



Mother Phubbing and Child Problematic Media Use: The Role of Mother-Child Relationship and Paternal Coparenting

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Purpose: This study investigates the relationship between mother phubbing and preschoolers' problematic media use, examining the mediating role of the mother-child relationship and the moderating effects of paternal coparenting. Drawing on the Interactive Theory of Childhood Problematic Media Use and family system theory, we aim to identify key family dynamics that influence early childhood media habits. The findings could provide insights into mitigating the negative impacts of parental phubbing on children's media habits and inform targeted interventions to promote healthier media use among young children.

Methods: The study examined 1008 mothers (Mage = 35.58 years, *SD* = 3.90) with preschool-aged children (Mage = 4.59 years, *SD* = 0.92) who completed self-report questionnaires. Path analysis with bootstrap sampling was executed to assess the moderated mediation model.

Results: Mother phubbing was positively associated with preschoolers' problematic media use, with this relationship mediated by the mother-child relationship. Paternal coparenting moderated both the direct and indirect pathways in this relationship. Specifically, paternal coparenting directly mitigated the impact of mother phubbing on child problematic media use. Additionally, it alleviated the negative influence of mother phubbing on the mother-child relationship, thereby indirectly reducing its adverse effect on preschoolers' problematic media use. Overall, paternal coparenting demonstrated a protective function against the negative consequences of mother phubbing.

Conclusion: The findings significantly contribute to our understanding of how mother phubbing might increase the risk of problematic media use among preschoolers and underscore the potential importance of reducing mother phubbing and increasing paternal coparenting as integral steps to prevent preschoolers' problematic media use.

Keywords: mother phubbing, mother-child relationship, problematic media use, paternal coparenting, preschoolers

Introduction

Problematic media use, characterized by excessive and troublesome utilization of electronic media, negatively affects individual development and functioning.¹ With the increasing prevalence of digital devices, young children are increasingly exposed to and engaging in problematic media use.²⁻⁵ While research has extensively examined this issue in older children and adolescents, the specific factors and mechanisms contributing to problematic media use in preschool children remain underexplored. This study aims to address this critical knowledge gap by investigating the relationship between mother phubbing and problematic media use among preschoolers, examining the mediating effect of the mother-child relationship and the moderating effects of paternal coparenting. Drawing on the Interactive Theory of Childhood Problematic Media Use⁶ and family system theory,⁷ our research offers a novel perspective by integrating multiple family subsystems in the context of early childhood media use. This research holds significant theoretical and practical implications. Theoretically, it extends our understanding of the factors influencing preschoolers' problematic media use. Practically, our findings can inform the development of targeted interventions to promote healthier media habits in young children, crucial for enhancing their well-being and development in the digital era.

Child Problematic Media Use

Problematic media use refers to an individual's excessive dependence on media content that extends beyond normal leisure and learning needs, manifesting as a compulsive behavior that impacts psychological health and social functioning.⁸ In today's society, electronic devices have become integral to daily life, with societal and cultural influences normalizing their use. Children are particularly vulnerable to this phenomenon, being exposed to electronic devices from an early age. Due to their relatively underdeveloped self-control, judgment, and resistance to temptation, children are at a heightened risk of developing an excessive reliance on electronic devices, such as tablets and smartphones.^{9–11} Researchers have called for increased attention to problematic media use among preschool children, noting that empirical studies have identified that one in five preschool children using smartphones could exhibit signs of problematic smartphone use.⁴ Furthermore, preschool children are considered to be at the highest risk for developing smartphone-related addictive behaviors compared to other age groups.³

Problematic media use in preschool children manifests in three primary aspects: (1) Excessive use of media. Preschool children spend more time daily on various media (TV, tablets, smartphones) than recommended by experts, potentially impairing cognitive development and learning capabilities.⁹ (2) Inappropriate content. Children are exposed to media content containing violence and inappropriate sexual material, which they may imitate, adversely affecting their social behavior and emotional regulation capabilities.¹² (3) Disruption of daily life. Excessive media use can replace interactions with parents, teachers, and peers or encroach upon valuable sleep time, negatively impacting children's language development, social skill acquisition, and overall physical and mental health.¹⁰ While early digital experiences can have both positive and negative impacts on the structural and functional development of children's brains,¹³ digital addiction has been found to have harmful effects on the structure and functionality of children's brains.¹⁴ Therefore, it is essential to conduct a thorough investigation into problematic media use among preschoolers to fully understand its implications and to formulate interventions aimed at mitigating its negative impacts.

