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# Parental phubbing accelerates depression in late childhood and adolescence: A two-path model

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## ABSTRACT

**Introduction:** Phubbing is a social exclusion behavior related to mobile phone use. It undermines interpersonal relationships and mental health. This study aimed to test the connections between parental phubbing and depression in late childhood and adolescence, as well as the mediating roles of parental warmth, parental rejection, and relatedness need satisfaction.

**Methods:** We conducted two studies. Study 1 was a cross-sectional study of 530 Chinese students (268 boys and 262 girls,  $M_{age} = 13.15 \pm 0.64$  years) who completed self-report questionnaires. We conducted structural modeling to test the relationship between parental phubbing and depression. Study 2 used a short longitudinal design to validate the results of Study 1 and test the mediating roles of parental warmth, parental rejection, and relatedness need satisfaction. In Study 2, we recruited 293 Chinese students (151 boys, 141 girls, and one participant with no reported gender information,  $M_{age} = 12.87 \pm 0.74$  years) to complete the questionnaires and applied structural equation modeling to analyze the data.

**Results:** Two sequential mediation effects were found. The first was parental phubbing → parental warmth → relatedness need satisfaction → depression (protection-reduced effect). The second was parental phubbing → parental rejection → relatedness need satisfaction → depression (risk-increased effect). Gender differences were non-significant.

**Conclusions:** The study revealed that parental phubbing was associated with students' depression in late childhood and adolescence through two paths. The present study highlights the need to establish family norms regulating mobile phone use to reduce phubbing.

## 1. Introduction

Mobile phones are embedded in people's daily lives, and their influence is far-reaching. The Pew Research Center found that about 53% of people across 11 nations use mobile phones to access the Internet and run apps (Silver et al., 2019); in the US, more than 90% of parents use mobile phones (Pew Research Center, 2010). Turkle (2011) observed that people depended more on digital devices (e.g., mobile phones) than on the people around them. Indeed, in real life, the use of mobile phones can make people neglect others around them, such as partners, friends, colleagues, parents, and offspring. One kind of neglect is “phubbing.” Phubbing is a social exclusion behavior related to mobile phone use (Roberts & David, 2017) in which users ignore their interlocutors to attend to their phone. In face-to-face conversations, phubbing disrupts the feeling of copresence (Kadylak et al., 2018), leaves an impolite and

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impatient impression, and makes for poor-quality communication (Abeele, Antheunis, & Schouten, 2016). Emerging studies are constantly giving evidence on the fact that phubbing is a risk factor for people's interpersonal relationships and mental health. In family systems, “partner phubbing” (phubbing behavior in romantic or marital relationships) decreases spouses' mental health, relationship quality, and satisfaction (Chotpitayasunondh & Douglas, 2016; Halpern & Katz, 2017; Roberts & David, 2016; Wang, Xie, Wang, Wang, & Lei, 2017), and exacerbates marital conflicts (Ahlstrom, Lundberg, Zabriskie, Eggett, & Lindsay, 2012).

Many studies have investigated the effects of partner phubbing. However, within the family system, the parent-child relationship is important for development in late childhood and adolescence (Shaffer & Kipp, 2010). To our knowledge, few studies to date have investigated the psychological states of adolescents after being phubbed by their parents. To fill this gap, the present study focused on parental phubbing. Based on the definition of “phubbing,” the present study defined “parental phubbing” as a phenomenon where parents use their mobiles to make a child feel excluded in parent-child interactions. Parental technofence, a phenomenon similar to parental phubbing, reduces the quality of co-parenting (McDaniel & Coyne, 2016b) and positively predicts children's and adolescents' internalizing problems (McDaniel & Radesky, 2018a, b; Stockdale, Coyne, & Padilla-Walker, 2018).

Depression is a serious risk factor for adolescents that puts them in various disadvantageous situations that may entail negative outcomes (Xie, Wang, et al., 2018). Besides these serious consequences, their prevalence rate is also considerable. In China, about one-third of adolescents suffer from depressive symptoms (Li, Chen, Zhao, & Xu, 2017), and excessive mobile phone use is correlated with depression (Jun, 2016). In a study by Wang et al. (2017), Chinese adults reported high depressive symptoms and low relationship satisfaction after being phubbed by their spouses. Additionally, McDaniel and Coyne (2016a) found that technofence was negatively correlated with relationship quality and life satisfaction and positively associated with depression. In summary, the present study aimed to uncover the mechanisms behind the effect of parental phubbing on depression in Chinese children and adolescents.

