Browsing makes you feel less bad: An ecological momentary assessment of passive Qzone use and young women's negative emotions

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Passively browsing other's content on social networking sites (SNS) is popular among young females. It remains unclear how passive use relates to female's negative emotions, and especially whether short-term associations are confined by individual differences. This study used ecological momentary assessment over the course of one week to examine the associations between passive use of SNS and negative emotions, and investigated whether individual differences (i.e., self-esteem and life satisfaction) would moderate this relationship. A sample of $N = 99$ Chinese female undergraduates ($M_{age} = 18.81$, $SD_{age} = 0.84$) completed a baseline online survey on self-esteem and life satisfaction, and received a daily online survey about their Qzone use as well as their negative emotions for seven days. Multilevel modeling revealed that passively browsing Qzone on a given day was associated with less negative emotions. However, the within-person association was independent of self-esteem and life satisfaction. Implications of passive SNS use are discussed especially regarding their potential to reduce negative feelings among Chinese young female undergraduate students, at least in the short term.

1. Introduction

Over the past decade, social networking sites (SNS) became widely prevalent. In China, Qzone stands out as one of the most used local SNSs, with 47.6% of young Internet users being regularly active on the platform (CNNIC, 2020). Qzone provides users plenty social and entertaining features, including posting and sharing aspects of one's own life as well as browsing information from friends, acquaintances, and strangers. This could help especially young people to obtain various gratifications including socializing, information seeking, and entertainment (Apaolaza et al., 2014). People may as well use SNSs as a strategy to cope with negative emotions resulting from unsatisfied life needs (Rasmussen et al., 2020; Wadley et al., 2020), and evidence suggests that this motive is particularly true for young women (Chae et al., 2018; Su et al., 2020). However, as a coping strategy, using SNS too much could be maladaptive as excessive SNS use can lead to more mental health problems, including depression and loneliness (Appel et al., 2016; Boer et al., 2020; Ozimek and Bierhoff, 2020; Thorisdottir et al., 2019).

The negative consequences of SNS use on mental health issues have been particularly prominent among young females (Chae et al., 2018; Su et al., 2020), especially when they are sensitive to depression, and value interpersonal relations more (Nolen-Hoeksema, 2001), both online and offline. Previous research revealed that women were more likely than men to perceive SNS as a medium for information and interpersonal goals (Haferkamp et al., 2012; Krasnova et al., 2017). Women have been shown to spend more time on SNS to maintain social ties and get access to information about old and new friends in response to their unmet social needs (Krasnova et al., 2017; Su et al., 2020). Nevertheless, due to their sensitivity to social signals, frequent exposure to SNS may, in turn, raise the odds for women to experience the negative consequences of SNS including negative social comparison (Fardouly et al., 2015), depression (Ding et al., 2017; Thorisdottir et al., 2019) and problematic or addictive use (Chae et al., 2018; Su et al., 2020). However, to the best of our knowledge, it is not fully understood how passive SNS use may be associated with the increased negative emotions among women. Therefore, in order to obtain a better understanding of the short-term effects of SNS use among women, we investigated Qzone use among women and focused particularly on passive Qzone use and its links to daily negative emotions.

Because of the state-like constructs of passive SNS use and negative emotions (Griffioen et al., 2020), the current study uses ecological

momentary assessment (EMA) as a method to (a) explore the momentary association between females' daily passive Qzone use and negative emotions, and (b) test whether the individual differences in self-esteem and life satisfaction moderate this short-term association. Negative emotions were conceptualized as feelings of unhappiness, loneliness, and sadness. This study is among the first to study the momentary relationship between SNS use and negative emotions in a Non-Western context. In doing so, we gain a better understanding of how passive use affects Chinese women's negative emotions in the short term, and thus, complement existing cross-sectional, and retrospective, longitudinal studies that are unable to assess the momentary relationship between passive SNS use and negative emotions (e.g., JWang et al., 2018a; Zhang et al., 2020). Importantly, this study helps to better understand how young women can use SNS in a more adaptive way, thereby reducing the odds of emotional problems and social media addiction resulting from maladaptive SNS use. We thereby ultimately contribute to improving young women's mental health, especially for those with low self-esteem and life satisfaction.

1.1. The impact of passive SNS use on negative emotions

With the pervasive use of SNS, most people tend to regard SNS as a means to fulfil psychological needs and obtain sought gratifications (Apaolaza et al., 2014). For instance, individuals with low self-esteem may compensate for poor relationships by socializing more extensively on SNS (e.g., Lee et al., 2012; Zsido et al., 2020), since some of the affordances of SNS, including reduced cues, anonymity and controllability, can increase feelings of disinhibition and safety (Suler, 2004). However, the Compensatory Internet Use Theory (CIUT; Kardefelt-Winther, 2014) also suggests that it is hard for people with un-met real-life needs to benefit from the compensatory use of SNS (Dempsey et al., 2019; Kardefelt-Winther, 2014; Rasmussen et al., 2020; Zsido et al., 2021): Because using SNS, especially passively browsing other individuals' information, is a maladaptive coping strategy for adverse life events since it simply displaces the time of engaging in offline social activities instead of dealing with the problem (Rasmussen et al., 2020; Thorisdottir et al., 2019). In turn, habitual, compensatory SNS use can result in difficulties in emotion regulation and addiction-like symptoms in the long run (Dempsey et al., 2019; Kardefelt-Winther, 2014; Wadley et al., 2020).