Mother Phubbing and Child Problematic Media Use

Domoff et al proposed the Interactive Theory of Childhood Problematic Media Use (IT-CPU), which delineates the distal, proximal and maintaining factors contributing to the development of problematic media use.⁶ Among the proximal factors, parents' mobile phone use can have a direct impact on children's problematic media use. In line with this notion, the present study focused on a specific behavior known as "mother phubbing", which entails mothers' use of their mobile phones during interactions with their children.^{15,16}

There are two potential explanations for the relationship between mother phubbing and child problematic media use. On the one hand, according to social learning theory,^{17,18} children primarily acquire behaviors through observation and imitation, with parents being their main models. In this context, when mothers frequently engage with mobile phones in the presence of their children, children may emulate this behavior and start using electronic devices themselves. This imitative behavior can contribute to the development of problematic media use in children. On the other hand, children who constantly experience neglect from their mothers due to maternal phubbing may undergo negative emotional reactions and turn to electronic media for solace. The adverse outcomes of mother phubbing, such as decreased self-esteem, core self-evaluation, and increased levels of anxiety, depression, and loneliness, may serve as significant risk factors for problematic media use, such as internet gaming disorder and mobile phone addiction.^{19–22} Overall, the combination of children imitating their mothers' mobile phone habits and turning to electronic media as a coping mechanism due to maternal neglect may contribute to the positive association between mother phubbing and child problematic media use.

Mother-Child Relationship as the Mediator

According to the Interactive Theory of Childhood Problematic Media Use, proximal factors contribute to the maintenance of childhood problematic media use via the maintaining factors.⁶ Among the maintaining factors, the parent-child relationship holds a significant position. In addition to the direct association, the relationship between mother phubbing and child problematic media use might also be indirectly mediated by the mother-child relationship.

Mother phubbing may affect the quality of the mother-child relationship. According to the displacement hypothesis,²³ a mother's engagement with media may result in fewer meaningful interactions between her and her children, as the time spent on devices displaces these interactions. Mother phubbing reduces responsiveness and sensitivity to children during mother-child interactions.^{24,25} When using a phone compared to not using one, parents' chances of responding to their child's (0–5 years) demands for attention were five times lower, parents' reactions were less quick and weaker, sometimes they completely neglected their kid's emotional and safety requirements.^{26,27} Experimental studies involving infants and toddlers have indicated that maternal phubbing affects mother-child interactions.^{28,29} To sum up, mother phubbing impedes the development of a positive mother-child relationship.

Positive mother-child relationship is negatively associated with child problematic media use. According to attachment theory, a secure attachment between a child and their primary caregiver, usually the mother, provides a sense of security and emotional support.³⁰ In this context, the child is inclined to seek comfort and guidance from their mother when faced with challenges or distressing emotions. In contrast, an insecure mother-child relationship can have adverse effects on the child's emotional well-being and behavior. Problematic media use can arise as a result of an unfavorable mother-child relationship. When a child lacks a secure base in their relationship with their mother, they may resort to media as a source of comfort, distraction, or emotional regulation. A meta-analysis indicated a negative association between the quality of the parent-child relationship and problematic internet use among children and adolescents aged 6 to 25 years.³¹ Conversely, an increase in mother-child interaction at 18 months of age was positively associated with reduced screen time at 2 and 3 years of age.³² Therefore, it is reasonable to conclude that for preschoolers, a positive mother-child relationship may play a role in reducing problematic media use. To summarize, based on the Interactive Theory of Childhood Problematic Media Use, the present study posits that, in addition to its direct connection with child problematic media use, mother phubbing might exert an indirect influence on such media use by compromising the mother-child relationship.

Paternal Coparenting as the Moderator

Coparenting, as a triadic family subsystem involving both parents and the child, emphasizes the shared responsibility of parents in raising children.³³ Paternal coparenting refers to the extent to which a father supports or undermines the mother's parenting goals or behaviors in the process of raising children.^{34,35} Paternal coparenting plays an important role in children's social adjustment and mother-child relationship.^{36,37}

Paternal coparenting might serve as a buffer against the adverse effects of mother phubbing. While mother phubbing takes place within the mother-child subsystem, its impact on the mother-child relationship can also be influenced by other subsystems, such as the coparenting subsystem. Feinberg (2003) posits that coparenting acts as a moderator in the relationships between risk factors (including individual, family and extrafamilial) and family outcomes.³³ From this perspective, supportive coparenting functions as a protective factor capable of mitigating or shielding individuals from negative influence. Empirical studies support the notion that coparenting can alleviate the influence of parents' individual factors on parenting styles and child development outcomes.³⁸ As mother phubbing poses a risk to the healthy development of preschool children, positive paternal coparenting may assume a protective role. Favorable paternal coparenting may protect the mother-child relationship and attenuate the adverse effects of mother phubbing on children's problematic media use. In summary, paternal coparenting moderates the intricate relationship between mother phubbing, the mother-child relationship, and children's problematic media use.

The Current Study

The study aimed to explore how mother phubbing is related to preschooler's problematic media use. It also investigated the mediating role of the mother-child relationship and the moderating role of paternal coparenting in this association. The study proposed hypotheses based on theoretical frameworks and empirical evidence, using a moderated mediating model to analyze the relationships (shown in Figure 1). The study proposed the following hypotheses:

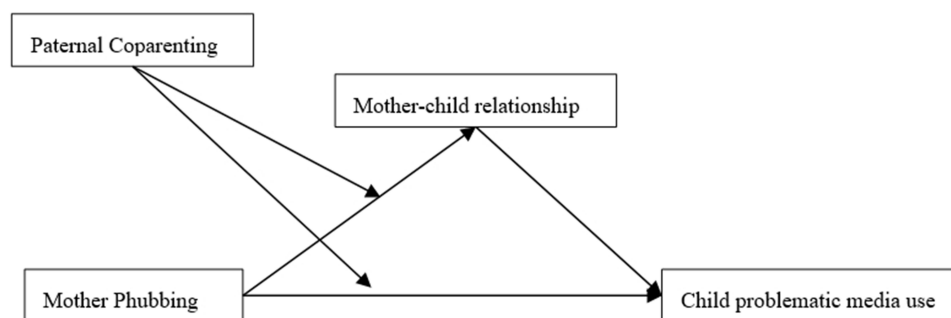


Figure 1 The hypothesized model.