### 1.1. Parents' phubbing and depression

Late childhood and adolescence are critical transition periods. For individuals in those periods, family is one of the most important protective factors for healthy adolescent development (Hall-Lande, Eisenberg, Christenson, & Neumark-Sztainer, 2007), and parents are important sources of socialization (Bogenschneider, 1996; Conger et al., 1992; Darling & Steinberg, 1993). The integrative model of parenting posits that parenting practices directly affect children's and adolescents' behaviors and characteristics (Darling & Steinberg, 1993). This theory indicates that parenting practices can directly help children and adolescents attain development goals and avoid deviant outcomes. For example, family support can reduce adolescents' risks of deviant behaviors (Mason & Windel, 2002), and protective parenting—including autonomy support, structure, and warmth—can enhance the socialization of children and adolescents (Grusec, 2011). In terms of media use, the ecological techno-subsystem theory indicates that mobile media and the interaction between the media and the environment in which children are living affects their development (Johnson & Puplampu, 2008). Home Internet use can benefit children's cognitive development (e.g., language expression, metacognitive planning, and visual perception) (Johnson, 2010); however, bedroom media use is associated with adolescent obesity and online game addiction (Gentile, Berch, Choo, Khoo, & Walsh, 2017). In addition, parental restrictive mediation rather than co-use mediation reduces children's online risk and Internet addiction (Chang et al., 2019).

In previous studies, Kildare and Middlemiss (2017) and McDaniel (2019) summarized how parental distraction with a mobile phone during parent-child communication harms the quality of the parent-child relationship. Cross-sectional and longitudinal studies have revealed that parents' phone usage was related to children's internalizing and externalizing problems (McDaniel & Radesky, 2018a; 2018b). For example, in mother-child communication, maternal mobile phone usage was found to impact young children's social-emotional functions (Myruski et al., 2018) and language learning (Reed, Hirsh-Pasek, & Golinkoff, 2017). Ding, Kong, Zhang, Zhou, and Hu (2018) conducted a longitudinal study that showed that parental phubbing increased Chinese adolescents' Internet addiction after six months.

The expectancy violations theory (Burgoon, 1993) can also explain how phubbing affects individuals (Miller-Ott & Kelly, 2015). This theory indicates that people often have some expectations about social interactions; when a partner's behavior violates expectations, the other spouse notices. In face-to-face dating, people expect their partners to focus all their attention on them, but partner phubbing makes them uneasy, especially in early dating situations (Miller-Ott & Kelly, 2015). According to the expectancy violations theory, adolescents expect parents to pay attention to them in parent-adolescent communication. An interview revealed that children often expect their parents to pay attention to them and put down their mobile phones during parent-child conversations (Hiniker, Schoenebeck, & Kientz, 2016). However, parental phubbing is an interruption of parent-child communications with a lower interaction frequency and poor responsiveness to children's cues (McDaniel & Radesky, 2018b). When a parent's attention is interrupted by a mobile phone, offspring's expectations are negatively violated, and they experience negative emotions, such as depression (Stockdale et al., 2018). Therefore, based on the theories and previous studies, the present study hypothesized that parental phubbing would positively correlate with adolescents' depression (H1).

### 1.2. The mediating role of relatedness need satisfaction

Although previous studies have uncovered a positive relationship between parental phubbing and adolescent depression, the mechanisms of the effect are still unknown. In other words, there may be several potential mediators in this relationship. Relatedness need satisfaction is potential one mediator that should be considered. Self-determination theory posits that satisfying basic psychological needs can enhance life satisfaction and reduce negative emotional states (Ryan & Deci, 2000, 2017). Relatedness need is a

basic psychological need expressed as the desire for belonging or the feeling of meaningful connection with others (Prentice, Jayawickreme, & Fleeson, 2019; Ryan & Deci, 2000). Relatedness need satisfaction enhances adolescents' mental health. For instance, one cross-sectional study found that adolescents with high relatedness need satisfaction report fewer depressive symptoms than adolescents with low relatedness need satisfaction (Emery, Toste, & Heath, 2015). In addition, adolescents who perceive high parental relatedness need support will report low scores for depression and loneliness (Inguglia, Inguglia, Liga, Lo Coco, & Lo Cricchio, 2015). Furthermore, a longitudinal study also revealed that relatedness need satisfaction enhanced adolescents' school-related subjective well-being (Tian, Chen, & Huebner, 2014). Based on self-determination theory and previous studies, the present study posited that relatedness need satisfaction would decrease symptoms of depression in adolescents.

Although there is no direct evidence supporting the notion that parental phubbing decreases relatedness need satisfaction, some related studies provide indirect support. Based on the definition, phubbing is a kind of mobile phone-induced ostracism (Chotpitayasunondh & Douglas, 2018). Williams (2009) suggested that rejected individuals will feel that their basic needs are threatened and experience social pain. Empirical evidence indicated that individuals reported a low sense of belonging after being phubbed (Chotpitayasunondh & Douglas, 2018). Other studies also revealed that phubbing negatively related with social relationship quality, including marital satisfaction and relationship quality (Halpern & Katz, 2017; Karadağ et al., 2016; Wang et al., 2017). One recent study indicated that mobile phone-induced ostracism decreased people's basic needs satisfaction, including social belonging needs (Hales, Dvir, Wesselmann, Kruger, & Finkenauer, 2018). As the need to belong is part of relatedness needs (Ryan & Deci, 2000), the present study posited that adolescents' relatedness needs would be threatened by parental phubbing. Therefore, we advance a second hypothesis that relatedness need satisfaction would mediate the connection between parental phubbing and depression (H2).