The most frequent pattern of SNS use is passive SNS use, which refers to passively browsing SNS without producing anything and without interacting with anyone (Metzger et al., 2018; Verduyn et al., 2015). Compared to active SNS use, such as updating status, or sending messages to other users, passive SNS use is usually seen as a more maladaptive SNS use pattern and therefore positively related to less well-being and more negative emotions including depression and loneliness (Burke et al., 2010; Thorisdottir et al., 2019). Two theories explain this: First, passive SNS use may result in someone's emotions being inhibited internally (Verduyn et al., 2015), while, in contrast to that, active SNS use involving interactions with others could facilitate that emotions are expressed outward (Myruski et al., 2020). According to general emotions regulation theory, emotion expression is a vital step for seeking social support and for reinforcing someone's existing relationships with friends, while emotion suppression is much more ineffective in reducing negative emotions (Farmer and Kashdan, 2012; Nolen-Hoeksema, 2012; Rasmussen et al., 2020). Hence, active SNS use was found to enhance social support and to reduce loneliness (Burke et al., 2010), while passive SNS use predicted increases in negative emotions (Burke et al., 2010; Deters and Mehl, 2013). Thus, students who adopted passive SNS use patterns to cope with daily stressors encountered more difficulties in recovering from negative emotions (Duvenage et al., 2020).

Moreover, passively browsing social media increases the likelihood of exposure to information shared by peers. Social Comparison Theory (Festinger, 1954) suggests that this process can facilitate upward social comparisons, which, in turn, may decrease an individual's self-evaluation by eliciting feelings of "inferiority" (de Vries and Kühne, 2015; Fardouly et al., 2015; Midgley et al., 2021). In particular, frequent exposure to other users' idealized images and self-presentations make it more likely to perceive a discrepancy between their real and their ideal self (Haferkamp and Krämer, 2011), and thereby experiencing negative mood (Fardouly et al., 2015). Passive SNS use and social comparisons have been demonstrated to exert detrimental effects on Chinese users' mental health as well (Chen et al., 2016; Wang et al., 2018a). For example, Ding et al. (2017) suggested passive Qzone use could lead to lower levels of well-being by increasing envy; compared to their male counterparts, female students were more likely to experience reduced well-being.

1.2. Passive SNS use and negative emotions: an individual perspective

Passive SNS use is likely to affect individuals' mental health differently (Valkenburg et al., 2021; Valkenburg and Peter, 2013). It is also possible that negative emotions change with SNS use only for a short amount of time (Valkenburg and Peter, 2013). In the long run, such within-person, short-term associations between SNS use and negative emotions may provide critical information about individual differences (i.e., how one person differs from another) (Wang et al., 2012). However, many media effects studies have not looked more in depth into within-person associations between passive SNS use and negative emotions, but rather concentrated on between-person effects. However, that only explains whether users who use SNS more frequently passively would experience higher levels of negative emotions than users who less frequently use SNS passively (e.g., Wang et al., 2018a). An experiment by Fardouly et al. (2015) showed for example that compared to those who spend time on browsing a control condition website, females who browsed Facebook profiles for 10 min reported to experience more negative mood. Furthermore, studies have regarded individual patterns of passive SNS use and negative emotions as rather stable traits and neglected their intra-individual fluctuations over time, which has usually been regarded as "noise" (e.g., Wang et al., 2018a; Zhang et al., 2020). Taken together, this begs the question whether (particularly) women show short-term changes in their emotional state when passively using SNS.

Although more recent studies have investigated within-person associations between passive use and negative emotions across various situational contexts of everyday life (e.g., Aalbers et al., 2018; Valkenburg et al., 2021), these studies have primarily been conducted in Western countries and are based on U.S.-based SNS such as Facebook and Instagram (e.g., Kross et al., 2013; Valkenburg et al., 2021; Verduyn et al., 2015) not considering popular Chinese SNS such as Qzone (CNNIC, 2020). Importantly, Verduyn et al. (2015) demonstrated short-term negative associations between passive Facebook use and affective well-being. Therefore, the first goal of the present study is to examine the within-person associations between passive SNS use and negative emotions experienced by Chinese women. Based on cross-sectional findings in a Chinese study context and the within-person findings in Western contexts, we hypothesized that there would be a positive within-person association between passive Qzone use and negative emotions in Chinese female students (Hypothesis 1).

