resilience was related to substance addiction (Alim et al., 2012) or behavioral addiction (Goldstein et al., 2012). In numerous studies, psychological resilience has been shown to predict video game addiction (Turan, 2021) and internet addiction (Zhou et al., 2017). Despite the close relationship between adverse childhood experiences (ACE) and addictive behaviors, researchers have not explored the relationship between psychological resilience and mobile phone addiction. Thus, the possible mechanism of how psychological resilience affects mobile phone addiction needs to be researched further.

Coping Style and Mobile Phone Addiction

Coping strategies are psychological models used by individuals to manage emotions, thoughts, and behaviors when they encounter various states of stress in different stages, reflecting all responses to stress that can be utilized and successfully used (Carver and Connor-Smith, 2010). Many studies have explored the relationship between coping strategies and behavioral problems (Windle and Windle, 1996; Liu et al., 2004). Gharaei et al. (2008) showed that some changes related to behavioral disorders were explained by coping strategies. They found that restraint coping was negatively associated with Internet addiction (Chou et al., 2015). Based on the relationship between coping strategies and addictive behaviors, the current study assumed that coping styles would predict mobile phone addiction.

Stress, Anxiety, and Depression, and Mobile Phone Addiction

Stress is an experience of negative emotions and behavioral changes. The environment plays an important role in generating stressors (Baum, 1990). Regarding the emotional state of adolescents, stressful life events, such as natural disasters, have been identified as a significant risk factor. Makwana (2019) indicated that the psychological effects of a disaster were more severe among children, women, and the dependent elderly population. Furthermore, research showed that youth experiencing high levels of exposure to such disasters had the highest mean levels of life stressors (Felix et al., 2020). Jermacane et al. (2018) found that anxiety and depression among survivors of widespread flooding in the United Kingdom had a prevalence of over 10% 2 years post-disaster.

In July 2021, the Henan province suffered from unusually heavy rainfall and maximum continuous rainfall of 958 mm (The Tenth Press Conference of Henan Province Flood Control and Disaster Relief, 2021), causing severe flooding. The flooding, referred to as the "7.20 Henan rainstorm," quickly destroyed the overwhelmed dams and river banks, causing severe traffic paralysis, water power failure, and waterlogging. It upended tens of millions of lives. The government called on people to stop working and attending school, and actively organized personnel to launch necessary rescue missions. Many adolescents and their parents were trapped in their homes, and some parents volunteered to help with relief efforts. Flooding causes severe stress which continues long after the waters recede (Felix et al., 2020). This prolonged stress can induce behavioral problems in children, lead to grief and economic difficulties for families, increase substance use and misuse, exacerbate existing problems, and negatively impact mental health (Stanke et al., 2012). The present study supposes that stress, anxiety, and depression positively relate to mobile phone addiction.

Psychological Resilience, Coping Style, and Stress, Anxiety, and Depression

Children who had more exposure to the flood events had greater resilience than those who had less or none (Arshad et al., 2020). Resilience is a dynamic process that significantly contributes to survivors successfully recovering from disasters (Bonanno et al., 2010). Previous studies have also shown that disaster exposure was positively associated with substance use and was negatively related to children's psychological resilience (Fuchs et al., 2021). Indeed, Bonanno and Galea (2007) found that resilient participants were less likely than others to smoke and use marijuana after a traumatic experience. In addition, they found positive coping and resilience were protective factors for the emergence of stress, anxiety, and depressive symptoms in junior high and high school students (Zhang et al., 2020). Though adolescent mental health was impacted by COVID-19 and its variants during the study period, there were no new cases of COVID-19 in our region (Central People's Government of the People's Republic of China, 2022), there was no lockdown, and everyone could enter public places with health Quick Response (QR) codes and masks. Therefore, this study focuses on the impact of stress caused by sudden floods on adolescents' mental health in normalizing epidemic prevention and control.

Many scholars believe that adolescent resilience is also related to substance use, such as smoking and excessive drinking (alcoholism) (Davis and Spillman, 2011). Some experts also believe that depression, anxiety, and pressure may lead to internet addiction (Carli et al., 2013). However, studies on the relationship between mental resilience and adolescents' coping styles, mental health, and mobile phone addiction are rare.

Given this, adolescents confined to their homes may be likely to overuse mobile phones and the internet due to floods in China. Thus, we hypothesized a correlation between resilience and mobile phone addiction among adolescents, and that coping style and mental health play a mediating role in that relationship.

Associations Between Adolescent Resilience, Coping Style, Mental Health, and Mobile Phone Addiction Outcomes

As a stressor, flooding can affect adolescent mental health and cause symptoms of anxiety and depression. Many studies show that resilience eliminates the symptoms of anxiety and depression, and increases self-esteem and mental well-being among young people (Downie et al., 2010; Baldwin et al., 2011). Studies have found that young people with high resilience have fewer mental health problems (Sood et al., 2013). Adolescents with different levels of resilience may have different coping styles when faced with stress. Furthermore, research has shown that adolescents with lower self-esteem engage in the coping strategies of ventilating feelings, avoiding problems, and relaxing. Adolescents with higher self-esteem are more likely to engage in coping styles that directly address their problems (Chapman and Mullis, 1999). The purpose of escapism is to escape from stress and the dilemma of reality. A study found that escapism mediates psychological grief and internet addiction (Ohno, 2016). Problematic mobile phone use was positively associated with mental health problems and escapism (Atış Akyol et al., 2021).

Resilience is a crucial developmental stage during adolescence, as it is a transitional period characterized by significant neurobiological and psychosocial changes in amplifying environmental demands and increasing sensitivity to social contexts (Schriber and Guyer, 2016). During the COVID-19 pandemic, children who used positive strategies to cope with the situation suffered less emotionally and behaviorally (Orgilés et al., 2021). Shao found a significant positive correlation between resilience and positive coping styles among middle school students in China, indicating that adolescents with high psychological resilience are more inclined to adopt a positive coping style (Shao et al., 2021). Psychological resilience is the ability to cope with a crisis or quickly return to a pre-crisis status mentally or emotionally (de Terte and Stephens, 2014). Resilience and positive coping are protective factors for the emergence of stress and anxiety symptoms in adolescents. The mediating role of parents' stress influences children's emotional and behavioral problems (Dąbkowska et al., 2021). The mutually enhancing relationship between resilience and positive mental health, and vice versa, a mutually reducing relationship between resilience and mental illness, presented the significant influence of mental health level on resilience (Wu et al., 2020). Malek showed that avoidant coping styles could aggravate depressive, anxiety, and stress symptoms during the COVID-19 pandemic. Conversely, applying resilience and approach-based coping techniques can decrease the mental health burden of the pandemic on participants (Smida et al., 2021). Researchers Brennan (2007), Ali et al. (2010), and Tempski et al. (2015) have indicated that enhancing resilience reduces behavioral problems and the risk of problematic mental health.

Based on the literature review, the present study constructed a chain mediation model to examine the mediating role of positive coping, stress, anxiety, and depression in the relationship between adolescent resilience and mobile phone addiction among Chinese adolescents. Furthermore, we proposed a model to test the associations among Chinese adolescent resilience, coping style, mental health, and mobile phone addiction to further clarify mobile phone addiction related to resilience (**Figure 1**).

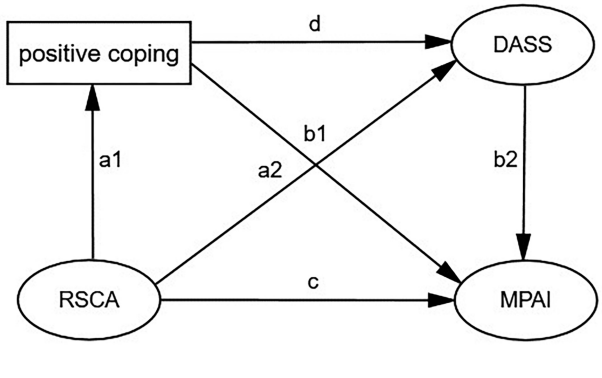

FIGURE 1 | Hypothesized model. MPAI, Mobile Phone Addiction Index; DASS-21, Depression, Anxiety, and Stress Scale with 21 Items; RSCA, the Resilience Scale for Chinese Adolescents; SCSQ, the Simplified Coping Style Questionnaire.

MATERIALS AND METHODS

Participants

Convenience sampling was employed to recruit students from grades 7–9 in middle school and grades 1–3 in high school in Henan province of China. Inclusion criteria: (1) flood areas in Henan Province; (2) junior or senior high school students, aged 12–18; (3) floods from July to August 2021; and (4) informed consent and voluntary participation in this study. Exclusion criteria: (1) teenagers who are not in school and (2) students who have communication problems. All subjects signed informed consent online before participating in the study, which was authorized by the Human Participant Review Committee of Xinxiang Medical College. All projects are available in an easy-to-understand Chinese version. Trained graduate students in psychology handed out and recycled the scales. They are also responsible for explaining possible doubts to avoid any confusion. It takes about 20 min to fill out the questionnaire. They completed online questionnaires from July 1 to August 30, 2021. A total of 1,751 valid questionnaires were obtained, with an effective response rate of 97.28%.

Measurement of Structures

Depression, Anxiety, and Stress Scale With 21 Items

The Depression, Anxiety, and Stress Scale with 21 Items (DASS-21) was used to evaluate negative emotional states of DASS (Lovibond and Lovibond, 1995), referring to the previous week, with each item classified into four Likert responses from 0 to 3 (0 = *never* to 3 = *most of the time*). This self-report instrument includes three subscales: (1) the stress subscale, which measures tension, agitation, difficulty relaxing, and negative affection; (2) the anxiety subscale, which assesses autonomic arousal, skeletal musculature effects, situational anxiety, and subjective

experience of anxious arousal; and (3) the depression subscale, which measures hopelessness, dysphoria, lack of interest, self-deprecation, and inertia. The reliability coefficients of depression, anxiety, and stress were 0.82, 0.82, and 0.79, respectively. The Cronbach's alpha of the total scale was 0.89.

Mobile Phone Addiction Index

Leung designed the Mobile Phone Addiction Index (MPAI) to identify addiction symptoms associated with mobile phone use among adolescents in Hong Kong (Leung, 2008). The scale includes 17 items answered on a five-point Likert scale of 1 to 5 (1 = *not at all*; 2 = *rarely*; 3 = *occasionally*; 4 = *often*; and 5 = *always*). The scale covers four dimensions: (1) "inability to control craving," which reflects the amount of time adolescents spend on their mobile phones, thereby leading to complaints from family and friends about their compulsive mobile phone use and causing the adolescents to lose of sleep due to excessive use; (2) "anxiety and feeling lost" assesses preoccupation, feeling lost or anxious, and having difficulty switching off the mobile phone; (3) "productivity loss" measures decreased productivity and diverted attention from pressing issues due to adolescents' excessive use mobile phones; and (4) "withdrawal and escape" indicates that adolescents use their mobile phones to escape from isolation, loneliness, and feeling down. The Cronbach's alpha of the scale was 0.90.

Resilience Scale for Chinese Adolescents

The Resilience Scale for Chinese Adolescents (RSCA) was developed by Hu and Gan (2008) according to the process model of the resilience concept and applied to Chinese adolescents. There are 27 items divided into two factors: "manpower" and "support." The former includes three factors: goal focus, emotion control, and positive cognition. The latter consists of two factors: family support and interpersonal assistance. The reliability of the total scale was 0.85.

Simplified Coping Style Questionnaire

This instrument was designed by Xie (1998) to simplify and modify non-Chinese coping style scales. A simple coping style questionnaire constructed from the perspective of Chinese cultural characteristics, it is composed of 20 items concerning strategies and attitudes people may adopt in everyday life to confront setbacks. The coping styles are divided into two categories: "positive coping" and "negative coping." The reliability of the total scale was 0.90, while the positive coping and negative response subscales were 0.89 and 0.78, respectively.