### 1.3. The mediating roles of parental warmth and parental rejection

Although we supposed that parental phubbing would decrease adolescents' relatedness need satisfaction, how this effect occurs is still unknown. Parent-adolescent relationships, such as parental warmth and parental rejection, are the potential mediators of this relationship because theoretical evidence indicates that parental warmth leads to the satisfaction of relatedness needs while parental rejection leads to the frustration of relatedness needs (Wehmeyer, Shogren, Little, & Lopez, 2017).

Warmth refers to affection, love, sweetness, and positive attitudes (Costa, Sireno, Larcán, & Cuzzocrea, 2019) and is related to positive development (Zhou et al., 2002). Parental warmth and relatedness need satisfaction are intrinsically consistent. Bireda (2015) found that adolescents who perceived high parental warmth reported low depressive symptoms. In contrast with parental phubbing, warm behaviors are involving and responsive (Wehmeyer et al., 2017). According to the expectancy violations theory (Burgoon, 1993), adolescents wish for their parents to display a high degree of involvement in their interactions. One study revealed that parental technofence increased adolescents' depression through a decrease in parental warmth (Stockdale et al., 2018). Thus, the present study supposed that parental phubbing would threaten adolescents' perceptions of parental warmth. Therefore, a sequential mediation effect would follow from parental phubbing to adolescent depression through decreasing parental warmth and relatedness need satisfaction (H3). Because this mechanism reflects how parental phubbing decreases the protective factor, namely parental warmth, we called this mechanism the "protection-reduced effect."

Contrary to parental warmth, parental rejection is a kind of relatedness thwarting behavior that leads to the frustration of relatedness needs (Wehmeyer et al., 2017). Social exclusion makes people feel rejected (Williams, 2009). As phubbing is a kind of social exclusion behavior (Roberts & David, 2017), we supposed that adolescents who are phubbed by their parents would perceive parental rejection. Therefore, the present study advanced another hypothesis, that parental rejection would mediate the connection between parental phubbing and adolescent symptoms of depression. Parental rejection has been found to be a risk factor for adolescent psychopathology (Sentse, Lindenberg, Omvlee, Ormel, & Veenstra, 2010). One study showed that adolescents in the parental rejection groups reported higher scores on anxiety-depression symptoms than adolescents in the low parental rejection groups (Miranda, Affuso, Esposito, & Bacchini, 2016). Another longitudinal study revealed that parental rejection has a long-term effect on adolescents' depressive symptoms, such that adolescents with high-perceived parental rejection reported high depressive symptoms one year later (Hale, VanderValk, Akse, & Meeus, 2008). Thus, the present study predicted that there would be a positive relationship between parental rejection and adolescent depression. Therefore, we posited a sequential mediation effect from parental phubbing to adolescent depression through parental rejection and relatedness need satisfaction (H4). Because parental rejection is a risk factor for adolescent development, we called this sequential mediation effect the "risk-increased effect."

### 1.4. The present study

We employed two studies, one cross-sectional and one short-term longitudinal, to examine how parental phubbing increases depressive symptoms in late childhood and adolescence. When testing the effect mechanism, the present study constructed two sequential mediation effects, the protection-reduced effect and the risk-increased effect, based on the expectancy violations theory and self-determination theory. Fig. 1 illustrates the theoretically hypothesized model. The present study went beyond previous studies to provide detailed information about the mechanisms of the risk effects of parental phubbing. In addition, boys and girls often express differently in social interaction (Maccoby, 1990) and depression (Angold, Erkanli, Silberg, Eaves, & Costello, 2002). Furthermore, Karadağ et al. (2016) found that gender moderated the relationships between various forms of media addiction and phubbing. Chotpitayasunondh and Douglas (2016) showed that the relationship between being phubbed and social norms of phubbing was stronger in male participants than in female participants. Because no previous study demonstrated a gender difference in this domain, we could not formulate specific hypotheses regarding gender difference. Therefore, we sought to determine whether

