

# Investigating the Cognitive and Affective Dynamics of Social Media Addiction: Insights From Peer Contexts

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Informed by the interaction of person-affect-cognition-execution (I-PACE) theory, the present studies examined the association between peer rejection, peer popularity, and social media addiction (SMA) at both between-person and within-person levels. Two distinct processes, the fear-driven/compensation-seeking process and the reward-driven process were explored. In Study 1, using a cross-sectional sample of high school students ( $N = 318$ ), both processes were supported via different cognitive mediators. Support for the fear-driven/compensation-seeking process was demonstrated by finding that avoidance expectancy was a significant cognitive mediator between peer-nominated rejection and SMA. In turn, the reward-driven process was supported by the significant mediation of reward expectancy between peer-nominated popularity and SMA. In Study 2, using ecological momentary assessment with college students ( $N = 54$ ), we found the fear-driven/compensation-seeking process partially supported through both between-person and within-person mediations. Specifically, negative affect and social media craving were two affective mediators that linked peer rejection and addictive social media use behaviors. On the other hand, the reward-driven process was predominantly supported by within-person mediations, in which positive affect and social media craving were found to be mediators of the relationship between peer popularity and addictive social media use behaviors. The results underscore that adolescents experiencing rejection tend to use social media to avoid negative feelings and compensate for interpersonal deficits, while adolescents experiencing popularity tend to use social media to maintain positive feelings and gain social rewards. Implications for the assessment, case formulation, and treatment of SMA in counseling practice are discussed.

## Public Significance Statement

The study suggests that peer rejection and popularity predispose adolescents to social media addiction through different cognitive and affective mechanisms. These findings warrant the need for counselors to assess and formulate SMA from an interpersonal perspective and develop counseling interventions that target unique cognitive and affective components.

**Keywords:** social media addiction, peer rejection, popularity, compensation, reward

With social media (e.g., Facebook, Instagram, or TikTok) becoming increasingly popular among teenagers, researchers and mental health professionals have raised concerns about social media addiction (SMA) and the extent that it negatively impacts young people's mental health (Xuan & Amat, 2020). SMA is a behavioral addiction characterized by six components: salience, mood modification,

intolerance, withdrawal, relapse, and conflict (Andreassen et al., 2012). A survey of approximately 150,000 adolescents across 29 countries found the prevalence of SMA ranged from 3.22% to 14.17% (Boer et al., 2020). Meta-analyses have shown global prevalence rates between 6% (Cheng et al., 2021) and 17% (Meng et al., 2022) for SMA with collectivist cultures and countries from Southeast Asia

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having the highest prevalence rates (Huang, 2014; L. Zhao, 2021). In China, SMA has become such a great public concern that the Cyberspace Administration of China released guidelines limiting screen time for adolescents less than 18 years old. Although SMA is not currently classified as a clinical disorder, it is a clear concern for counselors because of its strong association with psychological distress (Błachnio et al., 2016; Hussain et al., 2020), mental health disorders (e.g., depression, anxiety, attention deficit and hyperactivity disorder, and obsessive compulsive disorders; Hussain & Griffiths, 2018), and poor developmental outcomes for adolescents such as lower self-worth, interpersonal problems, and low academic achievement (Boer et al., 2020; Wartberg et al., 2020). As Xuan and Amat (2020) asserted in their systematic review, “counselors as well as mental health workers have to equip relevant knowledge in social media addiction to provide the most effective services to young people with social media addiction.” (p. 537).

Though SMA has become a significant clinical issue, little research in counseling psychology has focused on the mechanism of SMA especially in adolescents and young adults. As such, there is an imperative for researchers and practitioners to explore the developmental contexts and processes that lead to the development and maintenance of SMA in adolescents and young adults. This knowledge can help counselors to provide targeted interventions to clients who experience addictive social media behaviors. Therefore, based on the Interaction of Person-Affect-Cognition-Execution (I-PACE) theoretical model (Brand et al., 2016, 2019; see detailed description below), we conducted two studies that together explored (a) whether peer relations, particularly *peer rejection* and *peer popularity* are predisposing risk factors of SMA and (b) what underlying mechanisms (i.e., *the fear-driven/compensation-seeking process* and *the reward-driven process*) link peer rejection and peer popularity to SMA.

## The I-PACE Model

Many well-established counseling theories have been applied to examine the risk factors of SMA such as motivations (e.g., motivational interviewing; Miller & Rose, 2009), needs (e.g., self-determination theory; Ryan & Deci, 2000), and cognitions (e.g., social cognitive theory; Bandura, 1989), for a comprehensive review, see Y. Sun and Zhang (2021). More recently, Brand et al. (2016, 2019) proposed the I-PACE model to explain the development and maintenance of a variety of addictive Internet-use behaviors including SMA. The I-PACE model proposes that SMA develops as a consequence of the interplay between stable Predisposing variables (e.g., genetics, early childhood experiences, general coping style, psychopathology, motives), Affective (e.g., cue-reactivity, craving), and Cognitive (e.g., outcome expectancy, attentional bias) responses to certain stimuli as well as Executive functions (e.g., inhibitory control). Though relatively new, the I-PACE theory has got over 2,000 citations with researchers applying it to a Africa (Munyeti, 2022), China (Li et al., 2022; Luo et al., 2021a; Peng et al., 2020), Germany (Wegmann et al., 2015, 2018), Poland (Balcerowska et al., 2023), South Korea (Jhone et al., 2021), and the United States (J. Sun, 2023; N. Zhang et al., 2023), proving the universality of the theory. For the purposes of this study, we will be focusing on the predisposing variables (P), cognitive (C), and affective (A) components of the model.

According to the I-PACE model (Brand et al., 2016, 2019), predisposing variables are not directly associated with SMA but rather exhibit indirect associations through cognitive and affective processes. One key cognitive factor is outcome expectancy, including avoidance expectancy (i.e., beliefs that using social media can alleviate negative affect, avoid boredom, and troubles) and reward expectancy (i.e., beliefs that using social media can yield rewarding experiences and enhance positive affect; Brand et al., 2014; Wegmann et al., 2017). The I-PACE model (Brand et al., 2016, 2019) asserts that individuals with high outcome expectancy are more likely to use social media, which in turn consolidates the expectancy (i.e., reinforcement) and enhances the risk of addiction. The model also asserts affective responses as mediators between predisposing variables and SMA. For example, both negative affect and positive affect were found to be significantly associated with smartphone addiction (Li et al., 2020). Craving, a difficult-to-resist urge to engage in certain activities, is another affective response that plays an important role in the development of SMA (Brand et al., 2016). Niu (2016a) found cue-induced craving was more intense among internet addicts than nonaddicts.

These cognitive and affective processes lead to two distinct mediation pathways underlying SMA: the fear-driven/compensation-seeking process and the reward-driven process (Wegmann & Brand, 2019). Individuals with socially painful experiences (e.g., rejection, isolation, loneliness) may develop SMA through a *fear-driven/compensation-seeking process*, that is, they tend to use social media to compensate for social deficits and reduce the fear of missing out (Dempsey et al., 2019; Kardefelt-Winther, 2014). In contrast, socially rich individuals (e.g., high trait narcissism, high need for popularity) may be more likely to develop SMA through a *reward-driven process*, that is, they are motivated to use social media to maintain social status and gain others' admiration (Casale & Fioravanti, 2018). Despite the short-term benefits, the long-term and repetitive use of social media could strengthen the maladaptive cognitions (e.g., avoidance/reward expectancy) and affective components (e.g., negative/positive affect or craving) and eventually lead to addiction (Smahel et al., 2012; Weidman et al., 2012). Few studies explicitly tested two pathways since its proposal by Wegmann and Brand (2019), though some evidence showed avoidance expectancy mediated the associations between interpersonal sensitivity and SMA, possibly supporting the fear-driven/compensation-seeking process (Laier et al., 2018; Wegmann et al., 2017, 2018). We believe two crucial gaps existed in this line of work. First, no study has simultaneously examined the two hypothetical mechanisms in the context of SMA. This examination is important because it teases apart the unique contribution of positive reinforcement and negative reinforcement in the development of SMA and informs targeted interventions. Second, previous studies have largely focused on *intrapersonal* predisposing factors (e.g., personality, attachment styles, needs, motivations) of SMA. Considering the crucial role of peer relationships in predicting adolescents' mental health outcomes and problematic behaviors (Lee et al., 2017; Prinstein & Giletta, 2020), we believe it would be helpful to expand the I-PACE model by introducing *interpersonal* factors related to peer contexts. As compared to children (<10 years), adolescents spend significantly more time with peers, form more complex peer relationships, and are markedly more sensitive to social evaluations associated with peer status (e.g., acceptance, rejection, popularity; Lam et al., 2014; Somerville, 2013). Prior

research found peer status was associated with greater investment digital stress, digital status seeking, and internet addiction (Field et al., 2024; Nick et al., 2022; B. Zhao & Jin, 2023). As such, it is important to examine peer status (i.e., peer rejection and peer popularity) as risk factors of SMA under the theoretical framework of I-PACE.