Data Analysis

All data analyses were performed using SPSS 26.0 and Amos 23 (IBM Inc., Armonk, NY, United States). First, descriptive data were received using SPSS 26.0, and correlations variables were calculated using Pearson's correlations. Second, according to Baron and Kenny (1986), we analyzed the mediation effects using two measurement models to examine how well the indicators represented each latent variable. Second, we tested the hypothesized relationships among latent variables. Maximum likelihood (ML) estimation was used to test the two structural models in the AMOS 23.0 program. When Tucker-Lewis index (TLI) >0.90, comparative fit index (CFI) >0.90, and Root Mean Square Error of Approximation (RMSEA) <0.06, the model fits well, according to Hu and Bentler (1999). We followed the stepwise method to structure the best-fitting model for the mediated effects and bootstrapping with 5,000 replications to measure the chain mediation model. All data analyses were two-tailed, with significance levels of $P < 0.01$ and $P < 0.05$.

RESULTS

Descriptive Statistics

The demographic profiles and descriptive statistics for the final analysis of the participants are provided in **Table 1**. We included 1,751 participants. There were 727 (41.519%) participants in middle school; 1,024 (58.480%) in high school; 142 (8.110%) from single-child families; and 1,609 (91.890%) participants from non-single-child families.

Univariate Analysis and Correlation Analysis of Major Study Variables

As displayed in **Table 2**, for the 1,751 participants' results, the category total means (SD) are as follows: MPAI, 7.954 (±3.987); DASS-21, 5.190 (±4.566); positive coping, 10.588 (±5.123); negative coping, 16.068 (±4.741); RSCA, 39.833 (±13.555).The variables correlated with the constructs in **Table 3** were less than 0.85. The discriminant validity value (<0.85) was met in the construct correlation (Kline, 2005). These findings showed that valid and reliable constructs were used.

TABLE 1 | Demographic profiles and descriptive statistics of the participants.

Variables	Frequency	Percentage
Gender		
Boy	725	41.405
Girl	1,026	58.595
Single child		
yes	142	8.110
no	1,609	91.890
Birth order		
1st	854	48.772
2nd	802	45.802
3rd	95	5.425
Nationality		
Han	1,743	99.543
Hui	7	0.400
Miao	1	0.057
Grade		
Middle school (7th)	155	8.852
Middle school (8th)	568	32.439
Middle school (9th)	4	0.228
High school 1st	34	1.942
High school 2nd	471	26.899
High school 3rd	519	29.640
Total	1,751	100.0

TABLE 2 | Basic characteristics and measure scores.

	M	SEM	Frequency	Percentage
Age	15.165	2.352		
MPAI total	7.954	3.987		
Feeling anxious and lost	16.808	5.797		
Inability to control craving	7.758	3.271		
Productivity loss	7.314	3.456		
Withdrawal	13.609	12.674		
DASS-21 total	5.190	4.566		
Stress	4.060	4.234		
Normal			1,669.000	95.317
Mild			58.000	3.312
Moderate			24.000	1.371
Severe			0.000	0.000
Extremely severe			0.000	0.000
Anxiety	4.359	4.666		
Normal			1,463.000	83.552
Mild			95.000	5.425
Moderate			138.000	7.881
Severe			39.000	2.227
Extremely severe			16.000	0.914
Depression	19.798	7.497		
Normal			1,519.000	86.750
Mild			120.000	6.853
Moderate			92.000	5.254
Severe			20.000	1.142
Extremely severe			0.000	0.000
SCSQ total	58.908	18.792		
Positive coping	10.588	5.123		
Negative coping	16.068	4.741		
RSCA total	39.833	13.555		
Focused	18.829	5.759		
Interpersonal support	20.111	5.538		
Emotional control	14.375	3.659		
Positive cognitive	16.974	4.417		
Family support	89.967	17.790		

TABLE 3 | Correlation analysis of study variables.

	1	2	3	4
1. RSCA total	–			
2. DASS-21 total	−0.661**	–		
3. MPAI total	−0.413**	0.561**	–	
4. Positive coping	−0.323**	0.470**	0.354**	–

***P < 0.01.*

Structural Model Testing and Structural Relationship Between Constructs

The test results revealed the goodness of fit of the proposed structural model (χ^2/df = 2.85, RMSEA = 0.047, goodness-of-fit index (GFI) = 0.982, CFI = 0.987). The hypothesis relationships between the variates are demonstrated in **Table 4** and **Figure 2**. The indirect effects are presented in **Table 5**. Bootstrapping analyses (5,000 process repetitions) showed that the indirect effects of adolescent resilience on mobile phone addiction through positive coping and stress, anxiety, and depression were significant and positive (standardized indirect effect 0.112, 95% CI [0.057, 0.179], $P < 0.01$). The indirect effect of adolescent resilience on mobile phone addiction through stress, anxiety, and depression was −0.602, 95% CI [−0.88, −0.298], $P < 0.01$, excluding 0. The mediating effect was significant. The indirect effect of adolescent resilience on mobile phone addiction through positive coping was 0.122, 95% CI [0.038, 0.231], $P < 0.01$, excluding 0, and the mediating effect was significant. In **Figure 2**, the factor loading of the "positive cognitive" variable of RSCA is less than 0.5, which indicates that the reliability of the observed variable is not good and cannot reflect the true meaning of the latent variable to a certain extent, so it was deleted.

TABLE 4 | Results of the structural model: tests of hypothesized associations between constructs.

	Estimate	SE	*t*-Value	*P*
Positive coping ← RSCA	1.909	0.096	19.801	***
DASS ← RSCA	−1.723	0.088	−19.514	***
DASS ← positive coping	0.217	0.019	11.665	***
MPAI ← DASS	0.318	0.049	6.505	***
MPAI ← RSCA	−0.328	0.108	−3.042	0.002
MPAI ← positive coping	0.070	0.019	3.725	***

****P < 0.001.*

DISCUSSION

Direct Relations

Mobile phones are regarded as a necessity of modern life. With the increasing incidence of mobile phone addiction among adolescents, many researchers are focusing on potential risk factors leading to mobile phone addiction. To date, there is little research on the relationship between psychological resilience and mobile phone addiction in adolescents. To address this gap, this study surveyed how adolescent resilience, coping style, DASS affect mobile phone addiction among Chinese adolescents. The results showed that adolescent resilience could directly and negatively affect mobile phone addiction in Chinese adolescents. In other words, adolescents with lower levels of psychological resilience show an increased propensity for mobile phone addiction. This result is consistent with previous research findings (Robertson et al., 2018). According to the resilience framework theory (Kumpfe and Bluth, 2004), psychological resilience is an important protective factor for problem behavior and personal mental health. Griffiths (2005) argued that addictions consist of several components, such as relapse, mood modification, tolerance, conflict, and withdrawal. The findings of Shen (2020) demonstrated that psychological resilience is correlated with excessive smartphone use. However, they did not reveal whether the correlation was positive or negative. A study by Yaqiong et al. (2017) revealed that resilience negatively predicted mobile phone addiction. This result was consistent with other research findings. Such findings suggest that we could enhance

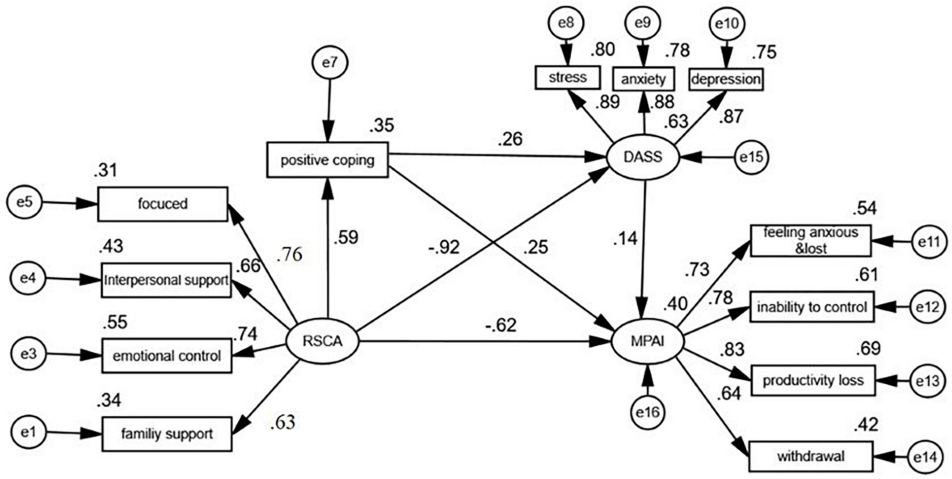

FIGURE 2 | The standardized path coefficients in model testing. MPAI, Mobile Phone Addiction Index; DASS-21, Depression, Anxiety, and Stress Scale with 21 Items; RSCA, the Resilience Scale for Chinese Adolescents; SCSQ, the Simplified Coping Style Questionnaire.

TABLE 5 | Bootstrap truncated regression results.

				Bootstrapping				
		Product of coefficients		BC 95% CI		Percentile 95% CI		
Relationships	**Point estimate**	**SE**	***Z***	**Lower**	**Upper**	**Lower**	**Upper**	***P***
Indirect effects								
RSCA → positive coping → MPAI	0.122	0.048	2.542	0.042	0.234	0.038	0.231	0.003
RSCA → DASS → MPAI	−0.602	0.15	−4.013	−0.889	−0.299	−0.888	−0.298	0.002
RSCA → positive coping → DASS→ MPAI	0.112	0.032	3.500	0.061	0.186	0.057	0.179	0.002
Total	−0.737	0.053	−13.906	−0.847	−0.639	−0.847	−0.637	0

psychological resilience levels to reduce the risk of mobile phone addiction.

Mediated Role

Positive coping styles and DASS play intermediary roles in adolescent psychological resilience and mobile phone addiction in Chinese adolescents, respectively; thus, our hypothesis was supported. This is consistent with previous studies. Understanding and managing coping styles can be particularly effective for addressing smartphone addiction (Alan and Guzel, 2020). The present study found that a positive coping style could moderate the relationship between adolescent psychological resilience and mobile phone addiction. Specifically, the indirect effect of psychological resilience on mobile phone addiction is moderated and buffered by a positive coping style. This result suggests that a positive coping style could help improve psychological resilience levels. Improved psychological resilience will reduce mobile phone addiction risk. The Simplified Coping Style Questionnaire (SCSQ) revealed that coping style had a robust effect on adolescent mobile phone addiction (Lu et al., 2021).

Depression, anxiety, and stress could moderate the relationship between adolescent psychological resilience and mobile phone addiction. Adverse COVID-19 experiences and exposure to flooding can lead to social isolation and unmet basic psychological needs, resulting in adolescent anxiety, depression, and other unpleasant or pathological psychological states. The online environment or use of a mobile phone could provide a temporary escape from unpleasant experiences and stress in the real world. However, using a mobile phone compulsively to acquire satisfaction and happiness may eventually result in addiction. Many studies have indicated a relationship between smartphone use and depression, anxiety, and loneliness (Elhai et al., 2018; Kim et al., 2019). Depression and social anxiety are risk factors for more problematic smartphone use (Pera, 2020). Stress, anxiety, and depression were significantly positively correlated with smartphone addiction (Choksi and Patel, 2021). Researchers found a significant positive relationship between anxiety about COVID-19 infection and the number of daily smartphone use hours. The strongest predictor of smartphone addiction was anxiety about COVID-19 infection (Al Qudah et al., 2021).