- (1) H1: Mother phubbing is positively associated with preschoolers' problematic media use.
- (2) H2: The mother-child relationship mediates the association between mother phubbing and child problematic media use.
- (3) H3: Paternal coparenting moderates the connection between mother phubbing and the mother-child relationship.
- (4) H4: Paternal coparenting moderates the relationship between mother phubbing and child problematic media use.

Methods

Participants

The survey recruited participants from Shanghai, China. A total of 1026 mothers with preschool-aged children took part in the survey. Among them, 18 mothers belonged to single-parent households, and their data were excluded from the analysis. Only data from 1008 mothers from two-parent families were included for analysis. The average age of the mothers was 35.58 years ($SD = 3.90$). The average age of the father was 37.38 years ($SD = 4.91$). Regarding the mothers' education level, 19.0% of the mothers had a junior college education or lower, 59.6% had a college education, and 21.4% had a graduate education or above. There were 189 full-time mothers, accounting for 18.8% of the total. Furthermore, 522 children were girls, making up 51.8%. The children's age ranged from 3 to 6 years, with an average age of 4.59 ($SD = 0.92$). There were 656 only children, making up 65.1% of the total.

Procedure

This research employed a cross-sectional design. The survey data were collected using "Wenjuanxing", the largest online survey platform in China. This study complies with the Declaration of Helsinki and has been approved by the Science and Technology Ethics Committee of Shanghai Normal University (Ethics approval number: 2022043). We employed a stratified convenience random sampling method. First, we selected 10 kindergartens in Shanghai. The researcher explained the purpose, content, and significance of the study to the kindergarten teachers. Subsequently, the teachers conveyed the research information to the mothers of the children. The participants were parents from these 10 kindergartens. Those mothers who expressed interest in the study were invited to participate. Written informed consent was obtained from all participants through the kindergartens. Participation was entirely voluntary, and participants were free to withdraw at any time. The teachers distributed the survey questionnaire link to the parents through class groups. Upon completion of the questionnaire, mothers received a parenting style report as a token of appreciation. Additionally, mothers could contact our team for assistance and support related to parenting issues.

Measures

Mother Phubbing

Mother phubbing was assessed using the Partner Phubbing Scale developed by Roberts and David,³⁹ revised by Li et al.⁴⁰ The partner phubbing scale was initially designed to evaluate phubbing within romantic partnerships, and was later revised by Li et al to accommodate the assessment of parental phubbing behavior in the presence of children within the context of

Chinese culture. The scale consists of 8 items organized into a single dimension. Mother rated each item (eg, “When I eat with my children, I use the phone”) on a 5-point Likert scale (1 = never, 5 = always). A higher score indicates a higher level of mother phubbing behavior. In the context of Chinese culture, it was found that this scale has good reliability and validity.^{22,41} In the current study, this scale demonstrated good reliability (Cronbach’s $\alpha = 0.802$).

Mother-Child Relationship

The Child-Parent Relationship Scale (CPRS), developed by Pianta (1992) and revised by Zhang et al,⁴² was employed to assess the quality of the mother-child relationship. The scale consists of 26 items, categorized into three dimensions: intimacy (10 items, eg, “My child and I have a close and affectionate relationship”), conflict (12 items, eg, “My child and I seem to confront each other all the time”) and dependency (4 items, eg, “My child is too dependent on me”). Each item was rated on a 5-point Likert scale (1 = “not at all compliant”, 5 = “fully compliant”). For the purpose of this study, only the dimensions of intimacy and conflict were considered, as previous research has revealed low reliability within the dependency dimension.⁴² The items in the conflict dimension were reverse-scored and then combined with the scores from the intimacy dimension. Higher scores indicate a higher quality of the mother-child relationship. This scale demonstrated acceptable reliability (Cronbach’s $\alpha = 0.898$ for intimacy, Cronbach’s $\alpha = 0.863$ for conflict) in our study.

Paternal Coparenting

The Coparenting Relationship Scale, originally developed by Stright and Bales⁴³ and revised by Hou,⁴⁴ was adopted to assess the quality of father’s coparenting. In each family, mothers were asked to provide their perceptions of father’s coparenting quality using a five-point Likert scale (1= never, 5 = always). This scale consists of two subscales: supportive coparenting (7 items; eg, “my partner backs me up when I discipline our child”) and undermining coparenting (7 items; eg, “my partner competes with me for our child’s attention”). Undermining coparenting items were reverse-scored. A higher average total score indicates a higher level of coparenting quality. The scale demonstrated good reliability (Cronbach’s $\alpha = 0.902$ for supportive coparenting, Cronbach’s $\alpha = 0.904$ for undermining coparenting) in our study.