### Peer Rejection, Peer Popularity, and Social Media Addiction

Developmental psychologists traditionally characterized two types of social status—likability and popularity in the peer system (Asher & Coie, 1990; Cillessen & Rose, 2005). Likeability reflects peers' general sentiment towards youth. Peer rejection is a marker of likeability that reflects the degree to which children or adolescents are disliked, denied, and neglected by their peers (Coie et al., 1990). Peer rejection was traditionally assessed by peer nomination (e.g., "who are the students in your class that you personally like/dislike the most"), though most studies have focused on how self-reported experiences of rejection impact SMA. Teens who self-reported experiencing peer rejection were more likely to use Instagram to escape from reality (Sheldon & Newman, 2019). Social media also served as a platform for adolescents to build online-only friendships following experiences of rejection (P. M. Valkenburg & Peter, 2009). These findings seem to support the fear-driven/compensation-seeking process of I-PACE that children and adolescents following experiences of rejection use social media as compensation for their unmet socialization needs in real life, and this might enhance the risk of SMA (Brailovskaia et al., 2019). However, no studies have directly explored the association between peer rejection and SMA and the underlying mediation mechanisms. This is an important oversight as the mediating cognitive and affective processes could be important intervention targets.

In turn, rather than reflecting the "likeability" among peers, peer popularity reflects the extent that adolescents are more popular, enjoy more resources, and have more power compared with their peers (Parkhurst & Hopmeyer, 1998). Peer popularity has also been traditionally assessed through peer nomination ("Who are the students in your class that you believe are most popular/unpopular"). Popularity can bring immediate rewarding experiences (e.g., feeling good, enjoying attention), which can be maintained and amplified through social media (Nesi et al., 2018a, 2018b). For example, a common way of seeking popularity via social media is writing blogs or sharing photos of self (i.e., "selfies"), which can lead to receiving "likes" and positive comments that maintain positive feelings and high social status (Sherman et al., 2016). However, use of social media in this way could lead to the development of expectancy to obtain these rewards (i.e., likes) and excessive reliance on social media for gratification may increase craving for those rewards which ultimately leads to SMA (Wadsley & Ihssen, 2022). Consistent with this, Longobardi et al. (2020) found adolescents with more followers on social media were more addicted to Instagram use, suggesting a possible association between peer popularity and SMA. These findings seem to support the underlying assertion of I-PACE about the reward-driven process. Nonetheless, no studies have directly explored the association between peer popularity and SMA and the underlying mediation mechanisms.

### From Between-Person to Within-Person Associations

So far, most empirical evidence about the fear-driven/compensation-seeking and the reward-driven processes of SMA has been limited to *between-person association*. These associations examine the extent to which variables, such as  $X$  leading to  $Y$ , differ for an individual compared to the average of all participants. While between-person associations offer valuable insights into examining *who* are more susceptible to SMA compared to group average, they cannot uncover the within-person changes in cognitions, affects, and behaviors. To understand SMA from a process-oriented perspective, it is necessary to gather more evidence regarding *within-person association*, which involves examining the extent to which variables, such as  $X$  leading to  $Y$ , vary in comparison to an individual's average level (L. P. Wang & Maxwell, 2015). In other words, it allows us to study *when* an individual tends to use social media more frequently, and *what* triggers their desire to engage with social media. This information is central to developing effective personalized interventions to help individuals (Heinz et al., 2020).

Ecological momentary assessment (EMA), also known as experiences sampling method or intensive longitudinal design, provides repeated within-day assessments of feelings and behaviors in real time and in naturalistic settings, thereby reducing retrospective bias and increasing ecological validity (Shiffman et al., 2008; Shiyko et al., 2014). The feasibility and validity of EMA has been demonstrated in individuals with substance addiction (Dvorak et al., 2018; Serre et al., 2015). Because SMA manifests as discrete, concrete, and repeatable social media use in daily life, EMA can provide insights for the mechanism of SMA through assessing the dynamics of positive and negative affect, craving, and concrete social media use behaviors as a function of contextual factors. In particular, two types of social media use behaviors have been conceptualized: Active social media use (active SMU) entails active interactions on social media such as posting a status update, commenting or "liking" a post, or sending private messages, while passive SMU refers to passively scrolling feeds or monitoring the online life of others without direct interactions (Verduyn et al., 2022).

No prior EMA study examined the within-person associations between peer rejection, popularity, affect, and SMA. Nonetheless, Hamilton et al. (2021) conducted EMA with adolescent girls and found negative peer interactions on social media were associated with a person's sustained negative affect such as sadness, worry, and stress, while positive interactions were associated with more sustained positive affect such as happy, joyful, and excited. In turn, negative affect was associated with both active and passive SMU (X. X. Zhang et al., 2020), and passive SMU was associated with a wide range of emotions including envy, inspiration, and enjoyment (P. M. Valkenburg et al., 2022). Conversely, craving exhibits a robust association with both momentary negative and positive affect and behaviors such as smoking and substance use (Dvorak et al., 2018; Mahadevan et al., 2020). In conclusion, more studies are needed to move beyond the between-person level to uncover the mechanism of SMA and assist the fields knowledge about to best intervene with individuals experiencing addictive social media use.

### The Present Studies

The goal of the present study is twofold. First, we aimed to examine the associations between peer rejection, peer popularity,

and SMA and explore two differential mechanisms, namely, the fear-driven/compensation-seeking process and the reward-driven process underlying these relationships. Second, we wanted to employ a multimethod approach to explore whether these relationships hold at both between-person (traitlike) and within-person (daily) level. Figure 1 shows the conceptual model of our study. For Study 1, we focused on the cognitive mediators (avoidance expectancy, reward expectancy) and the between-person associations. Methodologically, we collected cross-sectional data and measured peer-nominated rejection, peer-nominated popularity, outcome expectancies, and SMA. For Study 2, we focused on the affective mediators (negative affect, positive affect, social media craving) and expanded findings to the within-person level. We collected EMA data and assessed self-reported experiences of peer rejection, peer popularity, affect, social media craving, and a variety of social media behaviors (e.g., active SMU, passive SMU) four times a day for 14 days. The nature of this intensive sampling allowed for the examination of the associations at both between-person (traitlike) and within-person (daily) levels. Generally, we expected the association between peer rejection and SMA to be explained by the fear-driven/compensation-seeking process, while the association between peer popularity and SMA was explained by the reward-driven process. Specific hypotheses were stated before each study. The studies were not preregistered though all data have been made publicly available at the Open Science Framework and can be accessed at <https://osf.io/6cr3j/>.

### Study 1

Study 1 examined the cognitive mediating mechanisms in the association between peer rejection, peer popularity, and SMA in Chinese adolescents. Based on the fear-driven/compensation-seeking process (Wegmann & Brand, 2019), we hypothesized that the association between peer rejection and SMA would be positively mediated by avoidance expectancy (but not reward expectancy). Conversely, according to the reward-driven process (Wegmann & Brand, 2019), we hypothesized the association between peer

popularity and SMA would be positively mediated by reward expectancy (but not avoidance expectancy).

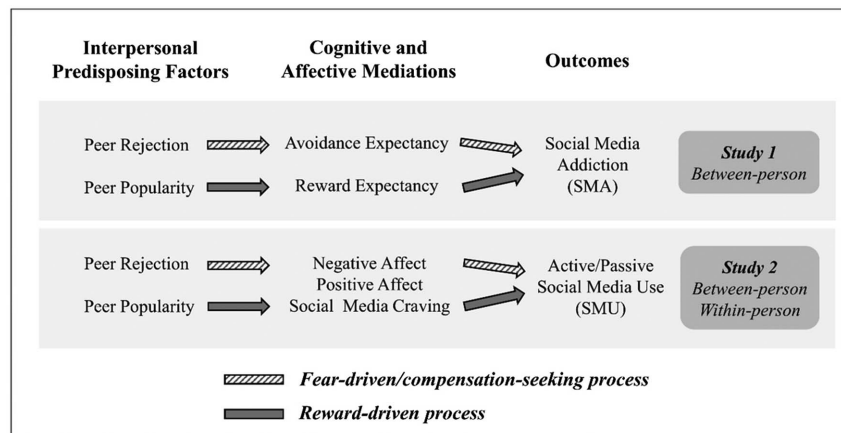
## Method

### Participants and Procedure

Participants ( $N = 318$ ) were Chinese adolescents from 17 different tenth grade classes in a high school in eastern China. Participants self-identified as female (57.5%;  $n = 183$ ) and male (42.5%;  $n = 135$ ), ranged in age from 14 to 17 years old ( $M = 15.56$ ,  $SD = 0.59$ ), and the majority were of Han ethnicity (93.7%,  $n = 298$ ). The majority of participants (81.8%;  $n = 256$ ) reported family average monthly income below 10,000 Renminbi (RMB; \$1,400) followed by income between 10,000 and 15,000 RMB (\$1,400–\$2,113; 12.8%;  $n = 40$ ), and income above 15,000 RMB (\$2,113; 5.3%;  $n = 17$ ). The majority (73.3%;  $n = 233$ ) of participants owned a smartphone.