The Chain Mediating Role

Positive coping style and DASS played a continuous intermediary role in the impact of adolescent resilience to mobile phone

addiction among Chinese adolescents. Smartphone users who experience depressive symptoms may similarly use their mobile devices as a coping strategy to alleviate these (Ahn and Kim, 2015). Coping and affective disorders play critical roles in international addiction among adolescents (Einar, 2017). Stressors such as COVID-19 and floods can cause psychological stress responses in adolescents, and differences in coping styles can cause a range of behaviors in adolescents. Coping style is a significant factor leading to smartphone addiction among adolescents. Problem-focused coping strategies directly target the source of stress, prompting individuals to use positive coping styles to deal with the adverse consequences of the pandemic. Conversely, avoidance, denial, and fantasy employed as coping styles in dealing with stress are potentially strong risk factors for smartphone addiction (Stahl and Caligiuri, 2005; Duan et al., 2021). Therefore, adolescents with low levels of psychological resilience may experience tension, anxiety, depression, and other emotions in the face of emergencies or stressors. Thus, adolescents with low levels of psychological resilience may deal with stressors in harmful ways or by trying to escape from reality. Finally, poor coping styles or avoidant thoughts may also raise the risk of phone addiction.

Limitations

This study had several limitations. First, using a convenience sample limits the generalizability of our results. Due to the cross-sectional study design, we could not produce longitudinal data. Therefore, we could not accurately deduce causal relationships between variables. Factors such as family environment, personality traits, peer relationships, and sleep quality may also affect mobile phone addiction among adolescents. Therefore, future studies should examine whether the relationship between Chinese adolescent resilience, coping style, DASS, and mobile phone addiction will change over time.

CONCLUSION

This study explored the impact of resilience on mobile phone addiction among Chinese adolescents during a pandemic and flood. A structural equation model was utilized to synchronously examine the individual and continuous mediating roles of coping styles and DASS. The results suggest that a negative relationship exists between resilience and mobile phone addiction in this population. In addition, stress, anxiety, depression, and coping style significantly influence the risk of adolescent mobile addiction and play intermediary roles in Chinese adolescent resilience and mobile phone addiction. These results indicate the importance of mobile phone addiction and resilience for adolescents. The findings may also help educators and medical personnel distinguish between predictive factors for adolescent mobile phone addiction. They could be used to design effective interventions to treat and prevent mobile phone addiction in adolescents when facing future challenging or traumatic events.

DATA AVAILABILITY STATEMENT

The original contributions presented in this study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

ETHICS STATEMENT

All procedures performed in studies involving human participants were approved by the Ethics Committee of Xinxiang Medical University (#XYLL-2018015). Written informed consent to participate in this study was provided by the participants' or their legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

HC designed the study. XL and SZ collected the data. AM analyzed the data and wrote the manuscript. YY and SG revised the manuscript. All authors contributed to the article and approved the submitted version.

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Utilization of wearable smartwatch and its application among Saudi population

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Study purpose: It is important to understand the users' perceptions toward the use of smartwatches and the various factors that affect the adoption of smart watches. These findings would contribute to the literature in understanding users' usage, preferences, needs, and expectations about smartwatches that would aid smartwatches designers and also decision-makers in integrating the smartwatch technology in various service-enabled areas such a healthcare, e-learning etc. To address this gap, the objective of this study was formulated to understand the actual consumers' perceptions of toward the use of smartwatches and explore the critical factors affecting the adoption and intention to use smartwatches in the Kingdom of Saudi Arabia.

Methods: A cross-sectional study was designed to assess the actual perception of use smartwatches and to investigate the influencing factors that affect the utilization among Saudi population using the survey technique. Questionnaire design was based on the domains of Technology Acceptance Model (TAM) to determine the factors affecting smartwatches utilization. The sample composed of Saudi Arabian residents aged 18 years and above. The response rate for the online questionnaire that was distributed through the social media applications was 58.61% representing 135 participants. The data was collected in November 2020 and analyzed using the Statistical Packages for Software Sciences (SPSS).

Results: The prevalence of participants who had knowledge about smartwatch was 94.1%. When comparing the demographic characteristics between those owning and not owning a smartwatch, it was found that educational level

(X2 = 9.365; $p = 0.025$) and knowledge about smartwatch (X2 = 7.897; $p = 0.005$) had significant relationship with owning a smartwatch. When comparing between design aesthetic, perceived usefulness, ease of use, enjoyment and healthology in relation to the socio demographic characteristics, it was found that respondents in the older age group (≥45 years) (F = 11.797; p<0.001) and those with master degree (F = 3.449; $p = 0.002$) observed to have significantly lower mean score in design aesthetic while females exhibited significantly higher score in perceived enjoyment and healthology (T = −3.629; $p = 0.001$) as well as design aesthetic (T = −2.070; $p = 0.043$).

Conclusion: Factors such as age, education, gender, income can significantly affect the adoption of wearable devices in Saudi Arabia.

KEYWORDS

wearable technology, smartwatch, Saudi Arabia, utilization and application, healthcare

Introduction

In the past few years, new types of wearable technologies have been evolving, which are referred as wearable smart devices or simply wearable devices. The wearable devices can be defined as computing devices that has advanced electronics and communication technologies and can be worn by individuals, facilitating interaction between the users and a smart platforms. Furthermore, the wearable devices, especially smartwatches, are getting significant attention and huge investments by big smartphone companies (Apple, Samsung, LG, Google, etc.) which illustrate the evolving era of smartwatches (Dehghani et al., 2018).

The smart wearable device is one of the fastest growing markets globally. In 2012, smartwatches drew the attention when the Pebble Smartwatch was introduced on the crowdfunding website (Choi and Kim, 2016). In 2016, the International Data Corporation (IDC) anticipated that smartwatch market would substantially grow by 2020, estimating a market of $17.8 billion (Afrouz and Wahl, 2019).

The smartwatch is a wrist-worn device with a portable computer that can connect to other devices via short range wireless connectivity. In addition to having an integrated clock, the smartwatch can provide alert notifications, collect data via sensors and upload personal data in a 24 x 7 manner in an attempt to improve the quality of daily life (Seneviratne et al., 2017). Smartwatches have the advantage of connecting to the skin since they are wrist mounted which facilitate their wide use in the fields of sports and healthcare. Smartwatches could decrease consumer's attention given to other devices, such as smartphones, as important information is conveniently displayed on the user's wrist (Chuah et al., 2016).

In a recent study conducted in Germany (Afrouz and Wahl, 2019), it was identified that attitude toward using wearable technology was the strongest predictor for the intention to purchase smartwatches followed by Perceived Behavioral Control. The smartwatch can be used for various purposes such as navigation, financial payments, physical and mental health monitoring, sport analytics, and medical insurance analytics (Seneviratne et al., 2017). It is worth mentioning that most smartwatch producers have merged the technology and fashion in an attempt to attract more consumers (Chuah et al., 2016; Moore, 2016).

International reports predict an increased demand for smartwatches in the future while the current actual sales are relatively less than what is forecasted (Chuah et al., 2016). This difference implies that what influences the consumers to own smartwatches is not sufficiently known; especially that smartwatches technology is in the initial stages of its lifecycle. Therefore, more studies are needed to address this gap in the knowledge.

There have been various studies (Baudier et al., 2020; Scott, 2020) identified in the literature that focused on the adoption and use of smart devices. Various influencing the adoption of smart watches. Scott (Scott, 2020) has identified that privacy concerns is one of the major factors affecting the smart watches adoption in USA. A similar study (Scott, 2020) conducted in four developed countries including USA, UK, France, and Germany has found that age and gender factors moderately impact the adoption of smart watches. In addition, it was found that perceived ease of use had no impact on the adoption attitudes. However, in a study conducted in South Korea, found that perceived ease of use had a significant impact on the intention to use of smart watches (Baudier et al., 2020). Other, factors such as prior experience, affective quality and technology-related anxiety impacted the adoption of smart watches among the older adults (Choe and Noh, 2018). Similarly, another study (Lazaro et al., 2020) conducted in Malaysia identified four dimensions including perceived benefits, healthology, IT innovation, and smartwatch as luxury products which

TABLE 1 Socio demographic characteristics of participants in relation to the usage of smartwatch.

Study variables	Overall	Own Smartwatch		X2	*P*-value
	N (%) ($n = 135$)	Yes N (%) ($n = 65$)	No N (%) ($n = 70$)		
Age group					
• 18–34 years	34 (25.2%)	19 (29.2%)	15 (21.4%)	1.233	0.540
• 35–44 years	55 (40.7%)	26 (40.0%)	29 (41.4%)		
• ≥45 years	46 (34.1%)	20 (30.8%)	26 (37.1%)		
Gender					
• Male	75 (55.6%)	37 (56.9%)	38 (54.3%)	0.095	0.758
• Female	60 (44.4%)	28 (43.1%)	32 (45.7%)		
Highest education					
• High school degree	24 (17.8%)	06 (09.2%)	18 (25.7%)	9.365	**0.025** **
• Professional degree	22 (16.3%)	08 (12.3%)	14 (20.0%)		
• Bachelor's degree	63 (46.7%)	36 (55.4%)	27 (38.6%)		
• Master's degree	26 (19.3%)	15 (23.1%)	11 (15.7%)		
Occupational status					
• Employed	89 (65.9%)	43 (66.2%)	46 (65.7%)	2.055	0.726
• Self-employed	13 (09.6%)	07 (10.8%)	06 (08.6%)		
• Student	02 (01.5%)	0	02 (02.9%)		
• Unemployed	17 (12.6%)	08 (12.3%)	09 (12.9%)		
• Others	14 (10.4%)	07 (10.8%)	07 (10.0%)		
Monthly income (SAR)					
• <5,000	29 (21.5%)	13 (20.0%)	16 (22.9%)	3.961	0.266
• 5,000–10,000	27 (20.0%)	09 (13.8%)	18 (25.7%)		
• 10,001–20,000	55 (40.7%)	29 (44.6%)	26 (37.1%)		
• >20,000	24 (17.8%)	14 (21.5%)	10 (14.3%)		
Knowledge about smartwatch					
• Yes	127 (94.1%)	65 (100%)	62 (88.6%)	7.897	**0.005****
• No	08 (05.9%)	0	08 (11.4%)		

significantly influenced the adoption of smartwatches. Using a complex model smartwatches adoption among IT professionals was investigated in a study (Said et al., 2021) and it was found that self-efficacy, personal innovativeness, social media influence, social image, aesthetics and external social influence were major factors of influence. Similarly, various studies (Hsiao, 2017; Kranthi and Ahmed, 2018; Dutot et al., 2019; Pua, 2020; Visuri et al., 2021) identified different technical factors affecting the intention to use smart watches, while the behavioral and user-centered aspects were undermined.

As highlighted by Choia and Seongcheol (Choi and Kim, 2016), most academic studies on smartwatches have been driven by technology rather than audience. Thus, it is important to understand the users' perceptions toward the use of smartwatches and the various factors influencing the adoption of smartwatches. These findings would contribute to the literature in understanding users' usage, preferences, needs, and expectations that would aid smartwatches developers and also decision-makers in integrating the smartwatch technology in various service-enabled areas such as healthcare and e-learning. This study aims to understand the actual consumers' perceptions of using smartwatches and explore the critical

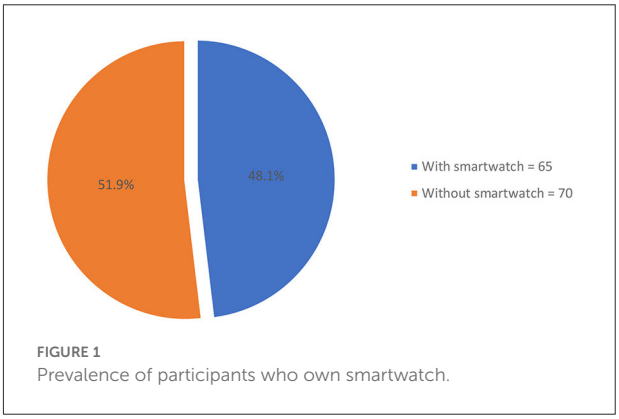

FIGURE 1
Prevalence of participants who own smartwatch.