1.3. The moderating roles of self-esteem and life satisfaction

Momentary associations between passive SNS use and negative emotions may vary individually, in line with the Differential Susceptibility to Media Effects Model (Valkenburg and Peter, 2013). Self-esteem and life satisfaction are two important dispositional susceptibility factors that could moderate the relationship between SNS use and mental health (e.g., Ellison et al., 2007; Niu et al., 2018; Wang et al., 2016). Some studies have found that individuals with low self-esteem or life satisfaction could be more susceptible to the negative effects of SNS due

to their negative perceptions (Niu et al., 2018; Wang et al., 2016). Specifically, individuals with lower self-esteem or less life satisfaction may tend to compare themselves with others who appear better-off on social media (i.e., an upward rather downward social comparison) (Midgley et al., 2021; Niu et al., 2018). They may attribute the other users' positive qualities presented online to their personalities rather than to situational factors (Chou and Edge, 2012). In result, they would perceive more discrepancies between themselves and others, which, in turn could make them feel even more dissatisfied with their lives (Fardouly et al., 2015; Tandoc et al., 2015). On the other hand, the more positive self-perceptions of individuals with higher self-esteem and life satisfaction may facilitate online social comparisons in a more favorable way for themselves or compare themselves more often with others who are doing less well (de Vries and Kühne, 2015; Niu et al., 2018). In that case, individuals who score higher on self-esteem and life satisfaction seem less likely to be affected by the negative impact of passive SNS use.

Against this backdrop, the second goal of this study was to investigate whether women with higher susceptibility to negative media effects are more likely to be negatively influenced by passive Qzone use than women with a lower susceptibility to negative media effects. Specifically, we assumed that self-esteem and life satisfaction would moderate the within-person relationship between passive Qzone use and negative emotions in that women with lower self-esteem and life satisfaction will experience more negative emotions after passively using Qzone (Hypothesis 2).

1.4. The present study

Overall, in this study we take a more nuanced look at the within-person relationships between passive Qzone use and negative emotions over the course of seven consecutive days using ecological momentary assessment (EMA). We also examined the moderating influence of self-esteem and life satisfaction on the momentary associations. By EMA we refer to an experience sampling method that involves repeatedly measuring attitudes and behavior in a natural setting in real time or almost in real time (Gabriel et al., 2019; Grif et al., 2020). This method has been widely used in media effect studies and yielded more in-depth findings especially in the most recent literature (e.g., Pouwels et al., 2021; Valkenburg et al., 2021). Unlike traditional self-report data, EMA helps to reduce recall bias through repeated measurement of all variables of interest (i.e., Qzone use and negative emotions) "in the moment" when they occur, which in turn enables us to more accurately estimate the momentary relationships between SNS use and negative emotions (Griffioen et al., 2020; George et al., 2018; Roberts et al., 2017).

In addition, EMA offers possibilities to assess SNS use and emotions in the participants' natural environment therefore enhancing ecologically validity (Bolger and Laurenceau, 2013). Considering the high co-occurrence of passive and active SNS use and their different influences on negative emotions (Aalbers et al., 2018), active Qzone use was considered as a control variable. The proposed research model is displayed in Fig. 1.

2. Method

2.1. Participants and procedures

We recruited participants in spring 2019 through psychological counselors from four public universities in China who shared an online advertisement with their students. Specifically, female Qzone users were invited to participate in this study. As usual for EMA studies, sample size is smaller due to the higher burden of continuously participating in EMA research, and thus, we recruited a sample size that was comparable to other EMA studies (e.g., Kross et al., 2013; Verduyn et al., 2015). A total of $N = 100$ female undergraduates from four public universities in China participated in this study, but one of them did not respond to the EMA
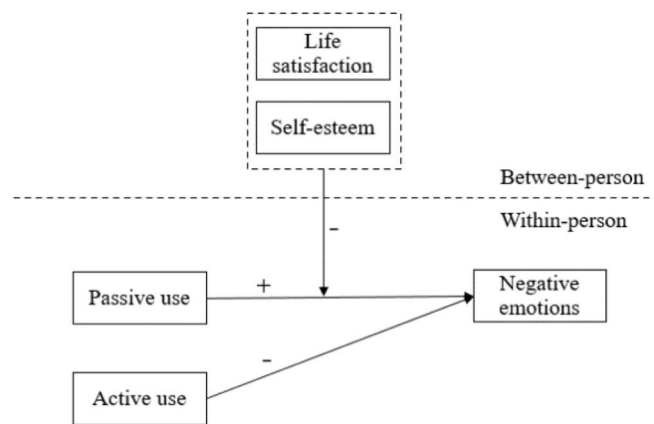

Fig. 1. Conceptual model of the moderating effects of self-esteem and life satisfaction on the momentary association between daily Qzone use and negative emotions.

phase of the study, resulting in a final sample of $n = 99$ study participants. Their mean age was 18.81 years ($SD = 0.84$). All of them were freshmen ($n = 47$, 47.5%) or sophomore students ($n = 52$, 52.5%). The university's IRB approved the study, informed consent was collected electronically from all participants in order to being able to participate in this study.

The study included two phases: In a baseline phase, we first assigned a numerical identification number to each participant to match their baseline survey responses and their subsequent EMA assessment data. All participants were asked to complete demographic information (i.e., age), life satisfaction, and self-esteem were also assessed at baseline. Second, during the EMA phase, participants were prompted to complete 3 online surveys per day for 7 consecutive days (i.e., resulting in 21 reports per person). Because participants were from different universities, the sampling scheme was tailored to a universal school's schedule. The morning survey had to be completed between 11:00 a.m. and 12:00 a.m., the afternoon survey between 5:00 p.m. and 6:00 p.m., and the evening survey between 11:00 p.m. and 12:00 p.m. In order to maximize participants' compliance and reduce attrition during the EMA phase, we did not randomly deliver text messages throughout the day because random sampling may disrupt the study participants' normal daily activities and therefore represent a burden to them (Elhai et al., 2020). However, to remind individuals to complete each survey, research assistants sent message reminders via QQ (an instant message platform) to each participant to notify them to complete the morning, afternoon, and evening surveys. Following the Oren-Yagoda and Aderka (2021) procedure, we instructed participants to complete each survey within one hour, during which message reminders were regularly sent until the survey was completed. After completing the EMA survey, participants were paid ¥35 (approximately $5) as compensation.