Study 1 was approved by the institutional review board of Peking University (Protocol number: #2022-06-02). Students ( $N = 910$ ) received a flyer that introduced the aim and procedure of the study. Informed consent documents were sent to both students and one of their parents/guardians, and both parental/guardian consent and student assent were obtained for eligible participants. Of the 910 students who received the flyer, 383 received both parental/guardian consent and student assent and each received an envelope along with a five-page questionnaire, which included a peer nomination task (see detailed description below) as well as other measures. To avoid the potential social desirability, students were asked to finish the questionnaire in a private space and then turn in the sealed envelope to the researcher. An additional 29 students were excluded before analyses were conducted as a result of failing at least two out of three instrumental checks such as “Please indicate option [never] for this question.” The remaining 354 students were spread out over 15 classes with the class participation rate (i.e., the percentage of students in the class who completed the peer nomination task) varying from 1.82% to 96.22%. Because a peer nomination score is typically calculated within class (see description below), the validity of peer nomination would be threatened in classes with very low participation

**Figure 1**  
*The Proposed Conceptual Model*



Note. SMA = social media addiction; SMU = social media use.



rates (e.g., less than 20%; Marks et al., 2013). Therefore, we excluded 36 students from classes which the participation rate was lower than 20%. This final sample includes 318 participants.

## Measures

**Peer Rejection and Peer Popularity.** The peer nomination method was used to measure peer rejection and peer popularity (see Cillessen & Mayeux, 2004). Participants were presented with a roster with all the names of their classmates in the alphabetic order and were asked to nominate people in the roster (except themselves) that “they liked most,” “they disliked most,” “were the most popular in class,” and “were the least popular in class.” Participants were allowed to nominate three people for each item. The number of “like,” “dislike,” “popular,” and “unpopular” were summed up and standardized within classes for each participant. Peer rejection was calculated as the standardized difference between the “dislike” score and the “like” score (i.e., peer rejection =  $Z_{(\text{Dislike}-\text{Like})}$ ) with a higher score indicating higher level of peer rejection. Peer popularity was calculated as the standardized difference between the “popular” score and the “unpopular” score (i.e., peer popularity =  $Z_{(\text{Popular}-\text{Unpopular})}$ ) with a higher score indicating higher level of peer popularity. The validity of peer rejection and peer popularity using peer nomination method have been demonstrated in Chinese children and adolescents (X. Chen et al., 1992; Niu, 2016b; Schwartz et al., 2010; Tseng et al., 2013).

**Avoidance Expectancy and Reward Expectancy.** The Internet Use Expectancy Scale for Social Network Sites (Wegmann et al., 2017) was used to measure avoidance expectancy and reward expectancy. Internet Use Expectancy Scale for Social Network Sites was comprised of two subscales: avoidance expectancy (four items, e.g., “I use social media to shift attention from problems/troubles”) and reward expectancy (four items, e.g., “I use social media to experience happiness”). Participants rated each item on a 6-point Likert scale, ranging from 1 (*completely disagree*) to 6 (*completely agree*). A summed score was computed for each subconstruct with higher total scores indicating greater levels of avoidance expectancy and reward expectancy. Construct validity was evidenced by its significant positive correlations with internet-use disorders in Chinese populations (Stodt et al., 2018). The Cronbach’s  $\alpha$  was .81 for avoidance expectancy and .90 for reward expectancy in our study.

**Social Media Addiction (SMA).** The short-form Bergen Social Media Addiction Scale was used to measure SMA (Andreassen et al., 2017). Participants were instructed to “Think of your general use pattern across social media platforms. Examples of social media include Weibo, Wechat, TikTok, etc.” The scale (six items) was unidimensional and assessed six addiction-related symptoms: salience, mood modification, withdrawal, intolerance, relapse, and conflict. An example is “In the past year, I spent a great amount of time thinking about social media or planning to use social media” for salience. Each item was measured on a 5-point Likert scale, ranging from 1 (*not at all*) to 5 (*very often*). A summed score was computed such that higher scores indicated greater levels of social media addiction. Bergen Social Media Addiction Scale has been widely used to assess the addition level of internet-related activities in Chinese adolescents and college students (Luo et al., 2021b; C.-W. Wang et al., 2015) and its construct validity was demonstrated by its significant positive correlations with time spent

on social media (N. Zhao & Zhou, 2021). The Cronbach’s  $\alpha$  was .82 for social media addiction in this study.

**Social Media Use Intensity.** We assessed social media use intensity as a potential covariate of SMA. Different from the measure of social media addiction that focused on typical symptoms, social media use intensity assessed exclusively the time spent on social media (Gori et al., 2023). Participants were asked to estimate the time they spent on each of the five social media platforms that are popular in China (i.e., Wechat, Weibo, QQ, Tiktok, Kuaishou) in the past 7 days with a 5-point Likert scale (1 = *do not use at all*, 2 = *less than 30 min*, 3 = *30 min–1 hr*, 4 = *1 hr–3 hr*, 5 = *3 hr–6 hr*). A higher score indicated a higher degree of SMU intensity. Cronbach’s  $\alpha$  of social media use intensity was .66 in this study.

## Statistical Analysis

Data were analyzed with Mplus 7.0. We conducted a structural equation modeling (SEM) with peer rejection and peer popularity as predictors, avoidance expectancy, and reward expectancy as mediators, and SMA as outcome. Peer rejection and popularity were manifest exogenous variables because they were assessed with a single index score. Avoidance expectancy, reward expectancy, and SMA were latent endogenous variables. We used the comparative fit index (CFI; values equal to or greater than .95), the root-mean-square error of approximation (RMSEA; values equal to or less than .08), and the standardized root-mean-square residual (SRMR; values equal to or less than .06) to estimate the fit of the model to the data (Hu & Bentler, 1999). We used the maximum likelihood estimation (i.e., ESTIMATOR = ML) with 10,000 bootstrapping to obtain robust confidence intervals of mediation effects (Shrout & Bolger, 2002).

## Results and Discussion

### Descriptive Statistics, Correlations, and Measurement Model

The mean, standard deviation, minimum, maximum, skewness, and kurtosis of each observed variable as well as the zero-order correlations are shown in Table 1. Considering the significant positive correlations between social media use intensity, smartphone ownership, and SMA demonstrated in previous studies and the present study (Boer et al., 2021; Chang et al., 2019), we included social media use intensity and smartphone ownership as covariates in the following analyses. It should be noted that removing covariates did not change the significant results of the model.

An initial test of the measurement model indicates an acceptable fit,  $\chi^2(118, N = 318) = 280.63, p < .001, CFI = .93, RMSEA = .07, 90\% CI [.06, .08], SRMR = .06$ . All factor loadings ( $\beta$ s ranged from .55 to .93) were significant ( $ps < .001$ ), indicating the latent variables were adequately measured by their indicators.

### SEM for Testing Mediated Effects

The structural model (see Figure 2) showed the same fitness results as the measurement model because the model was saturated,  $\chi^2(118, N = 318) = 280.63, p < .001, CFI = .93, RMSEA = .07, 90\% CI [.06, .08], SRMR = .06$ . Confirming the hypothesis of fear-driven/compensation-seeking process, we found the association between peer rejection and SMA was fully mediated by avoidance

**Table 1***Descriptive Statistics and Correlations Among Observed Variables in Study 1*

Observed variable	1	2	3	4	5	6	7
1. Peer rejection	—						
2. Peer popularity	-.66***	—					
3. Avoidance expectancy	.14*	-.05	—				
4. Reward expectancy	-.04	.12*	.43***	—			
5. Social media addiction	-.01	.04	.44***	.42***	—		
6. Social media use intensity	.01	.06	.17***	.24***	.31***	—	
7. Smartphone ownership	.01	.00	-.17**	-.20***	-.16***	-.28***	—
<i>N</i>	318	318	314	312	315	316	316
<i>M</i>	0.00	0.00	2.66	3.79	1.85	2.10	1.26
<i>SD</i>	0.99	0.99	1.23	1.28	0.76	0.78	0.44
Min	-3.12	-3.85	1.00	1.00	1.00	0.00	1.00
Max	3.77	4.15	6.00	6.00	4.50	5.00	2.00
Skewness	0.60	-0.16	0.63	-0.47	0.85	0.70	1.08
Kurtosis	2.02	4.25	-0.28	-0.30	0.26	1.17	-0.83

Note. *N* = 318.