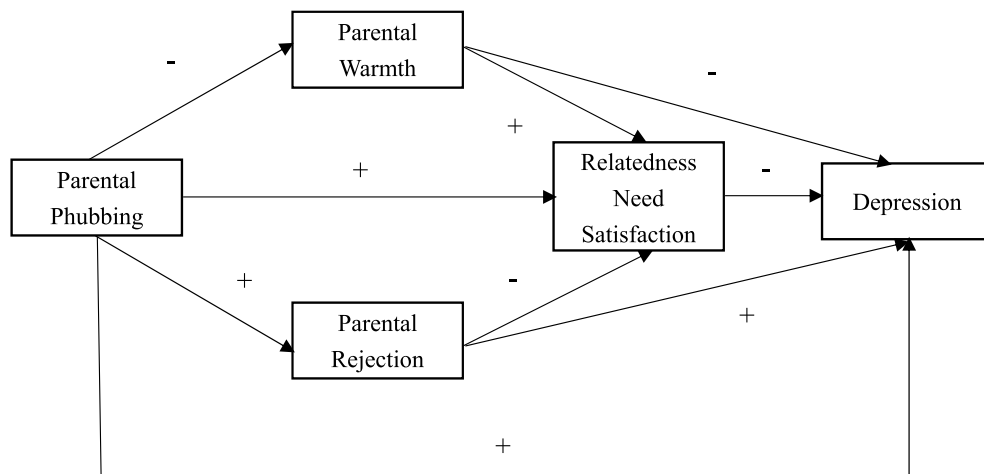


Fig. 1. Theoretical model.

gender moderated the mediation model and whether gender differences exist in relation to parental warmth, parental rejection, relatedness need satisfaction, and depression.

Given that reproducibility is an important issue in psychological studies, we conducted two studies to test our hypotheses. In Study 1, we employed a cross-sectional survey to test the correlation between parental phubbing and the depression of children and adolescents. In Study 2, we used a short-term longitudinal study to test the validity of these relationships and their mediation mechanisms.

## 2. Study 1

### 2.1. Participants and procedure

In Study 1, we conducted a cross-sectional study to test whether parental phubbing correlated with adolescent depression. We recruited 530 Chinese students (268 boys and 262 girls) to participate in the survey. The mean age of the participants was  $13.15 \pm 0.64$  years (ranging from 10 to 18 years). The survey was conducted in classrooms, and students completed questionnaires following the guide offered by the research assistants. We obtained consent from the teachers and students before data collection commenced. We investigated students' perceptions of parental phubbing, depression, and demographic variables.

### 2.2. Measures

#### 2.2.1. Parental phubbing

We revised the nine-item scale developed by Roberts and David (2016) and informed by McDaniel and Coyne (2016a) to assess the students' perceived parental phubbing. The initial scale was used to assess partner phubbing, and it evidenced good reliability and validity in Chinese participants (Wang et al., 2017). We revised the scale to assess the Chinese students' perceptions of parental phubbing. The example items included: "During a typical mealtime with my parents, my parents pull out and check their cellphones" and "My parents place their cellphones where they can see them when we are together." Students rated the items on a 5-point Likert scale from 1 = *Never* to 5 = *Every time*, where the total score indicates the level of perceived parental phubbing. The Cronbach's alpha coefficient of the revised scale in the present data was 0.84. This scale had a good constructive validity ( $\chi^2/df = 3.70$ , CFI = 0.95, TLI = 0.93, RMSEA = 0.071).

#### 2.2.2. Depression

The Center for Epidemiological Studies Depression Scale (Radoff, 1977) was used to assess the students' depression. This scale was revised in a prior study and showed good reliability and validity in Chinese adolescents (Xie, Dong, et al., 2018). This scale comprises 20 items (e.g., "I feel others are not friendly to me") on which students rated the depressive symptoms they experienced in the last week on a 4-point scale ranging from 1 = *Not at all* to 4 = *A lot*. The Cronbach's alpha coefficient of the revised scale in the present data was 0.89.

### 2.3. Results

*T*-tests showed that girls ( $M = 1.88$ ,  $SD = 0.52$ ) reported more depressive symptoms than boys ( $M = 1.71$ ,  $SD = 0.47$ ,  $t = 4.02$ ,  $p < .001$ , Cohen's  $d = 0.34$ ). Pearson correlations revealed that perceived parental phubbing ( $M = 2.90$ ,  $SD = 0.87$ ) was positively associated with depression ( $M = 1.80$ ,  $SD = 0.50$ ),  $r = 0.41$ ,  $p < .001$ . Next, we conducted structural equation modeling analysis

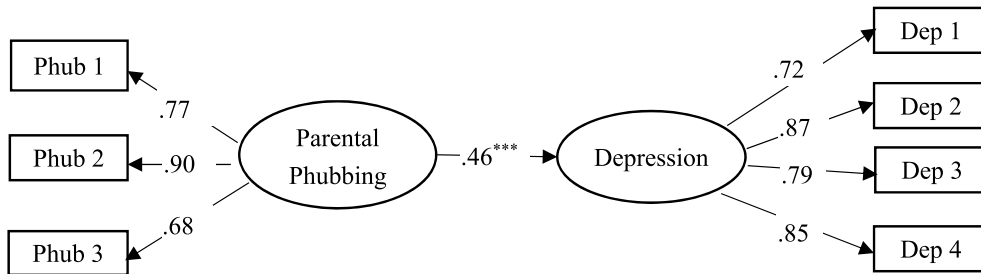


Fig. 2. Relation between parents' phubbing and adolescents' depression. \*\*\* $p < .001$ .

using the Mplus 7.4 software (Muthén & Muthén, 1998–2015) to test whether parental phubbing predicted students' depression. Results showed that parental phubbing positively predicted students' depression after controlling for gender ( $\beta = 0.46$ ,  $p < .001$ ;  $\chi^2/df = 2.34$ , CFI = 0.99, TLI = 0.98, RMSEA = 0.046). Fig. 2 shows the results, which indicate that parental phubbing was a risk factor for the students' depression. Students who suffered from a high degree of parental phubbing reported high scores for depression.