Given that emotional experience and digital use are related to a circadian rhythms (Peng and Zhu, 2020; Reyes et al., 2019), the three daily assessments were combined as a measure to capture daily SNS use and negative emotions. This approach allowed us to test daily passive SNS use and negative emotions after controlling the impact of circadian rhythms, which was widely applied in previous research (e.g., George et al., 2018).

2.2. Measures

2.2.1. Initial survey instruments

Self-esteem. The Rosenberg self-esteem scale (Rosenberg, 1965) is a 10-item scale measuring how one feels about oneself. Five of the items were positively worded, while the other five items were negatively worded. Participants were asked to indicate their responses on a five-point scale with responses ranging from 1 (strongly disagree) to 5

(strongly agree). Negatively worded items were reverse-scored so that higher scores reflect higher levels of self-esteem. Reliability in the current sample was excellent ($\alpha = 0.83$ and $\omega = 0.84$), and confirmatory factor analyses also showed a good validity, with $\chi^2/df = 1.46$, $p > .05$, TLI = 0.95, CFI = 0.97, RMSEA = 0.06 (90% CI = [.00, 0.11]), SRMR = 0.06].

Life satisfaction. The 5-item Satisfaction with Life Scale (SWLS; Diener et al., 1985) was used to assess satisfaction with life. Using a five-point Likert scale from strongly disagree (1) to strongly agree (5), respondents evaluated five items (e.g., "I am satisfied with my life''). By averaging the item scores, an estimate of adolescents' life satisfaction was created. Higher score represents higher level of life satisfaction. The scale showed good reliability ($\alpha = 0.86$ and $\omega = 0.86$). The confirmatory factor analysis revealed a good validity, with $\chi^2/df = 1.52$, $p > .05$, TLI = 0.98, CFI = 0.99, RMSEA = 0.01 (90% CI = [.00, 0.09]), SRMR = 0.02.

2.2.2. EMA survey instruments

For each EMA assessment, we asked participants to report the assigned number for baseline-EMA data matching. Next, participants were required to report their Qzone use and negative emotions since the last survey.

Qzone use. Qzone use was adapted from a Facebook activity questionnaire (Shaw et al., 2015). *Active Qzone use* refers to users interacting with friends on Qzone through posting, commenting, and liking behaviors, which was assessed by three items. For example, "Since the last survey, how many statuses have you posted?" "How many comments (including wall posts) have you wrote?" and "How many 'Likes' have you gave to your friend?" We added up the number of activities per day to get the daily numbers of posted status updates, comments and Likes. Each of these three items was standardized at the individual level and ultimately summed up to generate a score of daily active Qzone use.

Passive Qzone use was measured by asking individuals to report the amount of time they spent on browsing Qzone, which is a common method used in prior EMA studies to measure SNS use (e.g., Kross et al., 2013; Valkenburg et al., 2021). Besides, they also reported (since the last survey) the number of (a) checking the newsfeeds, (b) visiting a friend's profile/photos, (c) visiting a stranger's profile/photos and (d) visiting an old friend's profile/photos. These activities can be measured accurately as Qzone provides visiting records and this information is accessible to users. Responses from each of the three daily assessments were summed up and standardized at the individual level as the individual daily response. In present study, both active and passive Qzone use showed good reliability over the seven days of EMA ($\alpha = [.77, 0.84]$ and $\omega = [.78, 0.84]$).

Negative emotions. At each assessment point, participants were asked to rate their real-time feelings (i.e., "Right now, how are you feeling unhappy/lonely/sad") using a 5-point scale (1 = not at all, 5 = very much) (Kross et al., 2013). Because we were interested in the general, individual negative emotion response, rather than levels of each single emotion, daily negative emotions were summed up for each day (George et al., 2018) with a higher score representing higher level of negative emotions. This measure showed good reliability across all seven days, with α ranging from 0.87 to 0.94 and ω ranging from 0.88 to 0.94.

2.3. Analysis strategies

Because of the nested structure of our repeated-measurement of passive Qzone use and negative emotions ($N = 693$) within individuals ($N = 99$), multilevel modeling (MLM) seemed most appropriate to analyze the data (Raudenbush and Bryk, 2002; Wang et al., 2012). Multilevel data analysis allows us to differentiate between-person variables from within-person variables (Mathieu et al., 2012). In other words, we could investigate the effect of daily passive use on daily negative emotions regardless of the impact of individuals characteristics

(i.e., the baseline measures of life satisfaction and self-esteem).