\**p* < .05. \*\**p* < .01. \*\*\**p* < .001.

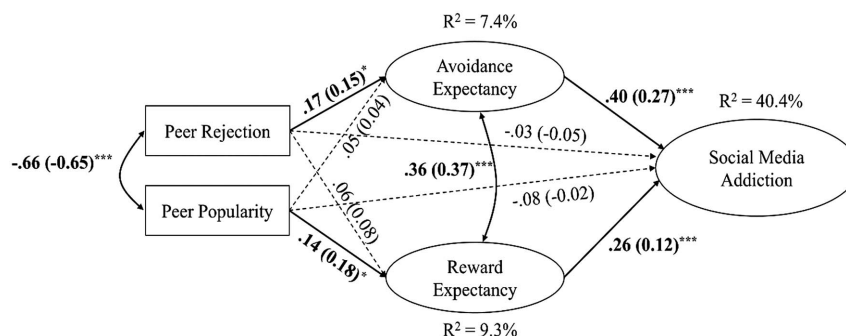
expectancy (indirect effect  $\beta = .07$ ,  $b = 0.04$ , 95% CI [0.002, 0.10]). Peer rejection had a significant positive correlation with avoidance expectancy ( $\beta = .17$ ), which in turn had a significant positive correlation with SMA ( $\beta = .40$ ). Furthermore, the path coefficient from peer rejection to reward expectancy ( $\beta = .06$ ) was not significant, suggesting that peer rejection was uniquely associated with avoidance (rather than reward) expectancy.

Confirming the hypothesis of reward-driven process, we found the association between peer popularity and SMA was completely mediated by reward expectancy (indirect effect  $\beta = .04$ ,  $b = 0.02$ , 95% CI [0.003, 0.05]). Peer popularity had a significant positive correlation with reward expectancy ( $\beta = .14$ ), which in turn had a significant positive correlation with SMA ( $\beta = 0.26$ ). Furthermore, the path coefficient from peer popularity to avoidance expectancy ( $\beta = .05$ ) was not significant, indicating peer popularity was uniquely correlated with reward (rather than avoidance) expectancy.

Overall, Study 1 provided some empirical evidence for the I-PACE theory by highlighting the role of two cognitive mediators—avoidance expectancy and reward expectancy in the relationship between peer rejection, peer popularity, and SMA. Consistent with previous research (Dijkstra et al., 2015), we found different peer status was associated with different motivations for social media use, which both increased the risk of SMA. Peer rejection was associated with the motivation to use social media to avoid real-world problems and compensate for negative experiences (i.e., avoidance expectancy), while peer popularity was associated with the motivation to use social media for rewards and positive feelings (i.e., reward expectancy). Our study also adds to the previous literature by further differentiating avoidance expectancy and reward expectancy and newly demonstrating their unique roles in the fear-driven/compensation-seeking process and the reward-driven process.

**Figure 2**

*Relationships Among Peer Rejection, Popularity, Expectancy, and Social Media Addiction*  
(*N* = 318)



Note. Covariates and observed factors of latent variables were omitted for parsimony. Solid lines with bold-face numbers and dashed lines indicated significant or nonsignificant paths, respectively. Numbers outside of the bracket indicated the standardized path coefficients and numbers inside the bracket indicated the unstandardized path coefficients. *R*-square represented the percentage of variance that the model explained for each exogenous variable. Social media use intensity and smartphone ownership were added to the model as covariates.

\**p* < .01. \*\*\**p* < .001.

## Study 2

Although Study 1 confirmed the unique role of fear-driven/compensation-seeking and reward-driven processes, such relationships were built on the between-person level (i.e., interindividual associations). In other words, we could only conclude that adolescents higher in traitlike peer rejection/popularity reported higher use expectancies, which are then associated with more social media use symptoms than their peers. To extract a clinically meaningful lesson from these between-person findings, one must infer that these between-person patterns occur temporally within-person (e.g., that rejective experiences in a person's daily life are related to more social media behaviors), which is still unknown. Therefore, Study 2 tested whether the fear-driven/compensation-seeking process and the reward-driven process are experienced at the within-person level with a focus on affective mediations. Study 2 collected ecological momentary assessment (EMA) data from a group of Chinese undergraduates who have more access to mobile technologies compared to high school students. We asked participants to report their peer rejection, peer popularity, momentary affect, social media craving, and social media behaviors five times a day for 14 consecutive days. To make measurements applicable to the EMA design, we assessed self-reported rejection/popularity instead of peer nomination. We also assessed SMU behaviors and classified them into active SMU (i.e., chatting, posting status, liking, commenting on others' status, and seeking social support) and passive SMU (e.g., scrolling other's status and making social comparison) as outcome variables (Verduyn et al., 2022). Notably, we did not measure SMA because SMA is conceptualized as a trait-based characteristic that remains unaffected by contextual factors in the short time window (e.g., hours to days).

We proposed that the association between peer rejection and active and passive SMU would be understood by a fear-driven/compensation-seeking process. Specifically, we hypothesized that the positive association between peer rejection and SMU would be serially mediated by increased negative affect and increased social media craving at both between-person and within-person levels. The rationale is that perceiving peer rejection would bring socially painful experiences, while social media creates an avenue for compensating or reducing the negative affect (e.g., fear, sadness, loneliness) following peer rejection (Lutz & Schneider, 2021). On the other hand, we proposed that the association between peer popularity and SMU would be understood by a reward-seeking process at both between-person and within-person levels. Specifically, we hypothesized the positive association between perceived peer popularity and SMU would be serially mediated through increased positive affect and increased social media craving. The rationale is that perceiving peer popularity would bring positive feelings and craving for social media, and social media use provides additional opportunities for reinforcing those positive rewarding experiences, for example, by posting a carefully polished selfie and receiving tons of "likes" (Utz et al., 2012).

It is important to note that at the within-person level, the fear-driven/compensation-seeking process and the reward-driven process may not be mutually exclusive. For example, an individual might initially turn to social media as a way to cope with rejection (increased fear-driven process) but may also find pleasure and a sense of popularity after using social media (increased reward-driven process). In this scenario, these two processes coexist, each

manifesting salience at different times (Brandtner et al., 2023). However, it is also plausible that following rejection, an individual primarily turns to social media for compensation due to heightened negative affect (increased fear-driven process) and might forego the enjoyable aspects of social media use (decreased reward-driven process) due to low positive affect. In this case, the two processes may be complementary (Ha et al., 2019). Since previous literature does not provide within-person evidence for us to make these additional hypotheses, we conducted exploratory analyses regarding: (a) the relationship between peer rejection and SMU through positive affect and/or craving and (b) the relationships between peer popularity and SMU through negative affect and/or craving.

## Method

### Participants and Procedure

Participants ( $N = 54$ ) from a northern university in China ranged in age from 17 to 24 ( $M = 18.8$ ,  $SD = 1.2$ ). The majority (55.6%;  $n = 30$ ) were female, first-year students (94.4%;  $n = 51$ ), and of Han ethnicity (88.9%;  $n = 48$ ). A majority of participants (42.6%;  $n = 23$ ) reported their family average monthly income to be below 10,000 RMB (\$1,400), followed by income between 10,000 and 20,000 RMB (\$1,400–\$2,800; 31.5%,  $n = 17$ ), or income above 20,000 RMB (\$2,800; 25.9%,  $n = 14$ ).