### 3. Study 2

#### 3.1. Participants and procedure

Although Study 1 revealed a positive correlation between parental phubbing and depression, this finding did not mean that a cross-sectional design would necessarily provide robust evidence. In Study 2, we employed a short-term longitudinal study to validate the results of Study 1 as well as to examine the mechanisms behind the relationship between parental phubbing and depression. We collected data in two waves. The first wave took place from the end of December 2017 to the beginning of January 2018, and the second wave from the end of March 2018 to the beginning of April 2018. In the first wave, we recruited 447 Chinese students; in the second wave, only 293 students remained. Among the 293 students, there were 151 boys and 141 girls (one participant did not report their gender information). The mean age of the students was  $12.87 \pm 0.74$  years (ranging from 10 to 15 years). The results of  $t$ -tests indicated that the missing data for depression and relatedness need satisfaction measured in the second wave were not related to gender, parent phubbing, warmth, and rejection ( $ps > .05$ ).

We obtained the consent of the students and their teachers before data collection commenced. In the first wave, we collected information about parental phubbing, warmth, rejection, and demographics. In the second wave, we collected data pertaining to relatedness need satisfaction and depression. We gathered the students' data in their classrooms. The students completed the survey by following guidelines provided by our research assistants.

#### 3.2. Measures

##### 3.2.1. Parental phubbing

We used the same scale as in Study 1 to test the students' perceived parental phubbing. The Cronbach's alpha coefficient of the scale in Study 2 was 0.85. This scale had good constructive validity ( $\chi^2/df = 3.62$ , CFI = 0.95, TLI = 0.93, RMSEA = 0.077).

##### 3.2.2. Depression

The depression scale was the same as that used in Study 1. The Cronbach's alpha coefficient in Study 2 was 0.90.

##### 3.2.3. Parental warmth and rejection

We used two sub-scales from the Chinese version of the short-form *Egna Minnen av Barndoms Uppfostran* (s-EMBU-C; Jiang, Lu, Jiang, & Xu, 2010) to assess the teenagers' perceptions of parental warmth and rejection. The warmth sub-scale comprised seven items (e.g., "Father/Mother praises me") and the rejection scale comprised six (e.g., "Father/Mother punishes me even when I make a very small mistake"). Students rated their parents' behavior on a 4-point scale from 1 = *Never* to 4 = *Always*. The rejection scale was reverse scored. The average scores for the fathers and mothers were represented as the "parent scores." The Cronbach's alpha coefficients for fathers' and mothers' levels of warmth were 0.89 and 0.87, respectively; for fathers' and mothers' rejection, the scores were 0.82 and 0.83, respectively.

##### 3.2.4. Relatedness need satisfaction

Relatedness need satisfaction was assessed by a sub-scale of the Basic Psychological Needs Scale (Chinese version) revised by Liu et al. (2013). The scale comprises seven items (e.g., "People are kind to me") rated on a 7-point Likert scale from 1 = *Not true at all* to 7 = *Completely true*. The Cronbach's alpha coefficient for the scale was 0.78.

**Table 1**  
Means and correlations between variables.

	M (SD)	1	2	3	4
1 Parental Phubbing	2.94 (0.81)	1			
2 Depression	1.70 (0.54)	.26***	1		
3 Relatedness Need Satisfaction	5.15 (1.03)	-.05	-.37***	1	
4 Parental Warmth	2.81 (0.69)	-.12*	-.25***	.40***	1
5 Parental Rejection	1.75 (0.68)	.18**	.24***	-.33***	-.17**

Note. \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

3.3. Data analysis

The present study conducted structural equation modeling to examine the theoretical sequential mediation model. Mplus 7.4 (Muthén & Muthén, 1998–2015) was used for analysis. When testing the indirect effects, we ran bootstrap arithmetic (5000 times), and 95% confidence intervals (CIs) that did not include zero indicated statistical significance at  $\alpha = 0.05$ . All the missing data were dealt with using Maximum Likelihood arithmetic.