TABLE 2 Descriptive statistics of Technology Acceptance Model (TAM) subscales.

Variables	Mean ± SD	Mean (%)	Median (min–max)	Cronbach Alpha	No. of Items
Perceived usefulness	15.5 ± 2.68	77.5%	16 (8–20)	0.764	04
Perceived ease of use	17.4 ± 2.24	87.0%	17 (9–20)	0.717	04
Perceived enjoyment and healthology	16.1 ± 3.20	80.5%	16 (4–20)	0.804	04
Design aesthetic	16.0 ± 2.99	80.0%	16 (8–20)	0.931	04
Attitude toward using smartwatch	14.2 ± 3.98	71.0%	16 (8–20)	0.916	04
Subjective norm	10.4 ± 4.07	52.0%	10 (4–20)	0.873	04
Perceived behavioral control	11.7 ± 2.47	58.5%	12 (6–15)	0.837	03
Purchase intention	9.79 ± 3.62	48.9%	11 (3–15)	0.964	03

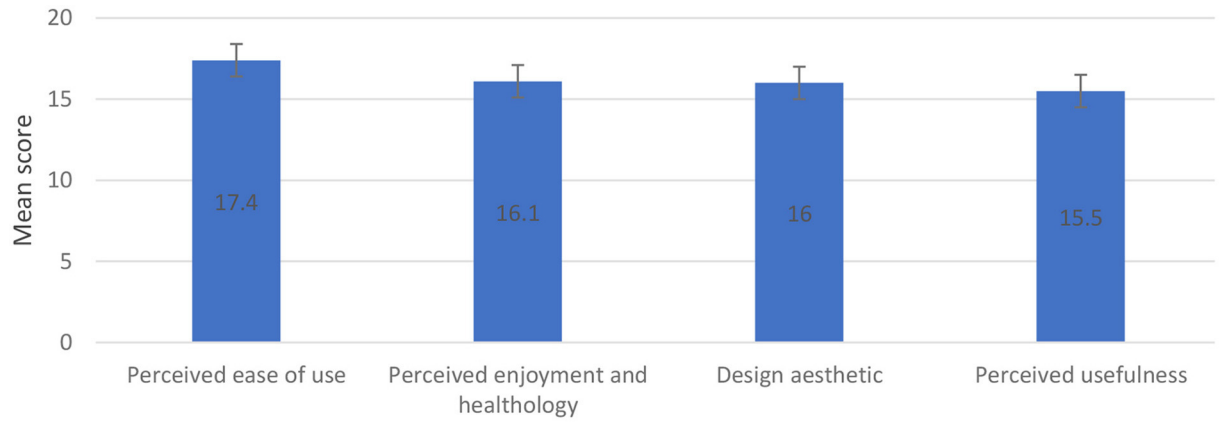

FIGURE 2
Mean distribution of design aesthetics perceived usefulness, ease of use, enjoyment and healthology.

factors influencing the intention to use smartwatches in the Kingdom of Saudi Arabia.

Methods

Study design

This is a cross-sectional study following the STROBE checklist for observational and cross-sectional studies (Equator-Network, 2021) that took place in November 2020. The study received the Institutional Review Board approval from Imam Abdulrahman Bin Faisal University, Saudi Arabia. The study follows the guidelines of Helsinki Declaration of 1975.

Questionnaire design

The questionnaire used was partially adopted from another study (Afrouz and Wahl, 2019) and contained 15 items to achieve the main objective of the study. The questionnaire was developed to measure the level of awareness, actual usage, and influencing factors to use smartwatches in the Kingdom of Saudi Arabia. Also, the questions were piloted before the actual use with the participants and the final questionnaire was confirmed clear and visible by two academic experts. In addition, the questionnaire was translated to Arabic language and validated using the back-and-forth translation process, and then distributed among Saudi targeted population.

Technology Acceptance Model (TAM) is one of the most used theoretical models to examine human behavior regarding potential acceptance or rejection of the new technology (Marangunić and Granić, 2014). This model helps to understand the individual's acceptance of new technologies or application. In this study we used eight domains of TAM which are Perceived ease of use (PE), Perceived usefulness (PU), Perceived Enjoyment and healthology (PEH), Design Aesthetic (DA), Attitude Toward Using (ATU), Subjective Norm (SN), Perceived Behavioral control (PBI) and Purchase Intention of use (PI).

The first five items in the questionnaire were obtaining demographic characteristics of the participants: gender, age, occupation, level of education, and monthly salary. Item 6 is dedicated to assess smartwatch awareness. Item 7 verifies the participants acquisition status of a smartwatch. Finally, items 8 to 15 are used, all items were measured on a 5-point Liker

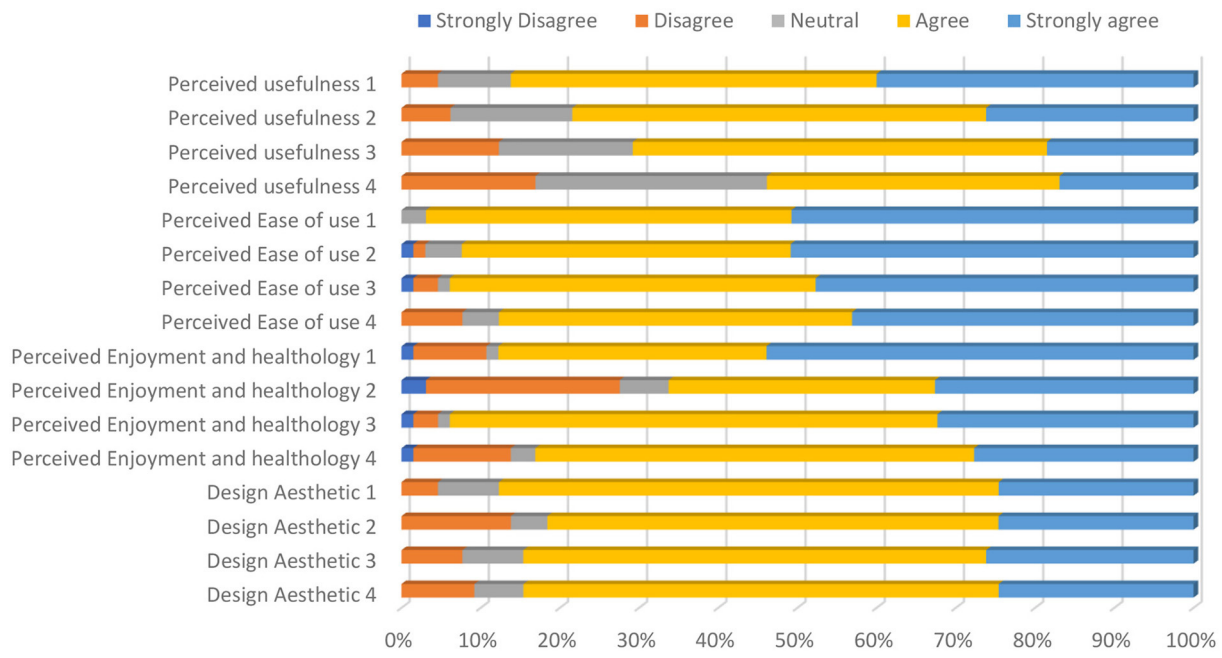

FIGURE 3
Explanation for each domain affects the smartwatch user on Saudi Arabia.

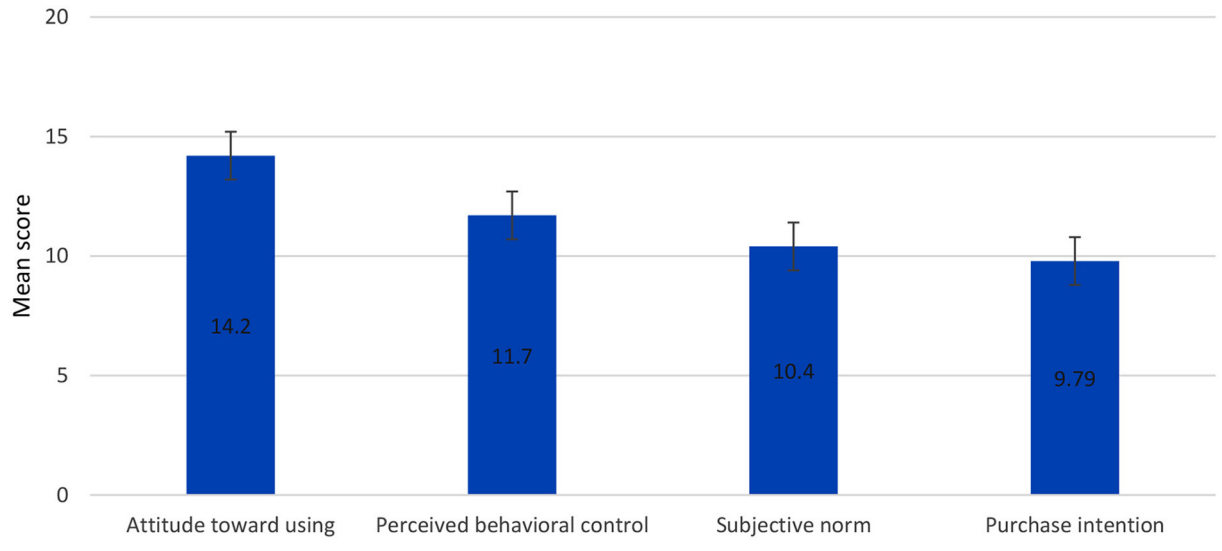

FIGURE 4
Mean distribution of attitude toward using, perceived behavioral control, subjective norm and purchase intention.

scale where 1 strongly disagree, 2 disagree, 3 neutral, 4 agree, and 5 is strongly agree. If the responses for item 7 is yes, then a set of having smartwatch questions were asked from item 8 to 11 to assess the perception of users toward the smartwatch utilization. If the responses for item 7 is no, then a set of don't own smartwatch questions were asked from item 12 to 15 to assess the perception of Saudi participants toward the smartwatch utilization.

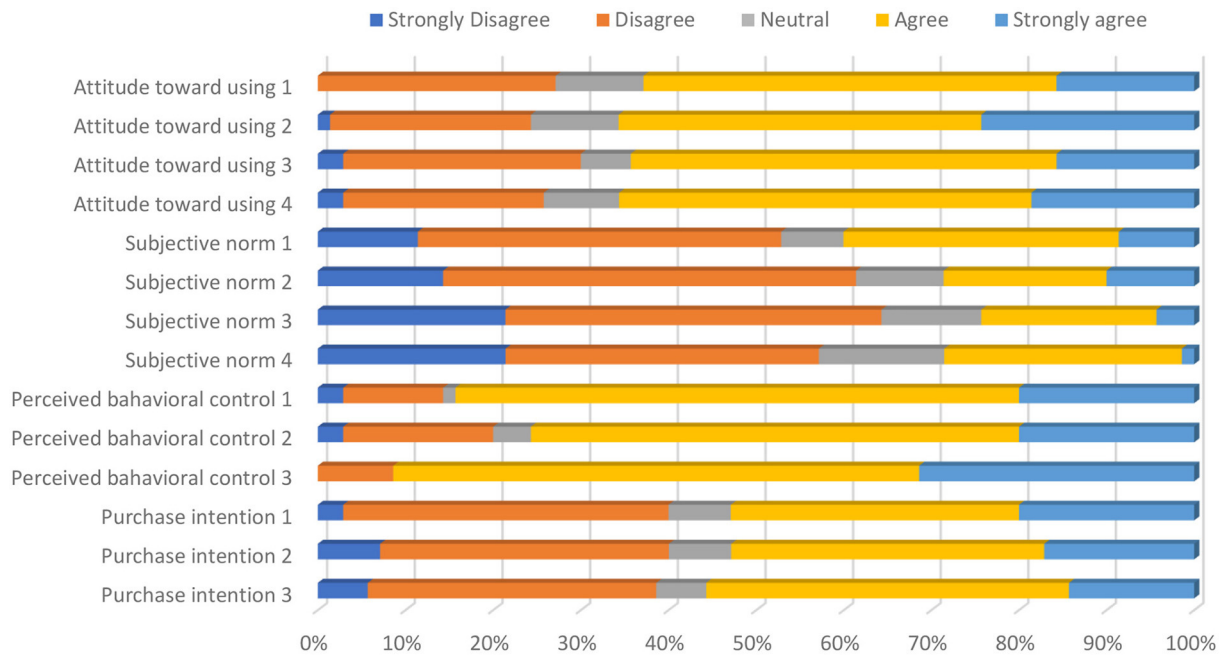

FIGURE 5
Explanation for each domain affects the customer who don't won smartwatch on Saudi Arabia.