Study 2 was approved by the institutional review board of Peking University (Protocol number: #2022-06-02). Eligible participants needed to own a smartphone and use social media platforms (i.e., *WeChat* or *Weibo*, two of the most popular social media platforms in China) no less than once a day. After being provided with the informed consent, participants were contacted by research assistants and then were instructed to install PIEL Survey (<https://pielsurvey.org/>) on their smartphones. PIEL Survey is a free app that has been widely used to gather data in daily life. One feature of PIEL Survey is that all data are stored on the participants' devices until sent by email rather than being uploaded or backed up on a remote server or to a cloud service. Due to this feature, researchers are not able to have access to data unless participants are willing to email it, which guarantees the voluntariness of data sharing. After finishing the 14-day EMA, participants sent their data via email and were compensated \$10–\$20 depending upon the completion rate (see monitoring plan below). Sixty-nine students initially agreed to participate in Study 2, however, 13 were not able to complete the EMA procedures due to software problems. Of the 56 participants who completed the 14-day EMA procedure, two were excluded whose completion rates were less than 50% (P. Valkenburg et al., 2021), leaving a final sample of 54 for data analysis.

**EMA Sampling.** During the 14-day EMA, each participant was prompted five times per day to fill out a survey of 19 questions that takes approximately 2 min to finish. In total, each participant received 70 ( $5 \times 14$ ) surveys. A semirandom sampling schema was applied to avoid the structural patterns in peer interactions while taking into account students' class schedules so that the prompts did not distract students from class (Pouwels et al., 2021). On weekdays, participants received prompts during morning class break (9:50–10:10), lunch break (12:00–1:00), afternoon class break (2:50–3:10), dinner break (5:30–6:30), and evening (8:30–9:00). On weekends, participants received prompts during 10:30–11:00 and 12:30–1:00 in the morning, 3:00–4:00 and 6:00–7:00 in the

afternoon, and 9:00–10:00 in the evening. If participants did not notice the prompt, the app would send a reminder in 5, 10, or 15 min. Participants could not open the survey if they did not respond to the prompt within 30 min. If participants opened the survey but failed to finish it in 15 min, the survey automatically closed.

Three types of incentives were set to motivate participants to finish surveys: (1) Participants received \$1 for downloading and testing the PIEL Survey app and \$0.1 for finishing each survey; (2) We randomly selected 3 days to check in with participants about their current completion rate and send encouraging words. If participants passed the check (i.e., completion rate > 60%), they received rewards ranging from \$0.5 to \$3 depending on their completion rate; (3) At the end of the study, participants received \$1, \$3, \$6, and \$9 if their completion rate was 50%–70%, 70%–80%, 80%–90%, and 90%–100%, respectively. In addition, participants received a \$5 bonus gift card if they finished the survey.

## Measures

**Peer Rejection and Peer Popularity.** Peer rejection and popular experiences were measured with five items that were adapted from Sequeira et al. (2021). To assess perceived peer rejection, participants first received a prompt “Think about the interactions with people of your age that made you feel the worst since last beep.” If participants could not think of a negative interaction, they could select the option that states “I find it hard thinking of something.” They were then probed with a statement that helped them think about what happened since last beep: “What did you do since last beep? Did you interact with peers online or face-to-face? Did anything happen that trouble you, hurt your feelings, or make you stressed out during your interaction with peers?” If participants continued to indicate they did not have negative peer interactions, then this observation was coded as missing and was not included in the calculation of peer rejection score. If participants indicated they experienced negative peer interactions, they were then asked to rate to what extent they felt *rejected*, *threatened*, and *ignored* during that interaction on a 5-point Likert scale (1 = *not at all*, 5 = *very strongly*). The average score of three items indicated the intensity of *perceived peer rejection*. In the present study, the Omega coefficient was calculated to assess the internal consistency of peer rejection both at the between-person level ( $\omega_{\text{between}} = 0.92$ ) and at the within-person level ( $\omega_{\text{within}} = 0.55$ ).

To assess perceived peer popularity, participants first received a prompt “Think about the interactions with people of your age that made you feel the best since last beep.” For those who could not think of a positive interaction, they were then probed with a statement “What did you do since last beep? Did you interact with peers online or face-to-face? Did anything happen that make you feel happy, joyful, make you feel good about yourself during your interaction with peers?” For participants who continued to indicate they did not have positive peer interactions, this observation was coded as missing and was not included in the calculation of peer popularity score. If participants indicated they experienced positive peer interactions, they were then asked to rate to what extent they felt *liked* and *popular* during that interaction on a 5-point Likert scale (1 = *not at all*, 5 = *very strongly*). The average score of two items indicated the intensity of *perceived peer popularity*. In the present study, the Omega coefficient for perceived peer popularity

was calculated at the between-person level ( $\omega_{\text{between}} = 0.99$ ) and at the within-person level ( $\omega_{\text{within}} = 0.63$ ).

**Positive and Negative Affect.** To assess momentary affect, participants were asked “What’s your feelings just before the beep?” and then indicated their momentary *positive affect* (i.e., *happy*, *joyful*, *excited*, and *interested*) and *negative affect* (i.e., *sadness*, *worry*, *stress*, and *anger*) on a sliding scale from 0 to 100 (Hamilton et al., 2021). The eight feelings were randomly presented. Positive affect ( $\omega_{\text{between}} = 0.96$ ,  $\omega_{\text{within}} = 0.82$ ) and negative affect ( $\omega_{\text{between}} = 0.94$ ,  $\omega_{\text{within}} = 0.72$ ) were calculated by the average of four positive feelings and four negative feelings.

**Social Media Craving and Behaviors.** In each prompt, participants were asked “How strongly do you feel an urge to use social media at this moment?” and then indicated their *social media craving* on a sliding scale from 0 to 100 (0 = *not at all*, 100 = *extremely strong*). They were then asked “Since the last beep, did you (a) *post a status, like or comment on others’ status*, (b) *chat with others*, (c) *seek social support*, (d) *view others’ status without any interactions*, (e) *compare with others on social media*?” Each behavior was coded as a binary variable (0 = *no*, 1 = *yes*). The sum score of the first three behaviors indicated the level of *active SMU* and the sum score of the last two behaviors indicated the level of *passive SMU*.

## Statistical Analysis

We estimated multilevel SEMs to capture the dynamic process of peer experiences and social media use, with EMA prompts (Level 1) nested within participants (Level 2). Multilevel SEMs partitioned each Level-1 variable into between-person and within-person components (Sadikaj et al., 2021). Between-person variance reflects individual differences in average responses across people, while within-person variance reflects moment-to-moment fluctuations around a person’s average level. This variance decomposition approach allows for the assessment of both stable and contextual/situational interpretations of how peer experiences relate to social media use, simultaneously. Since our goal was not to model causality, we did not include the lagged variables in the model (i.e., we only tested the *concurrent* rather than *prospective* within-person associations). Therefore, the interpretation of results should be limited to the concurrent co-variations of variables rather than the temporal relationships.

Models were estimated in Mplus with a Bayesian approach (i.e., ESTIMATOR = BAYES). We chose the Bayesian approach because it does not assume a normal distribution and is more suitable for small sample size with skewed data (Muthén & Asparouhov, 2012). Instead of providing confidence interval with bootstrapping method, Bayesian estimation provided the estimation of Bayesian credibility intervals (CIs) when testing statistical significance. Significance of model parameters was based on 95% CIs, with CIs that excluded zero indicating a parameter that differed significantly from zero. The model included random intercepts for each endogenous variable, which is the default in Mplus. However, we did not add random slopes for each within-person pathway into the model because this could lead to convergence failure in complicated models. Furthermore, the response time (how many hours of each day have passed when participants responded to each prompt) was group-mean centered and included in the model as within-person covariates, and the frequency of peer rejection and



peer popularity were grand-mean centered and included in the model as between-person covariates.

## Results and Discussion

### Missing Analyses and Descriptive Statistics

Participants who did not complete the study or were excluded from study due to low EMA completion rate ( $n = 15$ ) did not significantly differ from participants ( $n = 54$ ) who completed the EMA in terms of gender ( $\chi^2 = 0.02, p = .88$ ), age ( $t = -1.02, p = .31$ ), ethnicity ( $\chi^2 = 0.25, p = .61$ ), and family income ( $\chi^2 = 1.12, p = .78$ ).

Participants received 3,780 (i.e.,  $54 \times 14 \times 5$ ) prompts for EMA in total and completed 3,251 prompts, leading to a total completion rate of 86%. For each participant, the number of prompts completed ranged from 38 to 70 ( $M = 59.5, SD = 8.1$ ). Peer rejection experiences were reported in 1,487 prompts (46.25%) and peer popular experiences were reported in 2,279 prompts (70.89%). For each participant, the frequency of peer rejection ranged from 1 to 65 ( $M = 27.54, SD = 19.91$ ), and the frequency of peer popularity ranged from 5 to 69 ( $M = 42.20, SD = 16.94$ ).