Mplus version 8.1 was used to conduct MLM. We first computed the intra-class coefficient (ICC) by fitting an unconditional growth model to the data that only contained *Day* as a predictor to determine whether a significant variance at the between-person level exists. An ICC value closes to zero indicating that a model including Level-1 predictors only is appropriate; while IC > 0.059 or close to 1 suggests that there may be a Level-2 variable to explain the heterogeneity of dependent variable, thus justifying multilevel modeling (Aguinis et al., 2013; Raudenbush and Bryk, 2002). Within-person variables (i.e., repeated measures of Qzone use) were Level-1 variables, and between-person variables (i.e., self-esteem and life satisfaction) were Level-2 variables. Cross-level interactions were added to the models to assess the moderation hypothesis and to determine whether self-esteem and life satisfaction moderated the relationship between passive Qzone use and negative emotions. To analyze moderation effects in the form of cross-level interactions, we used a random coefficient prediction technique, also called "slopes-as-outcome" (Preacher et al., 2016; Raudenbush and Bryk, 2002). Specifically, we allowed the slope of negative emotions regressed on passive use to vary across individuals (i.e., a random slope). The two Level-2 predictors (life satisfaction and self-esteem) were then together regressed on this random slope (Preacher et al., 2016), but did not add these moderators separately to the model (see Aguinis et al., 2013). Adding cross-level interactions enabled us to test our moderating hypothesis, that is, whether individual differences in characteristics explained the variance in negative emotions for passive Qzone use.

In our models, time-variant variables at Level-1 (i.e., passive use and active use) were all person-mean centered (Aguinis et al., 2013). To ease model estimation (Preacher et al., 2016), we did not test for the moderating effects of self-esteem and life satisfaction on other slopes (between active use and negative emotions, or between *day* and negative emotions). Our multilevel model reads as follows:

Level 1 (within-person level):

$$Nega_{ti} = \pi_{0i} + \pi_{1i}Day_{ti} + \pi_{2i}Active_{ti} + \pi_{3i}Passive_{ti} + \varepsilon_{ti}$$

Level 2 (between-person level):

$$\pi_{0i} = \beta_{00} + \beta_{01}SE_i + \beta_{02}LS_i + \gamma_{0i}$$

$$\pi_{3i} = \beta_{30} + \beta_{31}SE_i + \beta_{32}LS_i + \gamma_{3i}$$

$$\pi_{1i} = \beta_{10} + \gamma_{1i}$$

$$\pi_{2i} = \beta_{20} + \gamma_{2i}$$

3. Results

3.1. Descriptive statistics and correlations

All $n = 99$ women completed all 21 assessments (7 days * 3 observations per day), without any missing data. On average, participants reported spending 71.65 min each day on browsing Qzone, and checking Qzone account 11.71 times each day. Besides, they visited the Qzone profile of existing friends ($M = 6.26$, $SD = 12.57$) more frequently than that of strangers ($M = 1.89$, $SD = 5.39$) or old friends ($M = 1.64$, $SD = 5.02$). Negative emotions across seven days are presented in Fig. 2. Over the course of 7 days, participants' negative emotions were typically lowest in the morning ($M = 2.10$, $SD = 0.62$) and peaked in the evening ($M = 2.22$, $SD = 0.66$), suggesting that combining the three real-time assessments into a daily negative emotions was appropriate. As shown in Table 1, passive Qzone use was positively related to active Qzone use at both the within-person and the between-person level (all $p_s < 0.05$), as well as to life satisfaction at the between-person level ($r = 0.21$, $p < .05$). Self-esteem was positively related to life satisfaction ($r = 0.43$, $p < .05$). However, neither passive nor active Qzone use was significantly related to negative emotions (all $p_s > 0.05$).
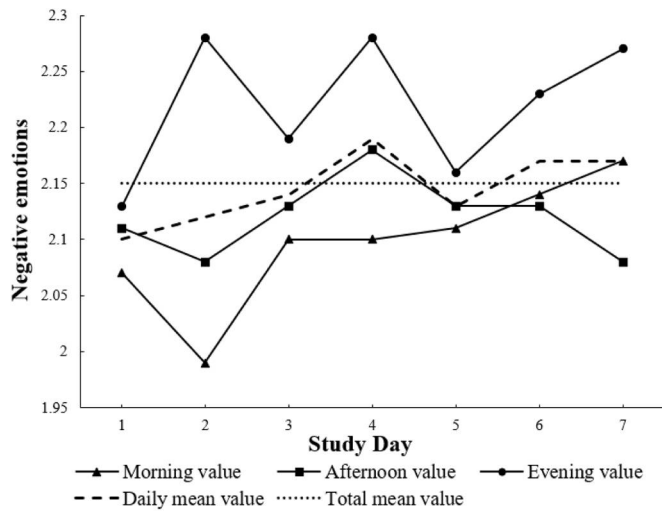
Fig. 2. Mean values of negative emotions across study days.

Table 1
Descriptive statistics and correlations for studied variables.

	M	SD	1	2	3	4
1 Passive use	0.00	3.24	–	**.50**	.04	–
2 Active use	0.00	6.89	**.57**	–	.06	–
3 Negative emotions	2.15	0.75	−0.19	−0.19	–	–
4 Self-esteem	3.51	0.56	.05	−0.10	−0.19	–
5 Life satisfaction	2.83	0.81	**.21**	.10	−0.20	**.43**

Note: Correlations below the dashed diagonal line represent between-person correlations. Correlations above the dashed line represent aggregated within-person correlations. Bold parameters are significant at $p < .05$. Active and passive use are standardized scores, their means are both equal to zero.