TABLE 3 Correlation (Pearson-R) between design aesthetic, perceived usefulness, ease of use, enjoyment and healthology.

SN	Variables	I	II	III	IV
I	Perceived usefulness	1			
II	Perceived ease of use	**0.599****	1		
III	Perceived enjoyment and healthology	**0.357****	**0.452****	1	
IV	Design aesthetic	**0.318****	**0.509****	**0.610****	1

**Correlation was significant at the 0.01 level 2-tailed.

TABLE 4 Correlation (Pearson-R) between attitude toward using smartwatch, subjective norm, perceived behavioral control and purchase intention.

SN	Variables	I	II	III	IV
I	Attitude toward using smartwatch	1			
II	Subjective norm	0.488**	1		
III	Perceived behavioral control	0.395**	0.289**	1	
IV	Purchase intention	0.783**	0.499**	0.414**	1

**Correlation was significant at the 0.01 level 2-tailed.

Study setting and participants

The sample population size was constituted by Saudi citizens all over the kingdom of Saudi Arabia. The participants have provided their agreement to participate in the questionnaire of this. Participation is entirely voluntary, and the responses were anonymized.

Inclusion and exclusion criteria

All of the Saudi citizens aged 18 years and older, whether or not using a smartwatch, were considered eligible in this study. All other residents of other nationalities were excluded.

Data collection

The questionnaire was distributed to the participants using online social media platforms and the data were collected from 14 to 29 November 2020. The survey link was forwarded to 231 participants through various social media channels including twitter, WhatsApp, Instagram, and Facebook. By the end of two-weeks, 135 responses were received indicating a response rate of 58.6%.

Statistical analysis

Categorical variables were presented as frequency and percentages (%) while continuous variables were presented as mean and standard deviation, whenever

TABLE 5 Comparison between design aesthetic, perceived usefulness, ease of use, enjoyment and healthology in relation to the socio demographic characteristics of participants.

Factor	PU Mean ± SD	PE Mean ± SD	PEH Mean ± SD	DA Mean ± SD
Age group[a]				
• 18–34 years	15.4 ± 2.24	17.9 ± 1.76	16.4 ± 2.78	17.3 ± 2.40
• 35–44 years	15.9 ± 2.63	17.4 ± 2.16	16.9 ± 2.17	16.9 ± 1.98
• ≥45 years	15.2 ± 3.15	17.1 ± 2.73	14.8 ± 4.27	13.7 ± 3.36
F-test	*0.454*	*0.624*	*2.739*	*11.797*
P-value	*0.637*	*0.539*	*0.072*	*<0.001***
Gender[b]				
• Male	15.2 ± 2.72	17.5 ± 2.30	14.9 ± 3.11	15.4 ± 2.78
• Female	15.9 ± 2.62	17.3 ± 2.18	17.6 ± 2.68	16.9 ± 3.09
T-test	*−0.915*	*0.389*	*−3.629*	*−2.070*
P-value	*0.364*	*0.699*	*0.001***	*0.043***
Highest education[a]				
• High school degree	16.0 ± 2.76	17.0 ± 2.00	17.8 ± 2.71	17.2 ± 4.31
• Professional degree	16.4 ± 2.72	17.7 ± 2.05	15.5 ± 5.01	16.9 ± 1.64
• Bachelor's degree	15.2 ± 2.67	17.5 ± 2.54	16.3 ± 3.04	16.5 ± 2.56
• Master's degree	15.6 ± 2.77	17.3 ± 1.75	15.4 ± 2.56	14.0 ± 3.27
F-test	*0.506*	*0.170*	*0.951*	*3.449*
P-value	*0.679*	*0.916*	*0.422*	*0.022***
Occupational status[a]				
• Employed	15.1 ± 2.85	17.3 ± 2.43	16.1 ± 2.69	16.4 ± 2.17
• Self-employed	16.0 ± 2.52	18.4 ± 1.99	14.9 ± 5.89	16.3 ± 5.22
• Unemployed	15.9 ± 2.36	16.7 ± 1.75	16.5 ± 3.46	15.8 ± 4.27
• Others	17.0 ± 1.63	17.9 ± 1.57	17.1 ± 2.61	13.9 ± 2.73
F-test	*1.171*	*0.807*	*0.628*	*1.518*
P-value	*0.328*	*0.495*	*0.600*	*0.219*
Monthly income (SAR)[a]				
• <5,000	15.3 ± 3.04	16.8 ± 2.19	15.2 ± 4.90	16.2 ± 3.74
• 5,000–10,000	16.6 ± 2.13	18.0 ± 2.00	17.7 ± 2.00	16.9 ± 1.76
• 10,001–20,000	15.4 ± 3.05	17.5 ± 2.63	16.5 ± 2.77	16.4 ± 2.61
• >20,000	15.2 ± 1.72	17.5 ± 1.51	15.2 ± 2.39	14.5 ± 3.35
F-test	*0.540*	*0.496*	*1.571*	*1.717*
P-value	*0.656*	*0.686*	*0.206*	*0.173*

PU, Perceived Usefulness; PE, Perceived Ease of use; PEH, Perceived Enjoyment and Healthology; DA, Design Aesthetic.
[a]P-value has been calculated using One-way Anova test.
[b]P-value has been calculated using independent t-test.
**Significant at $p < 0.05$ level.

appropriate. Between comparisons of variables, Chi-square test, independent *t*-test and One-way ANOVA test were applied. Correlation procedures were also conducted to determine the linear agreement between Technology Acceptance Model domains. $P \leq 0.05$ was considered statistically significant while $p \leq 0.01$ were considered highly statistically significant. All data analysis was performed using the Statistical Packages for Software Sciences (SPSS) version 21, IBM Corporation.

Results

A total of 135 responses were received to evaluate their use of wearable devices (smartwatch). As seen in Table 1, the most common age group was 35–44 years (40.7%) with more than a half (55.6%) were males and 46.7% had a bachelor's degree.

With regards to their occupational status, nearly two third (65.9%) were employed with 40.7% of them earned 10,001–20,000 SAR per month. The prevalence of participants who had information about smartwatch was 94.1% (Figure 1).

TABLE 6 Comparison between attitude toward using, subjective norm, perceived behavioral control and purchase intention in relation to the socio demographic characteristics of participants.

Factor	ATU Mean ± SD	SN Mean ± SD	PBC Mean ± SD	PI Mean ± SD
Age group[a]				
• 18–34 years	13.8 ± 4.41	9.67 ± 3.72	12.3 ± 2.28	8.87 ± 3.81
• 35–44 years	13.7 ± 4.09	10.3 ± 4.54	11.9 ± 2.08	9.48 ± 3.60
• ≥45 years	14.9 ± 3.63	10.9 ± 3.78	11.3 ± 2.95	10.7 ± 3.46
F-test	*0.706*	*0.453*	*0.867*	*1.350*
P-value	*0.497*	*0.638*	*0.425*	*0.266*
Gender[b]				
• Male	14.5 ± 3.72	9.58 ± 3.53	11.5 ± 2.29	9.84 ± 3.45
• Female	13.8 ± 4.30	11.4 ± 4.49	12.0 ± 2.68	9.72 ± 3.85
T-test	*0.657*	*-1.907*	*-0.797*	*0.141*
P-value	*0.513*	*0.061*	*0.428*	*0.888*
Highest education[a]				
• High school degree	14.3 ± 4.67	10.2 ± 4.66	11.1 ± 3.34	9.61 ± 4.27
• Professional degree	13.1 ± 4.50	10.5 ± 4.38	11.9 ± 2.25	9.21 ± 3.53
• Bachelor's degree	14.4 ± 3.51	11.1 ± 3.95	11.6 ± 2.24	9.96 ± 3.45
• Master's degree	14.8 ± 3.43	9.00 ± 2.86	12.9 ± 1.14	10.4 ± 3.32
F-test	*0.430*	*0.722*	*1.251*	*0.238*
P-value	*0.732*	*0.542*	*0.298*	*0.870*
Occupational status[a]				
• Employed	13.7 ± 3.62	10.2 ± 3.93	11.8 ± 2.05	9.76 ± 3.46
• Self-employed	13.5 ± 4.18	8.67 ± 2.73	11.7 ± 3.39	8.33 ± 4.41
Student	18.5 ± 2.12	6.50 ± 2.12	13.0 ± 2.83	9.00 ± 4.24
• Unemployed	13.1 ± 5.30	11.0 ± 5.45	11.2 ± 3.35	9.11 ± 4.11
• Others	18.0 ± 2.00	13.4 ± 2.94	11.7 ± 3.45	12.3 ± 2.93
F-test	*2.836*	*1.854*	*0.227*	1.195
P-value	*0.031***	*0.129*	*0.922*	0.322
Monthly income (SAR)[a]				
• <5,000	14.9 ± 4.94	11.1 ± 5.15	11.9 ± 2.91	9.75 ± 3.68
• 5,000 – 10,000	13.4 ± 3.91	10.7 ± 3.63	11.7 ± 2.49	9.39 ± 4.02
• 10,001 – 20,000	14.0 ± 3.49	10.1 ± 4.12	11.7 ± 2.21	9.77 ± 3.36
• >20,000	15.0 ± 3.89	9.60 ± 2.95	11.7 ± 2.71	10.6 ± 3.84
F-test	*0.548*	*0.356*	*0.044*	*0.234*
P-value	*0.651*	*0.785*	*0.988*	*0.872*

ATU, Attitude toward use; SN, Subjective Norm; PBC, Perceived Behavioral Control; PI, Purchase Intention.
[a]P-value has been calculated using One-way ANOVA test.
[b]P-value has been calculated using independent t-test.
**Significant at $p < 0.05$ level.

When comparing the socio-demographic characteristics against owning a smartwatch. It was found that educational level (X2 = 9.365; $p = 0.025$) and knowledge about smartwatch (X2 = 7.897; $p = 0.005$) had significant association with owning a smartwatch.

The descriptive statistics of Technology Acceptance Model (TAM) subscales are shown in Table 2. Based on the results, the mean score of perceived usefulness, ease of use, enjoyment and healthology, and design aesthetic were 15.5, 17.4, 16.1, and 16, respectively (Figures 2, 3), while the mean score of attitudes toward using smartwatch, subjective norm, perceived behavioral control and purchase intention were 14.2, 10.4, 11.7, and 9.79, respectively (Figures 4, 5). With regards to reliability analysis, the Cronbach Alpha was higher on purchase intention domain (Cronbach Alpha: 0.964), followed by design aesthetic domain (Cronbach Alpha: 0.931) and attitude toward using smartwatch

(Cronbach Alpha: 0.916) while perceived ease of use was the lowest (Cronbach Alpha: 0.717).

Table 3 showed the correlation procedure between design perceived usefulness, ease of use, enjoyment and healthology. It revealed that the correlation between perceived usefulness, perceived ease of use, perceived enjoyment and healthology, and design aesthetic were positively highly statistically significant ($p < 0.01$).