Child Problematic Media Use

Mothers completed the Chinese version of the Problematic Media Use Measure scale (PMUM), initially developed by Domoff et al⁴⁵ and later revised by Li et al.⁴⁶ This measure has demonstrated evidence of reliability and validity among parents of Chinese children.⁴⁶ The Chinese version of PMUM consists of 23 items and two subscales: psychosocial problems (11 items; eg, “My child’s screen media use interferes with family activities”) and tolerance and withdrawal (12 items; eg, “It is hard for my child to stop using screen media”). Each item was rated on a 5-point Likert scale (1 = never to 5 = always). Higher scores indicate more severe problematic media use. This scale demonstrated strong reliability (Cronbach’s $\alpha = 0.966$) in our study.

Covariates

In this study, child gender, child’s age, mother’s age, and mother’s educational level were considered as control variables. Previous research has found that the impact of mother phubbing on child problematic media use was influenced by child gender, indicating that the relationship between mother phubbing and child problematic media use varied for boys and girls.⁴¹ Moreover, studies have shown significant correlations between mother’s age and educational level with problematic smartphone use among preschool children.⁵ Therefore, for the subsequent data analyses, this study included child gender, mother’s age, and mother’s highest educational level as control variables in the model.

Statistical Analysis

The statistical software used in this study includes Mplus 7.4, and R (version 4.2.1). Firstly, to address potential common method bias, a confirmatory factor analysis was conducted using Mplus 7.4, given that all data were collected through questionnaires. Subsequently, descriptive statistics were computed for all measures, including means, standard deviations, and Pearson correlations. Then, simple mediation analysis and moderated mediation analysis were conducted. We also calculated the index of moderated mediation in accordance with Hayes’ recommendations to assess the moderating effect of the moderating variable on the overall mediation effect.⁴⁷ To provide a clearer and visual representation of the

moderating effect, Johnson-Neyman plots were generated using the R package “interactions”.⁴⁸ All data were calculated based on standardized scores. Bootstrap analysis was conducted by resampling the data 5000 times to create 95% bias-corrected confidence intervals for all effects. If the confidence interval does not include zero, it indicates statistical significance.

Results

Test for Common Method Bias and Preliminary Analyses

A confirmatory factor analysis was first conducted to test the hypothesis that a single factor can account for all the variance in the study data.⁴⁹ The results revealed a poor model fit ($\chi^2/df = 9.10$, $RMSEA = 0.090$, $TLI = 0.508$, $CFI = 0.496$, $SRMR = 0.104$), suggesting that there was no substantial bias in the estimation of the interrelations among constructs.

Table 1 presents the means, standard deviations, and correlations for all studied variables. Mother phubbing was negatively correlated with both the mother-child relationship and paternal coparenting, while positively correlated with problematic media use. Moreover, both the mother-child relationship and paternal coparenting were negatively correlated with problematic media use, while the mother-child relationship was positively correlated with paternal coparenting.

Mediating Model Analysis

It was expected that the mother-child relationship would mediate the connection between mother phubbing and the child’s problematic media use. The first step involves examining the relationship between the independent variable and the dependent variable. After controlling for the covariates, as shown in Table 2, the results show that there was a significant positive correlation between mother phubbing and child problematic media use ($\beta = 0.283$, $p < 0.001$). Thus, Hypothesis 1 was supported.

Table 1 Descriptive Statistics and Correlations Between Variables

Variable	<i>M</i> ± <i>SD</i>	1	2	3	4	5	6	7
1. Child gender	–	1						
2. Mother education	–	0.036	1					
3. Child age (Months)	60.27 ± 10.03	0.040	0.035	1				
4. Mother age (Years)	35.58 ± 3.80	0.038	0.066*	0.053	1			
5. Mother phubbing	2.81 ± 0.60	–0.050	0.083**	0.045	–0.003	1		
6. Mother-child relationship	4.32 ± 0.56	–0.026	0.082**	–0.003	0.058	–0.186***	1	
7. Child Problematic media use	1.82 ± 0.66	0.091**	–0.035	0.053	–0.021	0.273***	–0.578***	1
8. Paternal coparenting	3.81 ± 0.95	–0.016	–0.029	–0.018	–0.011	–0.156***	0.533***	–0.421***

Notes: Child gender: girls = 0, boys = 1; Mother education: 0 = high school and below, 1 = junior college education, 2 = college education, 3 = graduate education or above; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 2 Testing the Mediation Effect of Mother Phubbing on Child Problematic Media Use