Table 2 showed the descriptive statistics as well as the within-person and between-person correlations of the main variables. At the within-person level, peer rejection only significantly positively correlated with negative affect, while peer popularity had a significant positive correlation with positive affect, active SMU, and a significant negative correlation with negative affect. Social media craving was significantly and positively correlated with positive affect and active SMU. At the between-person level, craving was significantly and positively correlated with negative affect, positive affect, active SMU, and passive SMU.

### Testing the Fear-Driven/Compensation-Seeking and Reward-Driven Processes

The intraclass correlations of the main variables ranged from 0.25 to 0.48 (i.e., variances that could be explained by the between-person differences, see Table 2), which justified the adoption of multilevel

modeling. We estimated the hypothetical model using multilevel structural equation models. Figure 3 presented the parameters of each hypothesized path at both between-person and within-person levels. Table 3 presented the indirect effects of 16 hypothesized paths.

**Peer Rejection, Negative Affect, Craving, and Social Media Behaviors.** When peer rejection was the predictor and negative affect and/or craving were mediators (see the top section, Paths 1–4 in Table 3), there were two significant between-person mediation effects: (a) peer rejection  $\rightarrow$  negative affect  $\rightarrow$  social media craving  $\rightarrow$  active SMU and (b) peer rejection  $\rightarrow$  negative affect  $\rightarrow$  social media craving  $\rightarrow$  passive SMU. Specifically, in Figure 3, peer rejection was significantly and positively correlated with negative affect ( $\beta = .45$ ), while negative affect was positively correlated with social media craving ( $\beta = .39$ ), which in turn positively correlated with active SMU ( $\beta = .44$ ) and passive SMU ( $\beta = .47$ ). There was also one significant within-person mediation effect: peer rejection  $\rightarrow$  negative affect  $\rightarrow$  active SMU. In this path, peer rejection was positively correlated with negative affect ( $\beta = .12$ ), while negative affect was only significantly and positively correlated with active SMU ( $\beta = .05$ ) but not passive SMU ( $\beta = -.03$ ).

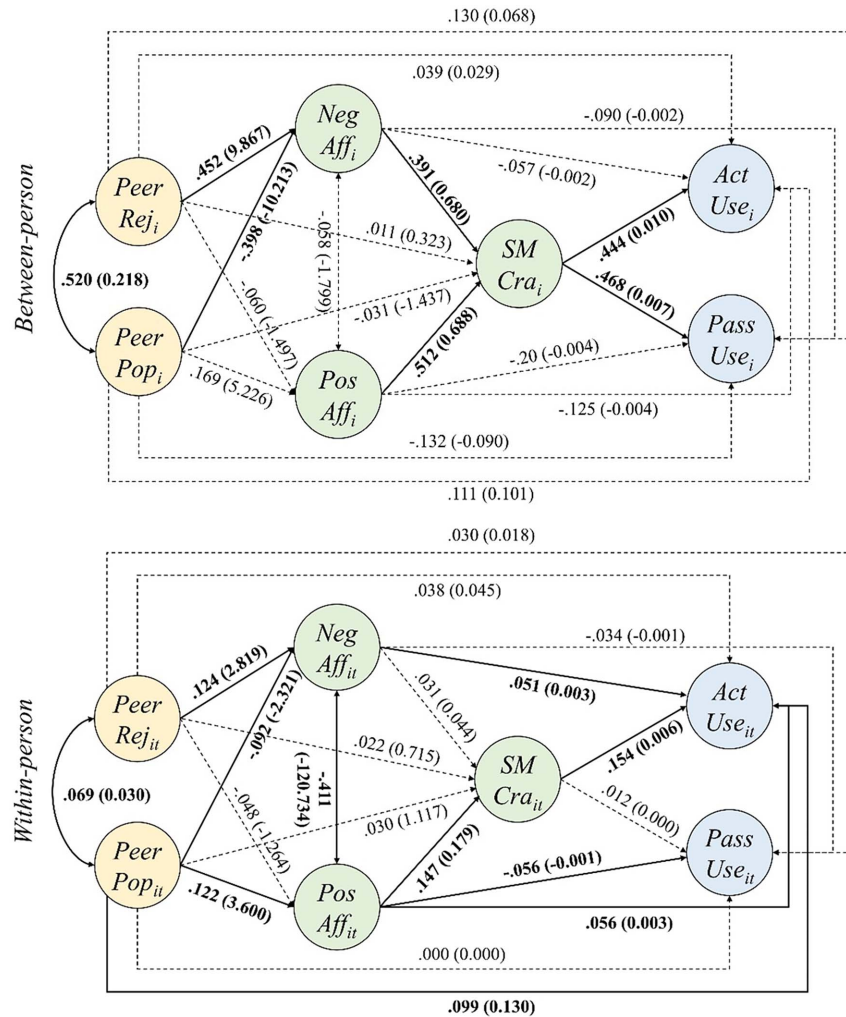
Overall, the above results partially supported the role of negative affect and craving in the fear-driven/compensation-seeking hypotheses at both between-person and within-person level. The significant between-person level mediation pathway (e.g., peer rejection  $\rightarrow$  negative affect  $\rightarrow$  social media craving  $\rightarrow$  active and passive SMU) indicates that for those participants who *on average* perceived more peer rejection than others, they also on average experienced more negative affect and stronger social media craving, which was linked with more active and passive SMU than others. The similar significant mediation pathway also appeared at the within-person level (e.g., peer rejection  $\rightarrow$  negative affect  $\rightarrow$  active SMU), indicating that when participants perceived more peer rejection *at a given time*, they were more likely to experience negative affect concurrently, and then were more likely to actively (but not passively) use social media. This might suggest at the moment of experiencing rejection, individuals tend to actively use social media to process negative feelings, build connections, and seek social

**Table 2**  
*Descriptive Statistics and Correlations of Main Variables in Study 2*

Main variable	1	2	3	4	5	6	7
1. Peer rejection	—	<b>.52</b>	.28	.02	.08	-.04	-.04
2. Peer popularity	.07	—	-.23	.15	-.06	.05	-.15
3. Negative affect	<b>.11</b>	<b>-.09</b>	—	-.16	<b>.27</b>	.01	.14
4. Positive affect	-.04	<b>.12</b>	<b>-.42</b>	—	<b>.53</b>	.24	.06
5. Social media Craving	.02	.04	-.03	<b>.14</b>	—	<b>.45</b>	<b>.41</b>
6. Active SMU	.06	<b>.11</b>	.02	<b>.06</b>	<b>.16</b>	—	.25
7. Passive SMU	.03	.00	-.01	-.04	.01	.01	—
<i>N</i> (number of participants)	54	54	54	54	54	54	54
<i>n</i> (number of observations)	1,487	2,279	3,215	3,215	3,215	3,215	3,215
<i>M</i>	2.94	3.72	25.05	50.19	45.77	1.55	0.43
<i>SD</i>	0.96	0.84	19.90	24.64	31.03	0.95	0.53
Min	1	1	0	0	0	0	0
Max	5	5	100	100	100	3	2
Skewness	0.09	-0.32	0.90	-0.13	0.04	-0.61	-0.67
Kurtosis	-0.50	-0.45	0.60	-0.83	-1.41	-0.81	-0.80
ICC	.48	.43	.36	.41	.46	.25	.31

Note. SMU = social media use; ICC = intraclass correlation. Values below diagonal indicate within-person coefficients and values above diagonal represent between-person coefficients. Values in bold are those for the credibility interval did not contain zero.

**Figure 3**  
Path Coefficients of Multilevel Structural Equation Model at the Between-Person (Upper) and Within-Person (Lower) Level



*Note.* Solid lines with bold-face numbers and dashed lines indicated significant or nonsignificant paths, respectively. Numbers outside of the bracket indicated the standardized path coefficients and numbers inside the bracket indicated the unstandardized path coefficients. *PeerRej* = peer rejection; *PeerPop* = peer popularity; *NegAff* = negative affect; *PosAff* = positive affect; *SMCra* = social media craving; *ActUse* = active social media use; *PassUse* = passive social media use. See the online article for the color version of this figure.

support. For example, Landau et al. (2019) studied the coping strategies for youth suffering from interpersonal rejection and found rejected youth would make self-disclosure to their online friends and join online communities (e.g., sexual minority), which helped them regain a sense of belongingness through validation and support. These results are also consistent with previous EMA studies that found positive within-person associations between peer rejection and negative affect (Ha et al., 2019; Hamilton et al., 2021).