In Table 4, the correlation between attitude toward using smartwatch, subjective norm, perceived behavioral control, and purchase intention had high statistical significance as well ($p < 0.01$).

When comparing between design aesthetic, perceived usefulness, ease of use, and enjoyment and healthology in relation to the socio demographic characteristics (Table 5), it was found that respondents in the older age group (≥45 years) ($F = 11.797$; $p < 0.001$) and those with master degree ($F = 3.449$; $p = 0.002$) observed to have significantly lower mean score in design aesthetic while females exhibited significantly higher score in perceived enjoyment and healthology ($T = -3.629$; $p = 0.001$) as well as design aesthetic ($T = -2.070$; $p = 0.043$).

Table 6, shows that only occupational status showed significant difference with attitude toward the use of smartwatch with students exhibited significantly higher score compared to the other groups ($F = 2.836$; $p = 0.031$). Other socio demographic characteristics did not differ significantly when compared to attitude toward use, subjective norm, perceived behavioral control and purchase intention (all $p > 0.05$).

Discussion

The purpose the study is to assess the actual perception of use of smartwatches and to investigate the influencing factors for utilizing them among Saudi population. This study enrolled 135 respondents to evaluates perception of the Saudi, regardless of owning a smartwatch or not, and their adoption intention toward this device. The findings of this study revealed that most Saudis, around 94%, have pre-existing knowledge about smart watches, approximately half (48%) of the Saudi who own smartwatch were: male (56.95%), had Bachelor's degree (55.4%), employed (66.2%) and their monthly income 10.000–20.000SR (44.6%). However, in a study conducted in Indonesia (Anggraini et al., 2019), it was identified that most respondents heard about smartwatches, half of them have a smartwatch and more than 70% of the remaining half don't have a smartwatch due to high price.

With regards to coefficient reliability during the study analysis, the reliability was higher in PI, followed gradually by DA, ATU, SN, BPI, PEH, PU, while PE was the lowest. This study revealed a strong association and positive relationship between the four domains: PU, PE, PEH and DA which were affected by the responder owning a smartwatch. It also showed strong association and positive correlation between the other four domains: ATU, SN. PBC, and PI which were affected by the responder who doesn't own a smartwatch among Saudi population. This is consistent with Hakroh et al.'s paper (Hokroh et al., 2020) where they investigated the association between: Heart Health (HH), Weight Management (WM), and Sleep Improvement (SI) as antecedents for Perceived Usefulness (PU). Also, Wearable Design (WD), Graphical User Interface (GUI) and Health Information Support (HIS) as antecedents for Perceived Ease of Use (PEU) as influences factors among Saudi population.

In this study, it is identified that Saudi citizens who own a smartwatch are usually highly educated and knowledgeable about smartwatches. Saudi users over the age of 45 as well as those with master degree level both observed with low interest in design aesthetic for smartwatches while female users had remarkable interest in perceived enjoyment and healthology as well as design aesthetic. According to Dehghani et al. (Dehghani et al., 2018) gender plays an important role in smartwatch adoption intention and actual usage. Most of smartwatches companies don't pay attention to the aesthetic features but they focus on technology features in designs. Furthermore, Companies need to consider marketing pending on the customer needs, gender and different setting. In a study conducted in Taiwan (Hsiao, 2017), it was identified that perceived product contributes effectively on adoption intention of smartwatches.

Moreover we observed that Saudi students who don't own a smartwatch showed positive attitude toward the use of smartwatch technology, in other words, student believe that using a smartwatch is a good decision compared to the other occupational status groups. In a study (Arpaci et al., 2021) conducted in Malaysia, machine learning techniques were applied in assessing the adoption and it was the first study to gather a novel assistance to the information systems (IS) literature by assessing the student behavioral intention for adoption of wearable technologies (smartwatch).

The total number of participants in the study was only 135, which is considered a key limitation therefore, the generalization of findings in this study must be done with care by future researchers. In addition, this study focused on smartwatches in general. However, the functionalities of the smartwatches may vary with the brand, their purpose, features and functionalities. Therefore, our findings may not be applicable to all types of smartwatches. However, researchers can develop many future research projects from this study. The study can be taken forward in a larger scale with the use of mixed-methods such as interviews

and surveys for in-depth analysis of the results. In addition, the future studies may focus on comparing the users' perceptions, adoption, and intention to use according to the smartwatches analyzed by brand, functions and features, and purpose.

Finally, our study carries both practical and theoretical implications. The findings from this study, such as the usage behavior of males vs. females; younger vs. older population; married vs. single; highly educated vs. low educated. can help in understanding the users' perceptions among the different groups, which can help the designers and developers of smartwatches in developing the devices according to the users' expectations and can streamline their marketing strategy by targeting a specific group of customers. Most importantly, our study contributes to enriching the knowledge gap in the literature about the users' perceptions, use, and adoption of smartwatches in the Middle East, and contributes significantly in understanding the users' preferences and adoption traits in this region, which can serve as a reference for future work in this domain.

Conclusion

Nowadays, Wearable's are becoming more mercantile and used among customers all over the world. Smartwatches are the most popular wearable's device known by most of the population. This study found the actual consumers' perceptions of smartwatch utilization in kingdom of Saudi Arabia, using TAM show the significant relationship between the 8 domains: PU, PE. PEH, DA, ATU, SN, PBC, and PI that used to determine the smartwatches acceptance among the Saudi population whether they own a smartwatch or not. These domains are considered as effective factors toward smartwatch utilization to provide wearable devices designed according to the user's preferences and needs. Finally, we can say, perceived product contributes effectively on adoption intention of smartwatches. Further related research is needed in order to further explore the influential factors for adoption intention, that were found to be significant in this study, for the sake of better understanding of consumers' needs.

Data availability statement

The raw data supporting the conclusions of this article can be provided by the authors upon request without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by the Institution Review Board (IRB) at Imam Abdulrahman bin Faisal University. The patients/participants provided their written informed consent to participate in this study.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

Conflict of interest

Author DuA is an employee of Saudi Aramco. Author HM is an employee of Johns Hopkins Aramco Healthcare.

The remaining 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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Exploring the relationship between social exclusion and smartphone addiction: The mediating roles of loneliness and self-control

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Previous studies have identified many antecedents of smartphone addiction. However, social exclusion as a risk factor for smartphone addiction has not been widely studied, and little is known concerning the psychological mechanism underlying this association. The present study tested the influence of social exclusion on smartphone addiction as well as the mediating roles of loneliness and self-control in this relationship. An online survey was conducted, and the sample consisted of 573 university students (323 females). The results revealed that (1) social exclusion was a positive predictor of smartphone addiction; (2) loneliness and self-control separately mediated the association between social exclusion and smartphone addiction; and (3) loneliness and self-control sequentially mediated the relation between social exclusion and smartphone addiction. Possible explanations were discussed. The findings of the current study would contribute to understanding the relationships between these study variables as well as the psychological mechanisms underlying these associations.

KEYWORDS

social exclusion, smartphone addiction, loneliness, self-control, mediating effect

Introduction

Smartphones have significantly changed our daily lives. Since millions of applications have been developed and installed on this internet-enabled intelligent device, nowadays, people are capable of communicating with others, listening to music, watching videos, as well as playing games. Some studies have indicated that smartphone usage can expand horizons, provide convenience, promote safety, alleviate pressure, and facilitate learning (Elhai et al., 2017; Hong et al., 2019). Therefore, the smartphone has become a "versatile baby-sitter" and has penetrated into nearly every aspect of our lives (Shen and Wang, 2019). Due to the fact that smartphones have brought great convenience to our daily lives and they can be used almost anytime and anywhere, an increasing number of people tend to spend

plenty of their time on them. In this way, they may develop immoderate usage habits (such as overuse and abuse), which can bring about many detrimental consequences. Smartphone addiction is one of the maladaptive usage behaviors (Xie et al., 2019), and it has gained a lot of attention from social scientists and the general public.

Smartphone addiction is defined conceptually as excessive smartphone use with associated functional impairment and resulting symptoms similar to those seen in other addictive behaviors such as withdrawal and tolerance (Billieux et al., 2015; Elhai et al., 2019). Previous studies have found that smartphone addiction can lead to a series of mental health problems, such as depression, loneliness, anxiety, stress, low self-esteem, low self-efficacy, and so on (Lee, 2017; Lapierre et al., 2019; Wang et al., 2019; Kara et al., 2021). Some scholars have verified that problematic smartphone usage can contribute to poor sleep quality and other physical symptoms such as eye syndromes, body fatigue, physiological dysfunction, and weakened immunity (Berolo et al., 2011; Choi et al., 2018; Xie et al., 2018; Yang et al., 2019). Besides, researchers have found that smartphone addiction can bring about academic procrastination, which may have adverse effects on addicts' academic performance (Ji et al., 2014; Hawi and Samaha, 2016). Since smartphone addiction can induce so many negative influences, it is imperative for researchers to investigate the antecedents and the underlying psychological mechanisms that may put individuals at the risk of this addictive behavior. This will not only be conducive to understanding the associations between these variables, but also contribute to the effective prevention and early intervention of this behavioral disorder.

Plenty of previous studies have provided empirical evidence for the relationships between the antecedents (such as depression, anxiety, stress, loneliness, personality) and smartphone addiction. However, one important antecedent—social exclusion—has not been widely studied. The psychological mechanisms underlying the relationship between social exclusion and smartphone addiction are still unclear. To this end, by constructing a sequential mediation model, the present study aimed to examine the relationship between social exclusion and smartphone addiction as well as investigating the mediating roles of loneliness and self-control.

The relationship between social exclusion and smartphone addiction

Social exclusion is defined as the sensation of being physically (e.g., social isolation) or emotionally isolated from others (Wesselmann et al., 2016). Social exclusion involves two core experiences rejection and ostracism. Rejection is defined as being explicitly or implicitly told that one is unwelcome in a social relationship; ostracism is commonly characterized by being overlooked and excluded by a person or group (Wesselmann et al., 2016). One previous study has indicated that individuals who experience a sense of social exclusion tend to have heightened requirements for attention. This will result in their attaching to social media (David and Roberts, 2017). Besides, researchers have found that social exclusion may contribute to Facebook addiction (Lim, 2019). On the one hand, this could be because people are afraid of being excluded and forgotten, which motivates them to spend more time and energy on Facebook; on the other hand, researchers have confirmed that social exclusion can cause social anxiety and motivate people to restore their social affiliation, which can lead to addictive behavior (Lim, 2019). In addition, some scholars have verified that social exclusion can significantly predict increased internet addiction. In their opinion, being excluded by other individuals leads people to experience enhanced negative emotions, decreased self-regulation, as well as impaired self-control, which may contribute to internet addiction (Poon, 2018; Arslan and Coşkun, 2021). Based on this, the present study hypothesizes (H1): social exclusion can significantly and positively predict the severity level of smartphone addiction.

The mediating role of loneliness

Loneliness has been proved to be an import consequence of social exclusion. Loneliness refers to the negative emotional reaction to the difference between one's anticipated and actual social relationship (Peplau and Perlman, 1982; Vanhalst et al., 2015). Previous research has demonstrated that some indicators of social exclusion (such as lower frequency of social contacts and lack of emotional support) can significantly and positively predict loneliness experiences (Dahlberg et al., 2022). Prior scholars also proved that social exclusion has a strong impact on students' loneliness as well as other mental health problems (Arslan, 2021). Besides, one empirical research confirmed that socially excluded individuals report more loneliness experiences than those who were not excluded (Kavakli, 2019). Moreover, other studies also provide evidence for the association between social exclusion and loneliness (Leary, 1990; Li et al., 2019; Arslan and Yıldırım, 2021). According to the need-to-belong theory and the temporal need-threat model (Williams, 2009; Baumeister, 2011), social exclusion can lead to a lack of belongingness, which can exacerbate feelings of loneliness. Therefore, loneliness as a result of social exclusion can be comprehended.