3.2. The momentary relationship between passive Qzone use and negative emotions

First, we computed ICC value for each of main variables, indicating the proportion of the variance in both between- and within-person levels. Results showed that the ICC values were 0.63 for negative emotions, and 0.90 for passive use. This means that 63% of the variance in negative emotions was between-persons and 37% was within-persons over time, 90% of the variance in passive use was between-persons and 10% was within-persons over time, demonstrating that multilevel modeling was appropriate. Besides, unconditional growth model indicated that the initial status of all individual's negative emotions at *Day* 1 was 2.15 (the response scale ranged from 1 to 5), while negative emotions remained stable throughout the study week ($b = 0.01$, $p = .32$). Similarly, passive use also remained stable over this period ($b = −0.08$, $p = .13$).

To examine whether passive use positively predicted negative emotions over time, we specified a conditional growth model that added time-varying predictors to the model at Level-1 and time-invariant predictors to the model at Level-2. Active use was included as a control variable at Level- 1. As shown in Table 2 and Fig. 3, the results of the model indicated that passive use could negatively predict negative emotions ($b = −0.10$, $p < .05$), while active use did not predict negative emotions ($b = 0.01$, $p = .53$). Besides, neither self-esteem ($b = −0.14$, $p = .25$) nor life satisfaction ($b = −0.10$, $p = .21$) significantly predicted the level of negative emotions.

In terms of the cross-level interactions, we found that neither self-esteem nor life satisfaction moderated the relationship between passive use and negative emotions. Specifically, for self-esteem, we did not find a significant influence in predicting the effect of passive Qzone use on negative emotions ($b = 0.02$, $p = .27$). And for life satisfaction, the

Table 2
Multilevel models of passive Qzone use predicting negative emotions.

Fixed Effects	Unconditional Growth model		Conditional Linear growth model	
	Coefficients	SE	Coefficients	SE
For initial status, π_{0i}				
Intercepts (β_{00})	**2.15**	.06	**2.92**	.39
Self-esteem (β_{01})			−0.14	.12
Life satisfaction (β_{02})			−0.10	.08
Rate of change for Day, π_{1i}				
Intercept (β_{10})	0.01	.01	0.07	.07
Active use, π_{2i}				
Intercept (β_{20})			0.02	.07
For the slope of passive use, π_{3i}				
Intercept (β_{30})			**−0.10**	.05
Self-esteem (β_{31})			0.02	.02
Life satisfaction (β_{32})			0.02	.01
Random Effects	RV	SE	RV	SE
Within-person variance (σ^2)	**.18**	.01	**0.18**	.01
Initial status (τ_{00})	**.35**	.05	**0.34**	.05
Rate of change (τ_{11})	**.01**	.00	**0.01**	.00
Passive use variance (τ_{33})			0.01	.01

Note: SE = standard error; RV = residual variance. Bold parameters are significant at $p < .05$. Active use was included as a control variable.
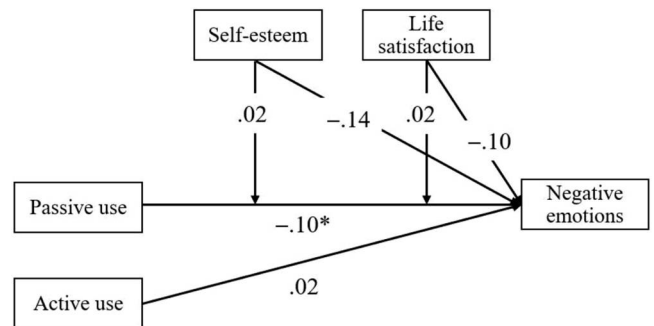

Fig. 3. The momentary relationship between passive use and negative emotions
Note: *$p < .05$.

cross-level interaction was likewise not significant, that is, life satisfaction could not predict the random slope for passive Qzone use ($b = 0.02$, $p = .11$).

3.3. Post-hoc power analysis

In order to estimate the post-hoc power of our multi-level models, we performed Monte Carlo power simulations in Mplus using the parameter estimates from our actual analyses (see Arend and Schäfer, 2019). Results showed that the achieved power in our sample was low in order to detect within-person relationships between *active Qzone* use and negative emotions or to detect cross-level interactions (all power ≤ 0.51). However, our sample had enough power to detect within-person relationships between *passive Qzone* use and negative emotions (power = 0.90). This suggests that 99 is a relatively small sample for cross-level interactive analysis, while 693 daily measures could provide sufficient power to examine the momentary associations between passive Qzone use and negative emotions.

3.4. Exploratory analyses

In addition to our main hypotheses, we conducted three exploratory analyses to enhance our understandings of the relationship between

passive use and negative emotions. Given that the longitudinal study of Wang et al. (2018) found a U-shaped relationship between Facebook use and loneliness, we also tested for curvilinear relationships between passive use and negative emotions using EMA data. A quadratic term of passive use was added to the model. Results revealed a significant linear relationship between passive use and negative emotions ($b = -.11$, $< .05$), but not a curvilinear relationship ($b = 0.01$, $p = .56$).