3.4. Results

3.4.1. Preliminary analyses

We first tested the means and Pearson's correlation coefficients of the variables. Table 1 presents the results. Parental phubbing was positively associated with depression and rejection but negatively associated with warmth. Warmth and relatedness need satisfaction were negatively associated with depression, but rejection was positively associated with depression. Girls ( $M = 5.37$ ,  $SD = 0.97$ ) reported higher scores on relatedness need satisfaction than boys ( $M = 4.95$ ,  $SD = 1.05$ ,  $t = -3.56$ ,  $p < .001$ , Cohen's  $d = 0.41$ ). Boys ( $M = 1.86$ ,  $SD = 0.74$ ) reported higher scores for parental rejection than girls ( $M = 1.63$ ,  $SD = 0.59$ ,  $t = 2.92$ ,  $p < .01$ , Cohen's  $d = 0.34$ ). There were no gender differences in the mean scores for parental warmth ( $M_{boy} = 2.80$ ,  $SD_{boy} = 0.69$ ;  $M_{girl} = 2.81$ ,  $SD_{girl} = 0.68$ ) and depression ( $M_{boy} = 1.71$ ,  $SD_{boy} = 0.57$ ;  $M_{girl} = 1.70$ ,  $SD_{girl} = 0.50$ ).

3.4.2. Mediation effect analysis

According to Anderson and Gerbing's (1988) recommendations, the present study used a two-step approach to test mediation effects. In the first step, we examined the measurement model, which showed good fit ( $\chi^2/df = 2.16$ , CFI = 0.95, TLI = 0.93, RMSEA = 0.063). All the latent variables were correlated with each other except for the relationship between parental phubbing and relatedness need satisfaction. In the second step, we tested the theoretical model. When examining the theoretical mediation model, we conducted the bootstrap algorithm (Bootstrap = 5000 times) to test the indirect effects. After deleting non-significant paths, the final sequential mediation model showed good model fit ( $\chi^2/df = 2.70$ , CFI = 0.92, TLI = 0.90, RMSEA = 0.076). Fig. 3 shows the final mediation model.

In the final model, we found that parental phubbing directly predicted adolescent depression ( $\beta = 0.14$ ,  $p < .05$ ). For each path in the model, parental phubbing negatively predicted warmth ( $\beta = -0.14$ ,  $p < .05$ ) but positively predicted rejection ( $\beta = 0.23$ ,  $p < .01$ ). Relatedness need satisfaction negatively predicted adolescent depression ( $\beta = -0.38$ ,  $p < .001$ ). Parental warmth positively predicted relatedness need satisfaction ( $\beta = 0.53$ ,  $p < .001$ ) and parental rejection negatively predicted relatedness need

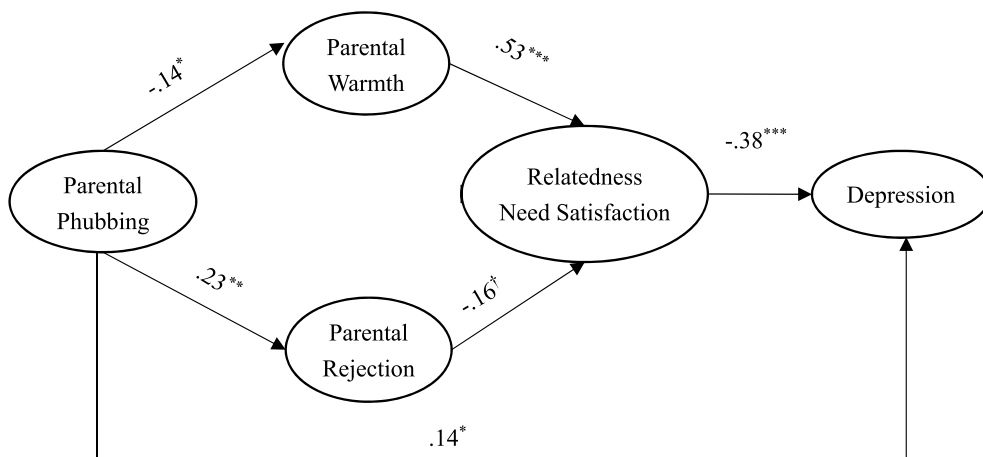


Fig. 3. Sequential Mediation Model. † $p < .10$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

satisfaction ( $\beta = -0.16, p = .053$ ). In terms of indirect effects, we found two indirect paths from parental phubbing to adolescent depression. The first was parental phubbing  $\rightarrow$  parental warmth  $\rightarrow$  relatedness need satisfaction  $\rightarrow$  depression, whose indirect effect was 0.03, 95%  $CI = [0.003, 0.060]$ . The second was parental phubbing  $\rightarrow$  parental rejection  $\rightarrow$  relatedness need satisfaction  $\rightarrow$  depression, whose indirect effect was 0.01, 95%  $CI = [0.002, 0.039]$ . The total indirect effect was 0.04, 95%  $CI = [0.013, 0.080]$ , the direct effect was 0.14, 95%  $CI = [0.018, 0.268]$ , and the total effect was 0.19, 95%  $CI = [0.051, 0.316]$ . The indirect effects explained 22.58% of the variance in the total effect. These results demonstrate that parental phubbing could exacerbate adolescent depression both directly and indirectly.

We also examined gender differences in the final model. We conducted a multi-group comparison to test gender differences. The results revealed that the final sequential mediation model was equivalent between boys and girls:  $\Delta\chi^2 = 2.18, \Delta df = 6, p = .90$ , indicating that parental phubbing had similar effects on depression for boys and girls.