Predictors	Model 1 (Child Problematic Media Use)			Model 2 (Mother-child Relationship)			Model 3 (Child Problematic Media Use)		
	β	<i>t</i>	95% CI	β	<i>t</i>	95% CI	β	<i>t</i>	95% CI
Child gender	0.107***	3.55	(0.096, 0.333)	–0.079	–1.28	(–0.201, 0.042)	0.173**	3.40	(0.073, 0.272)
Child age	0.040	1.319	(–0.002, 0.010)	0.001	0.045	(–0.006, 0.006)	0.004	1.612	(–0.001, 0.009)
Mother age	0.019	0.62	(–0.011, 0.021)	0.008	0.99	(–0.008, 0.024)	0.009	1.38	(–0.004, 0.023)
Mother Education	–0.066*	–2.14	(–0.178, –0.008)	0.132**	2.97	(0.045, 0.220)	–0.023	–0.62	(–0.095, 0.049)
Mother phubbing	0.283***	9.34	(0.224, 0.342)	–0.186***	–5.99	(–0.247, –0.125)	0.184***	7.13	(0.134, 0.235)
Mother-child relationship							–0.530***	–20.51	(–0.581, –0.480)
<i>R</i> ²	0.089			0.043			0.359		
<i>F</i>	24.575***			11.23***			112.01***		

Note: Child gender, child’s age in months, Mother’s age, and Mother’s Education are covariates. Child gender: girls = 0, boys = 1. Mother education: 0 = high school and below, 1 = junior college education, 2 = college education, 3 = graduate education or above. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Subsequently, the mediator variable is included in the model for further analysis. The result shows that mother phubbing was negatively associated with the mother-child relationship ($\beta = -0.186$, $p < 0.001$), and the mother-child relationship was negatively associated with child's problematic media use ($\beta = -0.530$, $p < 0.001$). Notably, at this time, a significant positive correlation persisted between mother phubbing and child's problematic media use ($\beta = 0.184$, $p < 0.001$). Therefore, the mother-child relationship acted as a partial mediator in the connection between mother phubbing and child problematic media use. Furthermore, a direct examination of the mediating effect using bootstrapping analysis revealed that the significance of the mediating role of the mother-child relationship (mediator effect = 0.099, $SE = 0.019$, 95% $CI = [0.064, 0.137]$), and the ratio of mediator effect to total effect was 34.98%. As a result, Hypothesis 2 was verified.

The Moderated Effect

The moderating effects of paternal coparenting are presented in Table 3. In Model 1, it became evident that the interaction between mother phubbing and paternal coparenting was positively associated with the mother-child relationship ($\beta = 0.059$, $p = 0.033$). Hypothesis 3 was supported. The findings from Model 2 revealed a significant interaction between mother phubbing and paternal coparenting in child problematic media use ($\beta = -0.075$, $p = 0.002$). Hypothesis 4 was supported. The overall results of the moderated mediation model are shown in Figure 2.

Furthermore, we used the Johnson-Neyman technique to examine the moderating effects of paternal coparenting. First, we examined the moderating role of paternal coparenting in the relationship between mother phubbing and the mother-child relationship, as shown in Figure 3. Within the area where paternal coparenting values are equal to or less than 0.79 (expressed in standardized data, meaning 0.79 standard deviations above the mean), the confidence bands did not contain zero. Within this range, the negative relationship between mother phubbing and the mother-child relationship was statistically significant, however its strength waned as paternal coparenting increased. Furthermore, this negative relationship lost statistical significance when paternal coparenting values exceeded 0.79, as indicated by confidence bands that contained zero. Therefore, the negative effect of mother phubbing on the mother-child relationship was weakened and even became statistically insignificant for fathers exhibiting higher levels of supportive coparenting.

Next, we examined the moderating effect of paternal coparenting on the relationship between mother phubbing and child problematic media use. The results are illustrated in Figure 4. Within the range of paternal coparenting values that are less than or equal to 1.34 (expressed in standardized data, meaning 1.34 standard deviations above the mean value), the confidence bands did not contain zero. Within this range, the positive relationship between mother phubbing and child problematic media use was significant but grew weaker as paternal coparenting increased. Furthermore, this positive relationship became insignificant when paternal coparenting values exceeded 1.34, as indicated by the

Table 3 Testing the Moderated Mediation Effect of Mother Phubbing on Child Problematic Media Use

Predictors	Model 1 (Mother-Child Relationship)			Model 2 (Child Problematic Media Use)		
	β	t	95% CI	β	t	95% CI
Child gender	-0.050	-0.95	(-0.153, 0.053)	0.167	3.32**	(0.068, 0.264)
Child age	0.001	0.271	(-0.004, 0.006)	0.004	1.519	(-0.001, 0.009)
Mother age	0.013	1.79	(-0.001, 0.026)	0.007	1.10	(-0.006, 0.020)
Mother Education	0.141	3.73**	(0.067, 0.215)	-0.038	-1.05	(-1.086, 0.033)
Mother phubbing	-0.110	-4.15***	(-0.163, -0.058)	0.180	7.08***	(0.130, 0.231)
Mother-child relationship				-0.439	-14.61***	(-0.498, -0.380)
Paternal coparenting	0.526	19.88***	(0.474, 0.578)	-0.164	-0.551***	(-0.222, -0.106)
Mother phubbing * Paternal coparenting	0.059	2.29*	(0.008, 0.109)	-0.075	-3.09**	(-0.123, -0.027)
R^2	0.315			0.382		
F	76.802***			88.301***		

Note: Child gender, Mother age, and Mother Education are covariates. Child gender: girls = 0, boys = 1. Mother education: 0 = high school and below, 1 = junior college education, 2 = college education, 3 = graduate education or above. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