Testing the three types of negative emotions separately to examine how passive use was associated with different negative emotions, we found that passive Qzone use was negatively related to unhappiness ($b = -.12$, $p < .05$), but not to loneliness ($b = -.09$, $p = .10$) or sadness ($b = -.09$, $p = .14$). Neither self-esteem nor life satisfaction moderated these within-person relationships (all $p_s > 0.05$).

4. Discussion

This study used an EMA approach to examine the momentary relationships between passive Qzone use and negative emotions among female Chinese undergraduate students and also inspected the moderating effects of two individual variables (i.e., self-esteem and life satisfaction). Overall, we found that female's passive Qzone use was negatively related to negative emotions, however only to a small extent. Contrary to our expectations, neither self-esteem nor life satisfaction moderated this momentary relationship. This finding suggests that irrespective of the levels of one's self-esteem and life satisfaction, browsing Qzone may in fact help female undergraduate students during their transition from high school to college, for example in regard to short-term coping with negative emotions. This unexpected momentary association between passive use and negative emotions further highlights how short-term effects of social media use may differ from their long-term effects, thereby offering a more nuanced insight into the theory of compensatory SNS use and enhancing our understanding of how social media works in regulating emotions (Kardefelt-Winther, 2014).

Contrary to Hypothesis 1, we found a negative relationship between passive Qzone use and negative emotions. Engaging more in passive Qzone use on a given day was an important predictor of decreased negative emotions in our sample. This finding seems to be inconsistent with the Compensatory Internet Use Theory (CIUT; Kardefelt-Winther, 2014) and other findings suggesting that compensatory SNS use, especially passive SNS use, was a maladaptive emotion regulation strategy that would lead to more serious emotional problems (e.g., Rasmussen et al., 2020; Shaw et al., 2015; Thorisdottir et al., 2019). In fact, according to the CIUT, problematic SNS use occur in large part due to the negative reinforcement associated with the reduction of distressing emotions (Elhai et al., 2019; Kardefelt-Winther, 2014). In this regard, our finding may reflect on young women's susceptibility to problematic or even addictive SNS use patterns (Chae et al., 2018; Su et al., 2020). In other words, browsing SNS may function as an adaptive external activity that could help Chinese young female students manage their negative emotions during the college transition over a short period. In the long-run, however, the short-term benefits from SNS could make individuals more habituated to turn to SNS when experiencing stressful life events. Over time, this may progress into more maladaptive coping strategies including the excessive use of SNS to escape from distressing situations and long-term difficulties in emotion regulation (Dempsey et al., 2019; Elhai et al., 2019; Wadley et al., 2020; Zsido et al., 2021). Fear of Missing Out (FoMO) also suggests that frequently browsing information on SNS could make users have rewarding experiences, but once aways from SNS, individuals may develop feelings of missing out important information they would otherwise have about social events or their friend networks (Przybylski et al., 2013). Pervasive fears can, in turn, drive people to more frequently and repeatedly check their SNS accounts (Dempsey et al., 2019). Therefore, future studies need to continue to apply a dynamic perspective that differentiates within- and between-person associations between passive SNS use and negative

emotions. Particularly, exploring the process of how momentary within-person media effects cumulatively lead to long-term detrimental effects seems worthwhile to further pursue (e.g., Thomas et al., 2021).

In terms of the momentary negative relationships between passive Qzone use and negative emotions, two potential mechanisms provide possible explanations: First, Chinese traditional culture places more emphasis on interdependence and relationship harmony, and encourages suppression and quietness in most social situations (Butler et al., 2007). In this light, passive Qzone use may function as an appropriate way to behave for Chinese women because it matches with the cultural norms of emotional suppression (Zhou et al., 2016). A meta-analysis by Yin et al. (2019) also found a negative relationship between passive SNS use and mental illness for individuals from collectivistic countries, while the relationship was positive for individualistic cultures. In other words, the negative effects of suppression might be reduced among individuals from collectivistic cultures with more Asian values, such as China (Butler et al., 2007).

Second, the potential differences between Chinese-based and American-based SNS may also help understand this finding. China is a typical Eastern-culture country, in which not only SNSs culture but users' motivation is more collectivistic than that of Western countries (Cho, 2010; Qiu et al., 2013). Following the Chinese traditional culture of humility and self-criticism (Kitayama et al., 1997), Chinese Qzone users may engage in more benevolent sharing behaviors, such as posting less self-enhanced content, than users in Western contexts do (Qiu et al., 2013). In line with Social Comparison Theory, such use patterns could reduce the occurrence of social comparisons and envy on Qzone, thereby preventing detrimental consequences of passive use (Tandoc et al., 2015). In these cases, passive browsing may be a benign process of information exchange (Metzger et al., 2018), which could provide an opportunity for undergraduate students to reconnect with their high school friends (Čičević et al., 2016; Ellison et al., 2007).