In summary, Study 2 validated the results of Study 1, indicating that parental phubbing increased students' depression in late childhood and adolescence. In addition, Study 2 further yielded a two-path model of how parental phubbing affected students' depression, showing that parental phubbing had a protection-reduced effect and a risk-increased effect on students' depression.

#### 4. General discussion

As phubbing is a risk factor for interpersonal relationship quality and mental health, the main aim of the current study was to investigate the relationship between parental phubbing and depression in late childhood and adolescence. Our results show that parental phubbing amplified students' perceived depressive symptoms via a sequential mediating model in which parental warmth, parental rejection, and relatedness need satisfaction were the mediators. Our findings reveal that parents' unhealthy media use is related to their children's mental health.

##### 4.1. Two-path model of the effects of parental phubbing on teenagers' depression

The results of the mediation tests revealed that parental phubbing has both direct and indirect effects on their children's depression. For the direct path, parental phubbing was positively associated with the students' depression. Theoretically, this result can be explained by the ecological techno-subsystem theory (Johnson & Puplampu, 2008) and the integrative model of parenting style (Darling & Steinberg, 1993). The ecological techno-subsystem theory postulates that the interaction of media and families affects development in children and adolescents. In the present study, parental phubbing was shown to be a negative interaction between mobile media and family members. Therefore, our finding that parental phubbing was positively related to depression in children and adolescents was in line with the tenets of ecological techno-subsystem theory. The integrative model of parenting (Darling & Steinberg, 1993) posits that parenting practices are directly related to adolescents' outcomes. In our findings, parental warmth and rejection were two kinds of parenting practices associated with students' depression.

Young people today are surrounded by media that impact their developmental outcomes. The current study demonstrated that contact with unhealthy media use can increase the risk of mental illness. From an empirical perspective, this result is in line with prior studies (e.g., Stockdale et al., 2018). As a form of mobile phone-induced social ostracism, phubbing can lead people who are phubbed to experience more negative emotions and less positive emotions than people who are not (Chotpitayasunondh & Douglas, 2018; Hales et al., 2018). Therefore, children and adolescents who suffer from parental phubbing reported more negative emotions, such as depression.

In the protection-reduced effect, parental phubbing increased students' depression through decreased parental warmth and relatedness need satisfaction. The first stage of this sequential mediation model revealed that parental phubbing reduced the students' perceptions of parental warmth. Young people who suffer from parental phubbing may think that their parents consider their mobile phones more important than them, and their perceptions of parental warmth subsequently decrease (Stockdale et al., 2018). In the second stage, we found that parental warmth was positively correlated with relatedness need satisfaction. This result was in accordance with Wehmeyer and colleagues' (2017) suggestion that parental warmth and relatedness need satisfaction are intrinsically consistent. Therefore, parental phubbing decreased the students' relatedness need satisfaction through decreases in parental warmth. In the third stage, we found that relatedness need satisfaction negatively predicted adolescent depression. This result provided further evidence for the fact that relatedness need is a protective factor for adolescent mental health in line with prior studies (e.g., Inguglia et al., 2015; Tian et al., 2014). The satisfaction of relatedness need helps people build good social relationships, gain social support, and cope with depression (Costa et al., 2019; Demir & Özdemir, 2010; Qusted et al., 2011; Sheldon, Abad, & Hirsch, 2011). This sequential mediation model is in line with the expectancy violation theory (Burgoon, 1993) and indicates that parental phubbing exacerbates children's depressive symptoms by breaking the protective mechanism for teenagers' mental health. We therefore called this the "protection-reduced effect."

For the risk-increased effect model, parental phubbing increased students' depression through parental rejection and relatedness need satisfaction. The first stage of this sequential mediation model showed that parental phubbing increased students' perceived parental rejection. As discussed earlier, parental phubbing is a kind of social exclusion (Roberts & David, 2017), which may have led to the students reporting highly negative emotions and perceiving themselves as excluded. Therefore, parental phubbing made the teenagers feel a high degree of parental rejection. The second stage revealed that parental rejection negatively predicted relatedness need satisfaction. This was in accordance with the theoretical model of basic psychological needs (Wehmeyer et al., 2017), in which interpersonal rejection decreases relatedness need satisfaction. Therefore, we have stated that parental phubbing threatens relatedness need satisfaction through an increase in perceived parental rejection. This third stage can be explained in the same way as the

third stage in the protection-reduced effect. As opposed to parental warmth, parental rejection is a serious risk factor for adolescent mental health (e.g., Miranda et al., 2016; Sentse et al., 2010). The second sequential mediation model revealed that parental phubbing increased the students' symptoms of depression by exacerbating risk factors. Therefore, we called this mechanism the "risk-increased effect."