**Peer Popularity, Positive Affect, Craving, and Social Media Behaviors.** When peer popularity was a predictor and positive affect and/or craving were mediators (see the bottom section, Paths 1–4 in Table 3), we found no significant between-person mediation effects

(peer popularity was not significantly correlated with positive affect at the between-person level). However, we did find three significant within-person mediation effects: (a) peer popularity → positive affect → active SMU, (b) peer popularity → positive affect → craving → active SMU, and (c) peer popularity → positive affect → passive SMU. Peer popularity positively correlated with positive affect ( $\beta = .12$ ). Positive affect, in turn, positively correlated with social media craving ( $\beta = .15$ ) and active SMU ( $\beta = .06$ ), and negatively correlated with passive SMU ( $\beta = -.06$ ).

Taken together, these results supported the reward-driven hypothesis at the within-person level, but not at the between-person level. The significant within-person level mediation

**Table 3***Indirect Effects From Peer Rejection, Peer Popularity, to Social Media Use Behaviors*

Mediator	DV	Between-person				Within-person			
		$\beta$	<i>b</i>	<i>SD</i>	95% CI	$\beta$	<i>b</i>	<i>SD</i>	95% CI
Peer rejection (PR) as a predictor									
1. PR → negative affect	Active SMU	-.027	-0.015	0.066	[-0.190, 0.100]	.006	0.008	0.003	[0.001, 0.014]
2. PR → negative affect → craving	Active SMU	.078	0.049	0.043	[0.001, 0.155]	.001	0.001	0.000	[0.000, 0.002]
3. PR → negative affect	Passive SMU	-.041	-0.018	0.048	[-0.131, 0.060]	-.004	-0.003	0.002	[-0.007, 0.000]
4. PR → negative affect → craving	Passive SMU	.082	0.036	0.030	[0.001, 0.105]	.000	0.000	0.000	[0.000, 0.000]
5. PR → positive affect	Active SMU	-.008	0.001	0.034	[-0.072, 0.079]	-.003	-0.003	0.002	[-0.008, 0.000]
6. PR → positive affect → craving	Active SMU	.013	-0.009	0.038	[-0.082, 0.079]	-.001	-0.001	0.001	[-0.003, 0.000]
7. PR → positive affect	Passive SMU	.012	0.002	0.032	[-0.061, 0.082]	.003	0.002	0.001	[0.000, 0.004]
8. PR → positive affect → craving	Passive SMU	-.014	-0.005	0.030	[-0.081, 0.063]	.000	0.000	0.000	[0.000, 0.000]
Peer popularity (PP) as a predictor									
1. PP → positive affect	Active SMU	-.022	-0.010	0.047	[-0.148, 0.038]	.007	0.009	0.004	[0.003, 0.017]
2. PP → positive affect → craving	Active SMU	.038	0.028	0.043	[-0.052, 0.130]	.003	0.004	0.001	[0.002, 0.006]
3. PP → positive affect	Passive SMU	-.034	-0.015	0.035	[-0.126, 0.018]	-.007	-0.005	0.002	[-0.009, -0.001]
4. PP → positive affect → craving	Passive SMU	.041	0.024	0.031	[-0.030, 0.093]	.000	0.000	0.000	[0.000, 0.001]
5. PP → negative affect	Active SMU	.024	0.016	0.070	[-0.117, 0.182]	-.005	-0.006	0.003	[-0.014, -0.001]
6. PP → negative affect → craving	Active SMU	-.069	-0.054	0.046	[-0.193, -0.001]	.000	-0.001	0.000	[-0.002, 0.000]
7. PP → negative affect	Passive SMU	.036	0.021	0.050	[-0.061, 0.124]	.003	0.002	0.001	[0.000, 0.005]
8. PP → negative affect → craving	Passive SMU	-.073	-0.042	0.032	[-0.138, -0.001]	.000	0.000	0.000	[0.000, 0.000]

Note. DV = dependent variables; SD = posterior standard deviation using Bayes estimation; CI = confidence interval; SMU = social media use. Values in bold are those for the credibility interval did not contain zero.

pathways suggested that when participants perceive themselves more popular at a given time, they tend to concurrently experience more positive affect and stronger social media urge, and then have more active SMU and less passive SMU. However, at the between-person level, those participants who on average perceived more peer popularity than others did not experience higher level of positive affect on average and did not differ from others in social media use. These results revealed that perceived popularity was uniquely associated with positive affect, craving, and active SMU at the within-person level. Indeed, Longobardi et al. (2020) found that the number of followers on Instagram was positively associated with SMA and negatively associated with subjective happiness, suggesting that popularity is not necessarily guaranteed with positive affect at the between-person level. However, moment-to-moment dynamic associations of these variables confirm the reward-driven process. For adolescents who are sensitive to peer popularity (e.g., care much about their social status), their reward system could easily be activated. They may then resort to social media to maintain popularity through active SMU, such as purposely posting during "high traffic" times so that their posts would get more likes (Nesi & Prinstein, 2019). Such behaviors could enhance positive feelings and, therefore, reinforce the reward-seeking process (Sherman et al., 2018).

### Exploratory Analyses

**Peer Rejection, Positive Affect, Craving, and Social Media Behaviors.** When peer rejection was a predictor of SMU and positive affect and/or craving were the mediators (see the top section, Paths 5–8 in Table 3), no mediation effects were significant at both the between-person and within-person levels. In other words, participants who on average perceived higher peer rejection than others (i.e., between-person) did not report less positive affect than others. Furthermore, momentary perceiving higher peer rejection was also not associated with decreased positive affect. These results seemed to indicate the relationship between peer rejection and SMU

is predominantly understood by the fear-driven/compensation-seeking process.

**Peer Popularity, Negative Affect, Craving, and Social Media Behaviors.** When peer popularity was the predictor of SMU and negative affect and/or craving were the mediators (see the bottom section, Paths 5–8 in Table 3), we found two significant between-person mediation effects: (a) peer popularity → negative affect → craving → active SMU and (b) peer popularity → negative affect → craving → passive SMU. Specifically, in Figure 3, peer popularity significantly correlated with decreased negative affect ( $\beta = -.40$ ), and in turn correlated with decreased social media craving, and decreased active and passive SMU. There was also one significant within-person mediation effect: peer popularity → negative affect → active SMU. This is slightly different from the between-person mediation because negative affect was directly correlated with active SMU but not through the mediation of craving.

The above results suggested the relationship between peer popularity and social media use could partially be understood through reduced fear-driven/compensation-seeking process. At the between-person level, for participants who on average perceived more peer popularity than others, they might report lower negative affect than others, lower desire for social media than others, and thus are less likely to engage in active or passive SMU as a way to compensate their negative affect (i.e., between-person mediation). At the within-person level, when participants perceived more peer popularity at a given time, they were likely to have lower negative affect concurrently, and thus were less likely to active (but not passive) SMU for compensation (i.e., within-person mediation).

### General Discussion

Research on SMA has grown at an exponential rate in recent years, with most studies exclusively focused on intraindividual predisposing factors (e.g., attachment style, cognitions, motives, psychopathology; Y. Sun & Zhang, 2021). As far as we are aware,

no empirical study has yet examined how peer contexts predispose adolescents to SMA from a process-oriented perspective. In two studies, we addressed this gap by connecting peer rejection, peer popularity, and SMA with two theoretical processes, respectively: the fear-driven/compensation-seeking process and the reward-driven process.

Our findings contribute to the existing literature by generalizing I-PACE theory to SMA and expanding the theory to include peer contextual variables. The original theory suggested that SMA is developed through the interplay of predisposing factors, cognitive bias, affective responses, as well as individuals' executive functions. An updated version proposed two distinctive processes that account for SMA, depending on whether individuals are predominantly seeking compensation or seeking rewards from social media (Wegmann & Brand, 2019; Wegmann et al., 2022). Our findings demonstrated that peer rejection and peer popularity, two completely different experiences, both make adolescents susceptible to SMA through different mechanisms. Driven by avoidance expectation and negative affect, adolescents experiencing high rejection tend to use social media to avoid negative feelings and compensate for interpersonal deficiency. In contrast, driven by reward expectancy and positive affect, adolescents experiencing high popularity tend to use social media to maintain positive feelings and gain social rewards. Uncovering these processes would shed light on interventions for SMA that target cognitive and affective components according to individuals' unique interpersonal experiences.

Another contribution of our study to the literature is that we employed an EMA design to study the within-person developmental process of SMA. Our EMA study closely examined peer rejection, popularity, affect, craving, and social media behaviors at the daily level. We confirmed the fear-driven/compensation-seeking process and the reward-driven process manifested at within-person level, moving above and beyond the between-person level associations. It seems that peer popularity, positive affect, craving, and active SMU were particularly strongly connected at the within-person level. This is in line with alcohol research that found enhancement/hedonic motives were most predictive of outcomes (Stevenson et al., 2019). It is interesting to note the low and nonsignificant correlation between self-reported rejection and popularity at the within-person level ( $r = .07, p > .05$ ). This seems inconsistent with the associations measured by peer nomination ( $r = -.66, p < .001$ ). However, it highlights the dynamic nature of subjective interpersonal experiences (e.g., experiencing rejection in one situation does not necessarily preclude the possibility of feeling popular in another) that are hard to capture through a cross-sectional approach. Future research about addiction could use EMA to capture real-life within-person associations between interpersonal contexts, emotions, and behaviors.