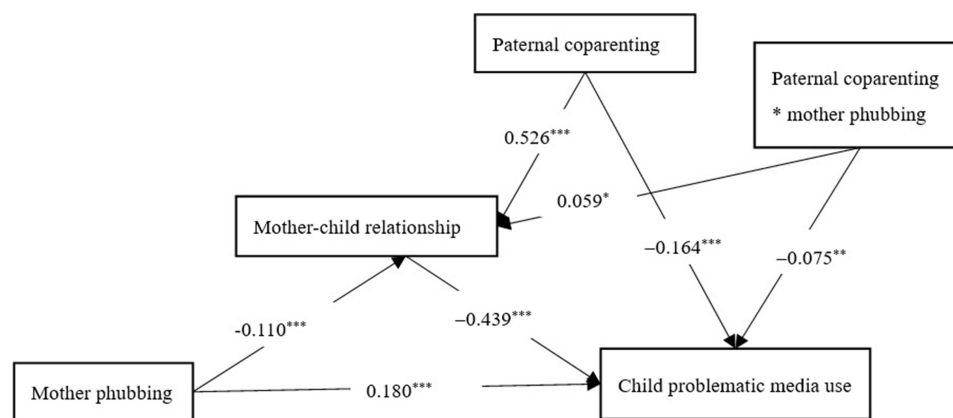


Figure 2 The path coefficients for the moderated mediation model.

Notes: Standardized coefficients are presented. Covariates are included in the model but not presented for simplicity. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

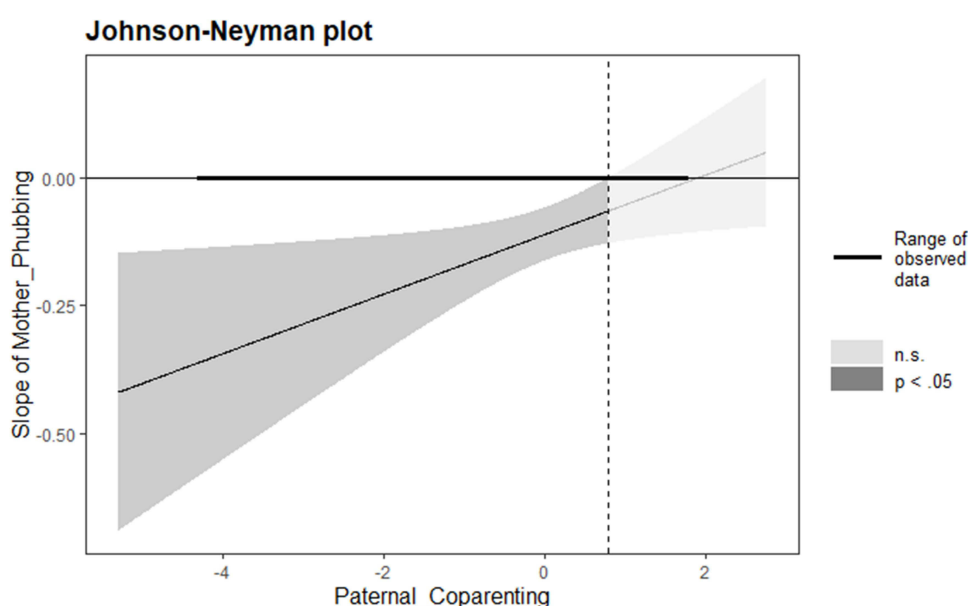


Figure 3 Johnson-Neyman plot demonstrates the moderating effect of paternal coparenting on the relationship between mother phubbing and mother-child relationship.

Notes: The Y-axis indicates the slope for the effect of mother phubbing on mother-child relationship at each specific point of father's coparenting. The X-axis refers to the range of paternal coparenting values. In this study, the range of values for paternal coparenting falls within the standardized range of $(-4.29, 1.76)$. The bold black solid line represents the simple regression line, showing how the connection between mother phubbing and the mother-child relationship varies by different levels of paternal coparenting. The shaded area corresponds to the 95% confidence interval, which delineates the region of statistical significance. The regions of significance are shown in black, while the nonsignificant region is shaded in grey. The vertical dashed line represents the boundary of the region of significance.

confidence bands that contained zero. Therefore, the positive effect of mother phubbing on child problematic media use was mitigated and even became statistically insignificant for fathers who had higher levels of supportive coparenting.

Furthermore, paternal coparenting demonstrated a significant moderating effect on the indirect pathway from mother phubbing to child problematic media use through the mother-child relationship. The index of moderated mediation was -0.259 ($SE = 0.014$, $95\% CI = [-0.048, -0.004]$). Simple slope analysis revealed that at lower levels of paternal coparenting (1 SD below the mean), the indirect effect of mother phubbing on child problematic media use via the mother-child relationship was significant and positive. However, at higher levels of paternal coparenting (1 SD above the mean), this indirect effect became non-significant. Detailed results are presented in Table 4. These findings indicate that paternal coparenting moderates the entire indirect pathway, such that the deleterious impact of mother phubbing on child problematic media use through the mother-child relationship attenuates as paternal coparenting increases.