Loneliness has been proved to be correlated with smartphone addiction by plenty of studies. Researchers indicated that individuals with loneliness experiences are more prone to overusing cyber-technological devices (Enez Darcin et al., 2016). Empirical research showed that loneliness can positively and significantly predict the pattern of smartphone usage and the severity of smartphone addiction (Bian and Leung, 2015). According to the compensatory internet-use model, people often use smartphones to alleviate negative emotions or compensate for psychosocial problems (Kardefelt-Winther, 2014). Therefore, lonely individuals may turn to smartphones to relieve their dysphoric moods or seek compensation for their psychological requirements. Ultimately, frequent, intensive, and excessive use will lead them to smartphone addiction.

From what has been mentioned above, the present study hypothesizes (H2): loneliness mediates the relationship between social exclusion and smartphone addiction.

The mediating role of self-control

The negative impact of social exclusion on self-control has been verified by numerous prior studies. Previous scholars have found that social exclusion is negatively and significantly associated with self-control (Crescioni and Baumeister, 2009; Burson et al., 2012; Xiaojun et al., 2017). Some scholars have also indicated that socially excluded individuals are more likely to behave aggressively than those who are not excluded (Ren et al., 2018). In addition, social exclusion can impair self-regulation (Stenseng et al., 2015), hinder the inhibitory capacities (Sato et al., 2018), lead to impulsive behaviors (Luo et al., 2021) as well as plenty of negative affects (such as loneliness; Arslan, 2021), which will decrease individuals' self-control (Chester et al., 2016). Moreover, because one of the primary goals of self-control (or self-regulation) is to get approval from others (Baumeister et al., 2005), according to the need-to-belong theory and the temporal need-threat model (Williams, 2009; Baumeister, 2011), individuals' self-control capacity will be impaired when they are socially excluded. Therefore, self-control could be considered as one of the detrimental consequences of social exclusion.

Low self-control has been confirmed as one of the major antecedents of smartphone addiction. Previous studies verified that self-control is a protective factor against individuals' smartphone addiction; the self-control score of the smartphone addiction risk group is significantly higher than that of the general group (Kim et al., 2018; Sok et al., 2019). Empirical studies have also revealed that ego-depleted individuals (with low self-control) exhibit more reward-sensitivity than the non-depleted participants (Giacomantonio et al., 2014). One behavioral and electrophysiological study showed that low self-control could lead to impulsive behavior (Dou et al., 2014). All of these consequences have been proved to be important predictors of smartphone addiction (Kim et al., 2016; Deng et al., 2021). According to the strength model of self-control (Baumeister et al., 2007), self-control relies on limited energy resource. Inadequate self-control will not only lead to impulse-control problems such as alcohol and drug abuse as well as smartphone addiction, but also bring about emotional problems that can further contribute to smartphone addiction. Therefore, it is reasonable to hypothesize that low self-control is a predictor of smartphone addiction.

Based on the results of theoretical and empirical studies, the present study hypothesizes (H3): self-control has a mediating role between social exclusion and smartphone addiction.

The sequential mediation model

The relationship between loneliness and self-control has been well documented by empirical studies (Liu et al., 2017; Li et al., 2021). Some scholars indicated that loneliness can promote internet addiction and Facebook addiction through low self-control (Özdemir et al., 2014; Iranmanesh et al., 2021). According to the Interactions of Person-Affect-Cognition-Execution (I-PACE) model (Brand et al., 2016), specific internet-use disorders result from the interactions between social cognition factors (such as perceived social exclusion) as well as the mediators -- affective and cognitive responses (such as loneliness and reduced self-control). Therefore, the present study put forward the following hypothesis (H4): loneliness and self-control can sequentially mediate the association between social exclusion and smartphone addiction.

The present study

In the current study, a sequential mediated model (Figure 1) was constructed to examine the relationship between social exclusion and smartphone addiction as well as the possible mediating mechanisms. The hypotheses of the present study were that (1) social exclusion would be positively correlated with smartphone addiction; (2) loneliness would mediate the association between social exclusion and smartphone addiction; (3) self-control would mediate the association between social exclusion and smartphone addiction; and (4) loneliness and self-control would be two sequential mediating mechanisms in the relationship between social exclusion and smartphone addiction.

Materials and methods

Participants and procedure

An online survey was designed and performed to collect information concerning the study variables. The final sample comprised 573 university students, and there were 250 males and 323 females. The average age of the total participants was 20.20 ± 1.61 years old, ranging from 18 to 25 years of age.

This study was approved by the ethical committee of the authors' institution. Participants were recruited from five universities in Inner Mongolia, China. All the participants

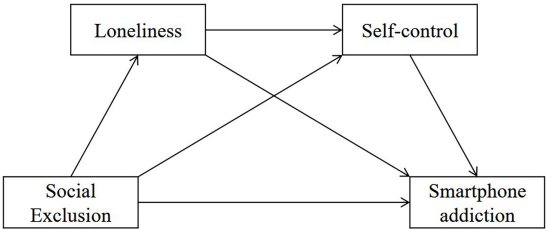

FIGURE 1
The sequential mediation model.

should be university students, and they should be at least 18 years old. They should have a smartphone, and they should be able to use the phones to complete the questionnaires. The survey was conducted during the spare time of the students, such as breaks between classes and after class time. Before sending out the link to the questionnaire, all the participants were verbally told that this survey was anonymous, they were not forced to complete the questionnaires, their data would be used merely for scientific research, and would be kept confidential. They could stop their participation anytime they wanted to, and this would not have any bad effects on them. This content was also presented as instructions in front of the formal questionnaire. After obtaining the verbal informed consent from the participants and their teachers, the link to the questionnaire was shared in the students' WeChat or QQ groups. They could complete these measurements without any restrictions.

Measurements

Social exclusion

Social exclusion was assessed by the Ostracism Experiences Scale (Carter-Sowell, 2010). This scale contained 8 items (e.g., "In general, others leave me out of their group"). Participants were asked to rate each item on a seven-point scale, ranging from 1 (hardly ever) to 7 (almost always). Higher sum scores indicated more ostracism experiences. In the present study, the internal consistency of this scale was high (Cronbach's $\alpha = 0.831$).

Loneliness

Loneliness was measured by the short-form UCLA Loneliness Scale (ULS-6; Xu et al., 2018). This instrument had 6 items (e.g., "I lack companionship"), all items were answered on a four-point Likert scale (from 1 "never" to 4 "always"), with higher scores representing greater degrees of loneliness. In this study, the internal consistency of this scale was high (Cronbach's $\alpha = 0.861$).

Self-control

Self-control was assessed by the Brief Self-Control Scale (Morean et al., 2014). This scale comprised seven items (e.g., "I am good at resisting temptation"). Items were scored on a five-point Likert scale ranging from 1 "not at all" to 5 "very much" (except four items that were reverse scored). Higher sum scores on this scale indicated higher self-control capacity. In the present study, the internal consistency of this was good (Cronbach's $\alpha = 0.735$).

Smartphone addiction

Smartphone addiction was measured by the Smartphone Addiction Scale (Kwon et al., 2013). This scale contained 10 items (e.g., "Missing planned work due to smartphone use"). Participants were asked to rate their levels of smartphone addiction on a six-point Likert scale (1 = "strongly disagree"; 6 = "strongly agree"). In the present study, the result of the internal consistency of this scale was good (Cronbach's $\alpha = 0.876$).

Statistical analysis

SPSS 25.0 software was applied to perform descriptive statistics, correlation, reliability, and linear regression analysis. SPSS PROCESS macro program (model 4) was employed to test the mediating roles of loneliness and self-control separately (social exclusion was added as the *X* variable, smartphone addiction was added as the *Y* variable, loneliness as well as self-control were added as the mediator separately); this program (model 6) was used to examine the sequential mediating effect as well (social exclusion was added as the *X* variable, smartphone addiction was added as the *Y* variable, loneliness and self-control were added as the mediators sequentially; Hayes, 2017). The bootstrap approach was used to obtain the 95% bias-corrected confidence intervals (CI) of these mediating effects. This method would repeatedly sample from the original data set using random samples of size *n* (identical to the size of the sample in the original data set); next, the parameters (such as confidence intervals) would be evaluated by using each bootstrap sample; finally, the statistical significance could be identified (Jung et al., 2019). The confidence interval (CI) referred to the interval between a parameter estimate's lower and upper limits at a certain confidence level (Jung et al., 2019). If a 95% CI included zero, the effect would be regarded as non-significant. Due to the fact that "bootstrapping provides the most powerful and reasonable method of obtaining confidence limits for specific indirect effects under most conditions" (Preacher and Hayes, 2008), and according to the recommendation of the previous study (Preacher and Hayes, 2008), the bias-corrected bootstrap estimates were performed based on 5,000 bootstrap samples.

Results

Preliminary analyses

The descriptive statistics and zero-correlations for all the study variables are displayed in Table 1. As expected, social exclusion was positively correlated with loneliness ($r = 0.535$, $p < 0.01$) and smartphone addiction ($r = 0.328$, $p < 0.01$), and negatively correlated with self-control ($r = -0.385$, $p < 0.01$). Besides, for the individuals with higher levels of loneliness ($r = 0.339$, $p < 0.01$) and low levels of self-control ($r = -0.541$, $p < 0.01$), they were more likely to be smartphone addicts. In addition, loneliness was negatively associated with self-control ($r = -0.389$, $p < 0.01$).

Social exclusion as a predictor of smartphone addiction

A linear regression analysis was conducted to test the effect of social exclusion on smartphone addiction. Results indicated that social exclusion had a significant and positive impact on smartphone addiction ($b = 0.565$, $p < 0.01$). This result verified the first hypothesis (H1) of the present study.

TABLE 1 Descriptive statistics and zero-order correlations of variables.

	Mean	SD	1	2	3	4
1. SE	17.347	5.997	1			
2. LON	11.189	3.602	0.535**	1		
3. SC	22.960	4.129	−0.385**	−0.389**	1	
4. SMA	32.691	10.333	0.328**	0.339**	−0.541**	1

SE, Social Exclusion; LON, Loneliness; SC, Self-Control; SMA, Smartphone Addiction. **$p < 0.01$.

TABLE 2 Results of the sequential mediated model.

Effect	*b*	95%CI	
		Lower	Upper
Direct effect			
SE → LON	0.322**	0.280	0.363
SE → SC	−0.171**	−0.231	−0.111
LON → SC	−0.293**	−0.394	−0.193
SE → SMA	0.156*	0.014	0.299
LON → SMA	0.314**	0.079	0.552
SC → SMA	−1.161**	−1.351	−0.972
Indirect effect			
SE → LON → SMA	0.101	0.028	0.181
SE → SC → SMA	0.199	0.132	0.276
SE → LON → SC → SMA	0.110	0.071	0.155
Total Indirect Effect	0.410	0.316	0.516

SE, Social Exclusion; LON, Loneliness; SC, Self-Control; SMA, Smartphone Addiction. *$p < 0.05$; **$p < 0.01$.

The mediating role of loneliness

PROCESS macro program (Model 4) was used to test the mediating effect of loneliness on the relationship between social exclusion and smartphone addiction. The results indicated that at step 1, social exclusion positively predicted loneliness ($b = 0.322$, $p < 0.01$); at step 2, social exclusion ($b = 0.355$, $p < 0.01$) and loneliness ($b = 0.655$, $p < 0.01$) positively predicted smartphone addiction. The direct effect of social exclusion on smartphone addiction was significant and positive ($b = 0.355$, 95% CI = [0.200, 0.510]); the indirect effect of social exclusion on smartphone addiction *via* loneliness was significant and positive ($b = 0.211$, 95% CI = [0.130, 0.312]). Therefore, loneliness partially mediated the association between social exclusion and smartphone addiction, the second hypothesis (H2) was supported.