Contradicting our Hypothesis 2, neither self-esteem nor life satisfaction moderated the momentary relationship between daily passive Qzone use and negative emotions. This is consistent with other EMA research suggesting that individual differences in gender, depression, and loneliness do not necessarily moderate the relationship between passive Facebook use and well-being (Verduyn et al., 2015). One possible explanation is that we conceptualized self-esteem and life satisfaction as trait-like measures rather than as momentary, state-like measures. Considering both self-esteem and life satisfaction as being able to fluctuate over time in result of daily experiences (e.g., Valkenburg et al., 2021), it could be possible that malleable, real-time self-esteem and life satisfaction may moderate the momentary relationship between passive use and negative emotions. More research is needed to examine the moderating effects of short-term, momentary differences in self-esteem and life satisfaction. Another reason might be that the limited sample sizes of this study at both within- and between-person levels may have hindered to elucidate a significant moderating effect (Gabriel et al., 2019). More specifically, our sample provided relatively small variability in Level-2 variables ($SD = 0.56$ and 0.81 for self-esteem and life satisfaction, respectively) and Level-1 slope ($SD = 0.10$), which may result in inadequate power to detect the cross-level interactions (Mathieu et al., 2012). Therefore, future studies need larger, more heterogeneous samples to examine individual differences.

5. Strengths, limitations, and implications for future research

To the best of our knowledge, the present work is the first to investigate whether passive use and negative emotions are associated in a non-Western, young, female sample of Chinese students. The novelty of this study is that we utilized EMA data over seven consecutive days to capture the real-time SNS use and negative emotions, thereby reducing recall bias. We also shed more light on passive Qzone use in China than has been done before by assessing it for more details—such as browsing newsfeeds as well as profiles or pictures of friends, old friends, and

strangers—rather than using one general item, such as "How much have you passively used Facebook?" (e.g., Aalbers et al., 2018; Verduyn et al., 2015). Moreover, this study used advanced analytical methods (i.e., multilevel modeling method and cross-level interaction analysis) to examine both within-person relationships between passive SNS use and negative emotions and moderating effects of self-esteem and life satisfaction simultaneously, thereby providing a more accurate estimation of short-term Qzone-induced changes in negative emotions. The present study showed that passive Qzone use can serve as an effective short-term external activity for female undergraduate students to regulate their emotions on a daily basis.

However, there are some important limitations that we also have to keep in mind. First, SNS use and negative emotions were measured using self-reports, which may lead to socially desirable answers which could explain the low mean score of negative emotions and the high score of self-esteem. Other objective measures, such as log data or physiological measures, could be used instead in the future in order to not underestimate the relationship between SNS use and wellbeing (Jones-Jang et al., 2020). Another limitation is the sample size of this study, which may not have been large enough to detect some effects, especially the moderating effects of self-esteem and life satisfaction that may have been underpowered due to the size of the current sample ($n = 99$). The sample of this study is young, females Chinese students, which may limit the generalization of our findings to a wider population (e.g., male students or Western cultures) We also cannot simply generalize our findings to longer time periods typically used in studies on this research field (e.g., weeks or months) due to the real-time nature of this study. Third, three types of negative emotions (i.e., unhappiness, loneliness, and sadness) were assessed in this study, but other negative emotions, such as anxiety, envy, or anger might as well be interesting to look at in order to get a deeper understanding of how passive use affects user's emotions in daily life. Finally, we examined the momentary relationship between Qzone use and negative emotions, more studies are needed to test whether this relationship also exists in other Chinese-based SNSs (e. g., WeChat), despite or because of other platforms' differences in affordances (Pouwels et al., 2021).

However, our study also comes with important implications. The significant positive effect of daily passive Qzone use on negative emotions suggests that there is no empirical support for the automatic reflex among parents and teachers to worry about the possible negative effects of SNS use on young SNS users' mental health—at least among young, female Chinese Qzone users, and as long as they do not browse Qzone excessively. Promoting longer-term, positive media effects, and preventing SNS addiction among young females seems still desirable though. For example, universities could include social media literacy programs in their class curriculums to correct the unhealthy habits of SNS use from high school and ultimately optimize students' use of social media rather than imposing restrictions on smartphone use (Shirzad et al., 2019). Parents and teachers could teach undergraduate students adaptive social and emotion regulation strategies including to seek support and engaging in face-to-face social activities, to help and support them in their transition into college. Finally, young females who prefer to use SNS in order to deal with their negative emotions should be aware of SNS browsing-induced FoMO and social media addiction, especially when they experience stressful life events (Dempsey et al., 2019; Rasmussen et al., 2020).

Overall, our study emphasizes the momentary relationship between Qzone use and negative emotions, thereby indicating that daily passive Qzone use was negatively related to female participants' negative emotions across seven days, and this within-person effect was not moderated by individual self-esteem or life satisfaction. From an individual perspective, this short-term finding provides evidence of the positive effect of passive use (e.g., Metzger et al., 2018), that is, passive Qzone use might be beneficial for some individuals to regulate their negative emotions in daily life. Given the ubiquity of SNS, it seems important to appropriately harness the power of social media to regulate

daily stress, especially when passive browsing is the dominant use pattern.

Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

CRediT authorship contribution statement

Xue-Qin Yin: Formal analysis, Writing – original draft, Supervision, Validation, Writing – review & editing. **Xin-Xue Zhang:** Data curation, Project administration, Validation, Writing – review & editing. **Sebastian Scherr:** Validation, Writing – review & editing. **Jin-Liang Wang:** Methodology, Supervision, Validation, Writing – review & editing.

Declaration of Competing Interest

The authors declare that there are no conflicts of interest.

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