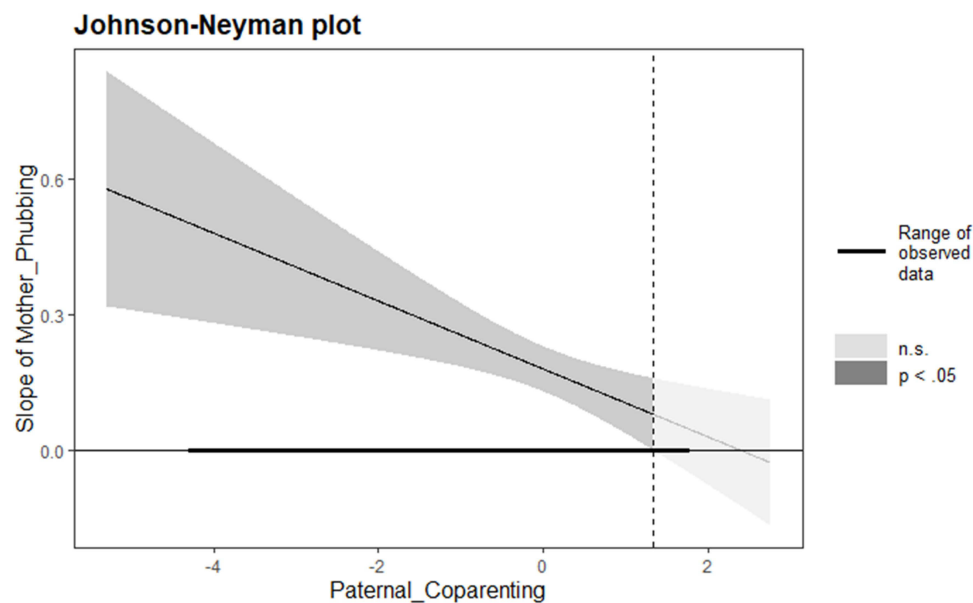


Figure 4 Johnson-Neyman plot demonstrates the moderating effect of paternal coparenting on the relationship between mother phubbing and child problematic media use. **Notes:** The Y-axis indicates the slope for the effect of mother phubbing on child problematic media use at each specific point of father's coparenting. Others are the same as Figure 3.

Discussion

This study explores the relationship between mother phubbing and problematic media use among preschool children, as well as the mediating role of the mother-child relationship and the moderating effect of paternal coparenting. The findings support our hypotheses: (1) there is a positive correlation between mother phubbing and children's problematic media use; (2) the mother-child relationship serves as a partial mediator in this association; and (3) paternal coparenting moderates the relationship between mother phubbing and both the mother-child relationship and children's problematic media use. These findings not only enhance our understanding of the factors influencing children's problematic media use but also provide important insights for family intervention strategies. In the following sections, we will discuss these findings in detail, along with their theoretical and practical implications.

Mother Phubbing and Preschooler's Problematic Media Use

This study confirmed that mother phubbing was positively associated with problematic media use in preschoolers, thereby supporting hypothesis 1. This finding resonates with earlier investigations carried out with adolescents.^{22,50,51} The present study lends further support to the Interactive Theory of Childhood Problematic Media Use framework,⁶ which posits that parental smartphone use may contribute to problematic media use in children. The violation of expectancy theory⁵² suggests that individuals maintain specific social norms and expectations regarding the conventions of various social interactions. When these expectations are contradicted, Individuals may encounter emotional discomfort, prompting them to adjust their behaviors accordingly. In the context of mother-child interactions, when preschoolers observe their mother's frequent use of electronic devices rather than providing their undivided attention, it disrupts their

Table 4 The Mediating Effect of Mother-Child Relationship at Different Levels of Paternal Coparenting

	Paternal Coparenting	Effect	BootSE	95% CI
Mediation effect of mother phubbing on child problematic media use	-1 (M - 1SD)	0.075	0.024	(0.030, 0.122)
	0 (M)	0.049	0.013	(0.024, 0.075)
	1 (M + 1SD)	0.023	0.012	(-0.001, 0.048)

Abbreviations: M, Mean; SD, Standard Deviation; 95% CI, 95% Confidence Interval.

anticipation of meaningful social interactions. Consequently, mother phubbing may evoke feelings of neglect in children, leading them to resort to media as a source of attention and satisfaction.

The Mediating Role of Mother-Child Relationship

The study revealed that the mother-child relationship served as a mediator in the positive association between mother phubbing and preschooler's problematic media use, thereby supporting hypothesis 2. This finding is consistent with previous research.^{41,50,53} This finding is in line with the Interactive Theory of Childhood Problematic Media Use (Domoff et al, 2020),⁶ which suggests that proximal factors like mother phubbing can influence child problematic media use by affecting maintaining factors such as the mother-child relationship. Firstly, mother phubbing can negatively impact the mother-child relationship. When mothers engage in phubbing behaviors, their attention becomes divided, preventing them from fully engaging in interactions with their children. This reduced attention and engagement can diminish the quality of mother-child interaction and hinder the establishment of a positive relationship.^{25,28,29} Secondly, insights from attachment theory shed light on why a poor mother-child relationship can contribute to problematic media use in children. According to attachment theory,³⁰ children possess an innate need for a reciprocal emotional bond with their primary caregiver, usually the mother. When the mother-child relationship is characterized by insecurity, inconsistency, or neglect, the child's emotional needs may become unmet. In an effort to compensate for this lack of emotional support and connection, the child may turn to media use as a means of seeking stimulation, comfort, or escape. Problematic media use can serve as a substitute for the emotional connection that is lacking within the mother-child relationship.