The mediating role of self-control

The mediating effect of self-control on the association between social exclusion and smartphone addiction was examined by adopting the PROCESS macro (model 4) as well. The results indicated that at step 1, social exclusion negatively predicted self-control ($b = -0.265$, $p < 0.01$); at step 2, social exclusion ($b = 0.242$, $p < 0.01$) and self-control ($b = -1.220$, $p < 0.01$) significantly predicted smartphone addiction. The direct effect of social exclusion on smartphone addiction was significant and positive ($b = 0.242$, 95% CI = [0.114, 0.369]); the indirect effect of social exclusion on smartphone addiction *via* self-control was significant and negative ($b = 0.324$, 95% CI = [0.251, 0.405]). Therefore, self-control partially mediated the association between social exclusion and smartphone addiction, the third hypothesis (H3) was confirmed.

The sequential mediation model

The PROCESS macro (model 6) was applied to test the sequential mediating roles of loneliness and self-control in the relationship between social exclusion and smartphone addiction. The results are presented in Table 2. Social exclusion was significantly and positively related to loneliness ($b = 0.322$, $p < 0.01$) and negatively related to self-control ($b = -0.171$, $p < 0.01$). Besides, loneliness negatively predicted self-control ($b = -0.293$, $p < 0.01$), and positively predicted smartphone addiction ($b = 0.314$, $p < 0.01$). In addition, self-control was negatively correlated with smartphone addiction ($b = -1.161$, $p < 0.01$). Moreover, the direct effects of social exclusion on smartphone addiction was still significant ($b = 0.156$, $p < 0.05$) after controlling the effects of loneliness and self-control.

As far as the indirect effects were considered, the pathway of "social exclusion → loneliness → smartphone" was significant (indirect effect = 0.101, 95% CI = [0.028, 0.181]). The indirect effect of social exclusion on smartphone addiction through self-control was significant (indirect effect = 0.199, 95% CI = [0.132, 0.276]). Besides, the indirect effect of social exclusion on smartphone addiction through loneliness and self-control in sequence was significant (indirect effect = 0.110, 95% CI = [0.071, 0.155]). Moreover, the total indirect effect was significant as well (indirect effect = 0.110, 95% CI = [0.316, 0.516]). These results indicated that loneliness and self-control partially and sequentially mediated the association between social exclusion and smartphone addiction, which supported the fourth (H4) hypothesis.

Discussion

The relationship between social exclusion and smartphone addiction has not been widely studied, and little is known about the mediating mechanisms behind this association as well. According to the related theories and empirical studies, by adopting the process macro program, the present study established a sequential mediation model to test the relationship between the two variables and the mediating effects of loneliness and self-control on this association. The main findings and implications were listed and discussed as follows.

The relationship between social exclusion and smartphone addiction

Previous studies have confirmed that social exclusion is one antecedent of Facebook addiction as well as internet addiction (Poon, 2018; Lim, 2019; Arslan and Coşkun, 2021). Some scholars have also found that social exclusion can positively and significantly predict substance use disorder and other addictive behaviors (Rabinovitz, 2014; Bacon and Engerman, 2018; Wesselmann and Parris, 2021). Likewise, consistent with H1, the results of the present study also demonstrated that social exclusion is a significant and positive predictor of smartphone addiction. According to the interpersonal model of addiction relapse (Leach and Kranzler, 2013), the aversion feeling associated with social pain is caused by the decreased endogenous opioid activity during and after the experience of social exclusion. When individuals were exposed to social exclusion, they appear to undergo "endogenous opioid withdrawal" which is marked by intense craving and significant negative emotion. Some early researchers also considered that addictive behavior may serve as an alternative for social bond (Panksepp et al., 1978). Besides, communicating with others is one of the most important functions of smartphones. This function can provide a virtual world for individuals who suffer from a lack of social connections. The "poor get richer" model indicated that the poor may use smartphones as compensatory tools to alleviate their social difficulties and increase their social networks (Amichai-Hamburger et al., 2008). As a result, people who have been socially excluded may be vulnerable to using smartphones to alleviate their aversion feelings. This will contribute to smartphone addiction.

The mediating role of loneliness

Results of the current study indicated that H2 was confirmed: loneliness partially mediated the relationship between social exclusion and smartphone addiction. Specifically, social exclusion was positively correlated with loneliness, which in turn resulted in a higher level of smartphone addiction.

For the first path of the indirect effect, some evidence might be helpful for understanding the relationship between social exclusion and loneliness. As far as the concepts were considered, social exclusion refers to the experience of being physically or emotionally separated from others (Fung et al., 2016). In line with the emphasis on the experience of being separated from others in social exclusion, the sensation of being kept apart from other individuals has been colloquially termed loneliness (Weiss, 1973). From this point of view, it is reasonable to comprehend the positive association between the two variables. Besides, empirical studies have confirmed that loneliness is one of the negative consequences of social exclusion. According to the information theory of emotion (Simonov, 2013), negative emotions originate from the difference between available and indispensable information. Consistent with this theory, previous research has indicated that loneliness results from the difference between the desired and achieved interpersonal interactions (Cacioppo et al., 2014). Due to the fact that social exclusion impedes individuals from achieving desired relationships, consequently, the deficiency of social acceptance, inclusion, and support will contribute to the occurrence and development of loneliness. In addition, the need-to-belong theory and the temporal need-threat model (Williams, 2009; Baumeister, 2011) also posited that social exclusion may threaten individuals' fundamental needs – belonging, which will result in loneliness feelings. Based on empirical and theoretical evidence, the relationship between social exclusion and loneliness could be comprehended.

For the second path of the indirect effect, loneliness was positively associated with smartphone addiction. This finding was consistent with the previous studies which demonstrated that loneliness is a risk factor for smartphone addiction (Enez Darcin et al., 2016; Mahapatra, 2019; Kayis et al., 2021). According to the compensatory internet-use model, the purpose that people go online is to alleviate negative affects or evade real-life events (Kardefelt-Winther, 2014). Therefore, loneliness, whether it serves as one of the undesirable experiences or a negative life issue, may lead people to be addicted to smartphones. The uses and gratifications theory posited that individuals' smartphone use was motivated by their underlying psychological requirements (Katz, 1974). Because loneliness is characterized by the absence of belonging (Franklin and Tranter, 2021), and belonging needs have been regarded as one fundamental human motivation (Baumeister and Leary, 1995), consequently, lonely individuals were more likely to use smartphones excessively, intensively and endlessly. This would result in smartphone addiction.

In summary, the current study provided evidence that social exclusion might threaten individuals' belonging needs, which would lead to loneliness. Subsequently, lonely people would select smartphones to alleviate their negative experiences as well as meet their basic psychological requirements for interaction with others and inclusion by others.

The mediating role of self-control

In line with H3, the results of the current study indicated that self-control partially mediated the link between social exclusion and smartphone addiction. Specifically, social exclusion experiences resulted in lower levels of self-control, which in turn brought about a higher severity of smartphone addiction.

For the first path of this indirect effect, the results of this study were consistent with the prior studies. Some scholars have indicated that social exclusion is not only a direct predictor of self-control (Crescioni and Baumeister, 2009; Burson et al., 2012; Xiaojun et al., 2017), but can also contribute to negative affects and experiences such as loneliness, depression, and anger (Fung et al., 2016; Feng et al., 2019; Carlyle et al., 2020; Arslan, 2021), which will indirectly decrease self-control (Chester et al., 2016). This might be because social exclusion threatens individuals'

basic psychological requirements (Williams, 2009; Baumeister, 2011), which will motivate people to do something actively to compensate for their psychological distress or find some substitutes to console themselves. The greater the extent of social exclusion they perceived, or the more social exclusion situations they experienced, the greater the motivation to fulfill their needs would be, and the lower the level of self-control they could possess. Besides, according to the strength model of self-control (Baumeister et al., 2007), managing emotions and overcoming unwanted motivations will deplete self-control resources. Because social exclusion might cause negative feelings and threaten people's basic psychological needs, individuals' self-control would decrease after being socially excluded. Therefore, self-control as one of the detrimental consequences of social exclusion could be understood.

For the second path of this indirect effect, self-control was negatively associated with smartphone addiction. This finding was consistent with the previous studies which demonstrated that low self-control is a risk factor for smartphone addiction (Kim et al., 2016, 2018; Sok et al., 2019). Following what had been discussed in the prior paragraph, when people's self-control resources were depleted, they would not be able to control or regulate their behaviors and suppress their undesirable actions; besides, they might fail to set and keep long-term goals (Sok et al., 2019). Empirical studies have also found that the consumption of self-control strength can promote approach inclinations and reward-seeking actions (Giacomantonio et al., 2014). Due to the fact that smartphones have multiple functions that could be used for numerous activities, individuals low in self-control are vulnerable to being attracted to smartphones and tend to use smartphones immoderately. This might lead them to be addicted to this intelligent device. Moreover, a prior study has confirmed that individuals with low self-control are more likely to be socially excluded (Walters, 2016). Consequently, the impact of social exclusion would exacerbate people's self-control and subsequently contribute to smartphone addiction.

In summary, the current study provided evidence that social exclusion might threaten individuals' psychological needs and bring about negative experiences, which not only motivated them to find compensation to fulfill their requirements but also depleted their self-control resources. Subsequently, people low in self-control would use smartphones to compensate for their psychological requirements and alleviate their negative feelings, which would contribute to smartphone addiction.

The sequential mediating effects of loneliness and self-control

The results of the present study supported H4: loneliness and self-control sequentially mediated the link between social exclusion and smartphone addiction. Specifically, socially excluded individuals were more likely to experience loneliness, which in turn depleted their self-control strength and eventually brought about a higher severity of smartphone addiction. According to the I-PACE model (Brand et al., 2016), social exclusion, which acts as one type of social cognitions, is one of the core characteristics of the individuals; the negative affects and reduced executive functioning represent the mediators. The interaction of these indicators can contribute to smartphone addiction. Likewise, according to Social Cognitive Theory (SCT), "environmental influences, cognitive and personal factors, and behaviors all operate as interlocking determinants that affect each other bidirectionally" (Bandura, 1985). In the present study, social exclusion, loneliness, and self-control were regarded as the environmental and personal factors that gave rise to the occurrence and development of the behavioral consequence -- smartphone addiction. Therefore, the I-PACE model and SCT offered holistic perspectives to explain the relationships between these variables, and in turn, the results of the current study also provided empirical evidence for the two theories.

Conclusion

The present study examined the association between social exclusion and smartphone addiction as well as the mediating effects of loneliness and self-control on this relationship. Results indicated that: (1) social exclusion was a positive predictor of smartphone addiction; (2) loneliness and self-control separately mediated the association between social exclusion and smartphone addiction; and (3) loneliness and self-control sequentially mediated the relation between social exclusion and smartphone addiction. These results were conducive to comprehending the relationship between the two study variables as well as the underlying mechanism of this relationship. Some suggestions for future studies were listed as follows: First of all, because the present study was a cross-sectional design, the longitudinal design was encouraged to investigate the stable influence and the mediating effects of loneliness and self-control of social exclusion on smartphone addiction. In addition, social exclusion could lead to other detrimental influences on individuals' mental health, such as low self-esteem and a need to belong (Williams, 2009). Since these mental distress might also contribute to the development of smartphone addiction, future research was required to investigate different mediating mechanisms of the association between social exclusion and smartphone addiction. Moreover, future studies were recommended to explore effective approaches for reducing social exclusion, which would contribute to reducing the risk of smartphone addiction.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by the College of Psychology Inner Mongolia Normal University. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

Author contributions

XZ and HB: funding acquisition. XY, XZ, and BL: investigation. HY: writing – original draft. HB: writing - review and editing. All authors contributed to the article and approved the submitted version.

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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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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2022.945631/full#supplementary-material

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