## Limitations and Future Research Directions

There are several key limitations and critical next steps for future research. First, while our approach to measuring peer rejection and popularity aligned with established theories and research on peer status (Cillessen & Rose, 2005), it is important to acknowledge the inherent limitations of our measures in capturing nuanced perspectives. Notably, the interpretation of terms such as "popularity" may exhibit variations across factors such as age, gender, culture. Popularity is associated with gender prototypical features (e.g.,

attractiveness and likeability for women; power and centrality for men; Lansu et al., 2023) and developmental stages (e.g., appearance and athletic ability during high school; extraversion, prosocial behaviors, social competency in college; O'Mealey & Mayeux, 2022). Furthermore, norms defining peer behavior among Chinese adolescents might be different from such norms among other parts of the world. For example, shy and sensitive students tend to be well-reputed among peers because shyness is valued as a sign of self-control and maturity in Chinese culture (X. Chen et al., 1992). However, this cultural norm of peer behaviors may be different in other cultures. These considerations underscore the importance of applying an intersectional approach to conceptualize and assess the multifaceted nature of peer relations. Future studies could collect qualitative information about peer experiences. For example, in the EMA study, if a participant endorsed perceived popularity, researchers could add an item such as "briefly describe this incident" to clarify the nature and quality of experiences.

Second, our findings provided limited support for the causal relationships between peer rejection, popularity, cognitive and affective responses, and SMA. Bidirectional relationships could exist between cognitions, affects, and behaviors. According to I-PACE theory, both fear-driven/compensation-seeking process and reward-driven process incorporate feedback loops, that is, the compensation or gratification experiences resulting from SMU should lead to cognitive bias and craving responses (Brand et al., 2016). These feedback loops gradually become salient in the later stages of addiction (Brand et al., 2019). Therefore, it is very likely that people with high level of SMA have distorted belief systems that social media could bring great enjoyment/compensation (Turel et al., 2011). It is also likely that certain social media behaviors would influence the affective responses. For example, Yin et al. (2022) found passive browsing social media reduced negative feelings using a daily diary design. We did not include time-lagged variables in multilevel SEM for Study 2, considering the limited sample size. Future research could further explore this reinforcement cycle by incorporating temporal relationships into the multilevel modeling. It is also interesting to follow up adolescents' peer-nominated rejection and popularity for several years and see how SMA would influence their developmental trajectory of peer status.

Third, several measurement issues warrant attention. For example, the reliability of the peer nomination method in Study 1 should be noted. The Cronbach's  $\alpha$  of each item (i.e., "like" "dislike" "popular" "unpopular") ranged from .60 to .96 across classes. This could be improved by having more nominators in the sample and using unlimited nomination (e.g., having each student nominate an unlimited number of classmates that they feel "liked" or "disliked"; Babcock et al., 2014; Marks et al., 2013). As one of covariates in the model, social media use intensity also presented low reliability ( $\alpha = .66$ ), probably because of the arbitrary categories. Although removing it from the model did not change the significant results, future studies could apply objective measures (e.g., screen time tracked by the smartphone system) to control time spent on social media. Furthermore, we used two items to assess self-reported popularity ("I felt liked/popular"). While these two items demonstrated face validity, future studies could improve construct validity, for example, by adding items like "I felt powerful/admired" and testing the internal consistency (Wegmann et al., 2022). In terms of measuring social media use behaviors, future studies could assess behaviors more closely associated with



experiences of rejection or popularity. Examples include strategic self-presentation, profile enhancement, or self-disclosure on social media (Utz et al., 2012). Finally, future studies could use multimodal measurements that move beyond self-reports. For example, avoidance expectancy and reward expectancy could be assessed with Implicit Association Testing (Turel & Serenko, 2020). Behavioral paradigms could also be harnessed to assess social media craving (e.g., cue-reactivity paradigm; Wegmann et al., 2021).

Our findings discovered the dual pathways that link peer experiences to SMA, which informs the interventions and preventions of SMA. Nonetheless, the mechanisms could be more complicated than we illustrated in Figure 1. One question involves the interplay of the fear-driven/compensation-seeking process and the reward-driven process. Although adolescents with high popularity are motivated to use social media for rewarding experiences, sometimes they might encounter need frustration, such as receiving less “likes” than desired, experiencing cyber victimization, or feeling inferior in social comparison (Longobardi et al., 2020; Nesi et al., 2021). In this case, would they still be reinforced to use social media for rewards/gratification? Or would they turn to social media for compensation? To answer these questions, further studies can adopt the attachment theory and the self-determination theory to understand the satisfaction and frustration of basic psychological needs (e.g., need for autonomy, need for competency, and need for connection) that underlie two processes (A. Chen, 2019). Gender differences in the dual processes could also be explored by future research. Since adolescent girls present with higher rejection sensitivity (Teunissen et al., 2011; Vanden Abeele et al., 2014), it is possible that boys and girls would differentially use social media to satisfy their basic psychological needs from peer rejection and peer popularity. More studies are also needed for nonbinary adolescents. Particularly, research found that Chinese adolescents who do not conform to traditional gender norms experienced higher social stigma and bullying, which was related to increased risk of problematic smartphone and internet use (Zheng et al., 2023). This highlighted the importance of exploring SMA for transgender and gender non-conforming adolescents. Finally, we recommend future studies expanding the I-PACE theory from a cultural lens. Noticing that meta-analyses found the prevalence of SMA is higher in collectivistic countries than individualistic countries (Meng et al., 2022), it will be interesting to explore whether certain cultural-related factors (e.g., individualism and collectivism) might shape the strength or direction of predisposing factors, cognitions, affects, and SMA within the I-PACE model.

### Implications for Counseling Psychology Practice

We believe our study offers valuable insights about counseling practice with SMA. Though SMA is not considered as a disorder in diagnostic systems, it is not unusual for counselors to see clients with mental health issues also struggling with excessive, even compulsive social media use. Our study informs counselors to assess and treat mental health concerns associated with SMA in a comprehensive and holistic manner. Specifically, counselors can benefit from applying I-PACE theory in their case formulation. This involves assessing predisposing factors such as age, general screen time, that make certain individuals more susceptible to SMA. It also involves assessing client's interpersonal contexts (e.g., relations with peers, family, and partners), maladaptive cognitions, emotions, and how they interact with each other to impact client's social media use. Our

study moves beyond an intraindividual perspective to an interpersonal perspective of SMA, which have great clinical implications because social media use, in its nature, elicits interpersonal interactions and fulfills social needs as opposed to other addictive behaviors such as substance use. A client's interpersonal experiences and patterns (e.g., rejection, discrimination) affect their motivation to use social media and social media in turn, affects their online and offline relationships. For example, a client experiencing rejection of their identity might excessively use social media to avoid offline interactions, but they might also strategically use social media to expand online social networks. We suggest counselors paying attention to how social media functions as coping strategies to either maintain or expand the client's interpersonal patterns and self-images, the motivation of social media use is fear-driven or reward-driven, or both, and eventually how social media use is related to the client's presenting concerns.

This comprehensive assessment and deep understanding of the client's social media use, in turn, could help destigmatize SMA and develop personalized interventions. On the one hand, counselors can empathize the unique experiences of clients and validate their motivations for engaging in social media use—whether driven by a need for compensation or a need for social rewards, from a nonjudgmental perspective. This will increase therapeutic alliance and reduce the client's resistance to change. On the other hand, counselors can provide psychoeducation about the addictive features of social media platforms (e.g., endless scrolling, personalized newsfeed), which many child and adolescent clients may not yet recognize (Montag & Elhai, 2023). They can then develop personalized interventions tailored to the client's unique cognitions, emotions, and behaviors related to social media use. For example, drawing from cognitive behavioral therapy, the client may practice ABC training (i.e., A stands for “antecedent,” B stands for alternative “behaviors,” and C stands for relevant “consequences”) to reduce habitual social media use. Instead of resorting to social media, clients may choose to go for a walk or seek in-person connections in personally relevant situations that can trigger addiction (e.g., when feeling rejected). The alternative behaviors result in similar positive short-term effects as using social media but are more aligned with client's long-term goals (Zhou et al., 2021).

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