The Moderating Role of Paternal Coparenting

The study revealed that paternal coparenting played a moderating role in the relationships between mother phubbing and both the mother-child relationship, as well as child problematic media use, thereby substantiating hypotheses 3 and 4. Specifically, as the level of paternal coparenting increases, the detrimental effects of mother phubbing on both the mother-child relationship and children's problematic media use gradually diminish, eventually becoming statistically insignificant. Moreover, our results indicated that paternal coparenting also moderated the entire indirect pathway from mother phubbing to child problematic media use through the mother-child relationship. This comprehensive moderating effect suggests that supportive paternal coparenting can mitigate the negative impact of mother phubbing not only on individual outcomes but also on the process through which these effects occur. This finding lends support to Feinberg's perspective on coparenting as a protective factor that can buffer or protect individuals from negative influence.³³ Paternal coparenting fosters a stable family environment, providing consistency, predictability, and security crucial for children's well-being. Additionally, paternal coparenting serves as a stress-alleviator for mothers. Mothers who engage in high levels of phubbing behavior may experience heightened stress and challenges in parenting. However, when fathers actively participate in coparenting, they share in the responsibilities and provide support in parenting tasks, thus reducing the stress and burden on the mother. Through this active and supportive involvement, paternal coparenting can mitigate the adverse effects of mother phubbing on the mother-child relationship, subsequently curtailing preschoolers' problematic media use.

Implications

The findings of this study underscore several key implications for parents and future research.

For mothers, it is imperative to recognize the potential negative impact of excessive mobile phone use on both the mother-child relationship and their children's media habits. Mothers are encouraged to adopt mindful parenting practices, which include being fully present during interactions with their children, minimizing mobile phone distractions, and prioritizing quality time together. Establishing clear boundaries around media use for both themselves and their children is also crucial to protect family interaction quality.

For fathers, active involvement in coparenting is essential. Fathers' engagement in sharing parenting responsibilities can significantly counteract the negative effects of mother phubbing. Through effective communication and cooperation with mothers, fathers can help set consistent media use rules, contributing to a balanced and healthy media environment for children. A strong coparenting relationship is vital for creating a supportive family atmosphere that nurtures children's development and well-being.

Future research should aim at developing and evaluating interventions to address mother phubbing and promote healthy media habits in preschoolers. These interventions should involve both parents, especially highlighting the role of fathers in the intervention process. Such research efforts will provide valuable insights for parents, educators, and policymakers, helping to tackle problematic media use and foster healthy media habits among preschool children.

Limitations and Future Directions

Several limitations in this study need to be addressed and improved in future research. First, the research design was cross-sectional, thereby restricting the ability to infer causal relationships. Future research should employ longitudinal designs and experimental methods to establish causation within the context of the moderated mediation model. Second, the data in this study were based on self-report from the participants, primarily from the mothers' perspectives. This one-sided measurement approach may introduce bias and limit the comprehensiveness of the findings. Future research should aim to include multiple perspectives, such as those from fathers or other caregivers, to provide a more balanced view. Additionally, incorporating objective measures for both media use and mother phubbing, such as screen time logs or observational approaches, could help obtain more accurate and reliable data. Furthermore, it is important to recognize that the study exclusively focused on Chinese participants, potentially constraining the generalizability of its findings across different cultural contexts. Future research should aim to include participants from diverse cultural backgrounds to acquire a broader and comprehensive understanding of the phenomenon.

Conclusion

This study not only confirms the association between mother phubbing behavior and problematic media use among preschool children but also reveals the mediating role of the mother-child relationship and the moderating effect of paternal coparenting. These findings expand our understanding of family dynamics in the digital age and highlight the significance of family systems theory in addressing contemporary parenting challenges. From a practical perspective, these findings underscore the need for intervention strategies that target the entire family system rather than focusing solely on individual family members. Policymakers should consider how to support families in cultivating healthy digital usage habits, such as through family media literacy education. Overall, this study provides a new perspective for understanding and addressing parenting challenges in the digital age, guiding future research and practical interventions.

Data Sharing Statement

The datasets used or analyzed during the current study are available from the corresponding author upon reasonable request.

Ethics Statement

The studies involving human participants were reviewed and approved by the Experimental Ethics Committee of the Shanghai Normal University (the ethical approval number is 2022043) and have been executed consistent with ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. The participants provided their written informed consent to participate in this study.

Funding

This study was supported by STI 2030—Major Projects (Nos. 2022ZD0209000, 2022ZD0209001, 2022ZD0209002, 2022ZD0209003, 2022ZD0209004, 2022ZD0209005, and 2021ZD0200516) awarded to Prof. Yan Li. The funding agencies had no role in the study design, data collection, analysis, interpretation or manuscript preparation.

Disclosure

No potential conflict of interest.

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