In addition, the non-significant gender differences revealed a similar extent of the effects of parental phubbing on adolescent depression in boys and girls. This indicates that although girls have better parent-adolescent relationships than boys, as has already been shown, that relationship cannot buffer the negative effects of parental phubbing. Thus, there may be no gender-specific effects of parental phubbing.

#### 4.2. Limitations and future directions

The present study has several limitations. First, the sample size in Study 2 was small. Because Study 2 collected data in two waves, there was a large loss of student participants between waves, leading to a small sample size in the final data. This large sample loss and resulting small sample size reduced the representativeness and external validity of the study. We should therefore be cautious when explaining the results. In the future, we hope our hypotheses will be re-examined using a large sample. Second, although we collected data in two waves, the interval between them was short, which might not have afforded sufficient time for all possible changes to manifest. In addition, we did not collect the same variables in the two waves, with the result that we were unable to formulate a statistical control. These shortcomings indicate that our results are inadequate to establish causal relationships between the independent and dependent variables. In future studies, a long-term survey and a careful statistical control will be welcome. Additionally, the present design limited us from conducting cross-lagged tests, and there may in fact be a reciprocal relationship between depression and perceived parental phubbing. In other words, students suffering from depression are at a high risk for perceiving parental phubbing, and depressed individuals are more vulnerable to stress (Rude, Gortner, & Pennebaker, 2004). Thus, in the future cross-lagged test should be conducted to test the reciprocal relation between parental phubbing and adolescent depression. Third, the data in the present study were all self-reported by adolescents, which may have increased the risk of common method bias, limiting their validity. It is well known that parent-adolescent relationships are dyad relationships. In future studies, parent-reported data on phubbing and parent-adolescent relationship quality should be considered. Moreover, the current study investigated the effects of parental phubbing on children. However, the effects of children phubbing their parents are unknown. It is very widely known that students hold mobile phones when communicating with parents, teachers, and friends. Indeed, there is a need for future studies to explore whether children's use of mobile phones in parent-adolescent interactions undermines their parents' perceived parent-adolescent relationship quality and mental health.

#### 4.3. Implications

Beyond adding to the scant literature on how parents' mobile phone usage affects their offspring's mental health (e.g., McDaniel, 2019; Stockdale et al., 2018), the current study has also made theoretical and practical contributions to previous literature. For the theoretical implications, this study showed that parental phubbing undermined the students' mental health in a two-path model, namely the protection-reduced path and the risk-increased path. This goes beyond what has been found concerning the mechanisms of parental phubbing. Compared with a singular effect (benefit-reduced or risk-increased), the two-path model postulated the potential of cumulative effects (benefit-reduced and risk-increased) of parental phubbing on adolescent depression. This highlighted how parental phubbing is a considerable risk factor in adolescent depressive symptoms. This chain mechanism combines and extends the expectancy violations theory and self-determination theory. Additionally, the current study also provides evidence for the protective factors of relatedness need satisfaction on depression.

The present study has significant practical implications. The ubiquity of smartphones may make it difficult for people to avoid phubbing others or being phubbed. McDaniel (2019) summarized that parental distraction by mobile phones negatively impacts children and adolescents' positive development. Phubbing constitutes harmful mobile phone usage. It undermines conversation quality and leaves a discourteous impression on the user's partner (Abeele et al., 2016; Misra, Cheng, Genevie, & Yuan, 2016). When having face-to-face conversations with a mobile phone present, people cannot maintain lasting eye contact (Karadağ et al., 2016), which negatively impacts their social relationship quality (Przybylski & Weinstein, 2012). Good parent-adolescent relationship quality and an intimate parent-adolescent connection is the precondition of good family functioning (Skinner, Steinhauer, & Sitarenios, 2000). It is obvious that parental phubbing may undermine family functioning. Adolescents in Stockdale and colleagues' (2018) study reported that parental technofence was negatively related to perceived parental warmth. Poor parental warmth is an indicator of poor family functioning. To construct a healthy family atmosphere for positive adolescent development, in this paper we put forward several realistic suggestions.

To avoid the negative impacts of mobile phone usage, family members can create a culture embodying care for one another and establish family norms to regulate mobile phone use. For instance, McDaniel (2019) suggests that appropriate responses to children and adolescents' cues are necessary for good parent-child interaction. In interviews, participants suggested that parents should put down their phones when children are telling them something, and parents should not spend all their free time on the phone (Hiniker et al., 2016). We thus follow their example and suggest establishing family cultures encouraging healthy mobile phone use. Excessive media use can also diminish the memory of experiences (Tamir, Templeton, Ward, & Zaki, 2018) and induce several clinical health symptoms (Xie, Dong, & Wang, 2018). Therefore, it is necessary to cultivate healthy smartphone usage habits.

In conclusion, the present study demonstrated that parental phubbing is positively related to depression in late childhood and



adolescence. Parental phubbing not only directly predicted depression, but also indirectly predicted it through parental warmth, parental rejection, and relatedness need satisfaction. The effects of parental phubbing on depression were found to be similar between boys and girls.

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