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The Relationship between Parental Smartphone Addiction and Preschool Children's Emotional Regulation

ABSTRACT

Objective: The objective of this study was to examine the relationship between parental smartphone addiction and preschool children's emotional regulation.

Methods: A total of 818 preschool children, aged between 3 and 6 years, and their fathers and mothers were included in the study. Data were collected using the Chinese version of the Emotional Regulation Checklist and the Chinese version of the Mobile Phone Problem Use Scale. SPSS v. 20.0 was used to conduct descriptive statistical analysis, independent sample *t*-test, one-way ANOVA, and correlation analysis. Mplus v. 7.11 was used to conduct structural equation model analysis.

Results: Girls' emotional regulation was significantly stronger than boys' ($P = .037$). The emotional regulation of preschool children in the older class was significantly stronger than that of preschool children in the intermediate class and primary class ($P = .045$). There was no significant difference in emotional regulation between intermediate class children and primary class children ($P = .213$). Fathers' smartphone addiction (FSA) and mothers' smartphone addiction (MSA) were significant negative predictors of preschool children's emotional regulation ($\beta_{MSA} = -0.541$, $\beta_{FSA} = -0.250$). Mothers' smartphone addiction had a significantly stronger predictive effect on preschool children's emotional regulation than fathers' smartphone addiction.

Conclusion: This study adds to previous research on parental smartphone addiction and preschool children's emotional regulation. The findings suggest that it is necessary to consider parental smartphone addiction, especially mothers' smartphone addiction, when developing intervention programs to enhance preschool children's emotional regulation.

Keywords: Preschool children, parental smartphone addiction, emotional regulation

Introduction

Alongside scientific and technological developments, mobile networks have become an indispensable part of people's lives. The 53rd Statistical Report on Internet Development in China, released by the China Internet Network Information Centre, shows that, as of December 2023, there were 1.091 billion Internet users in China, and the proportion of those using smartphones to access the Internet increased from 99.8% in 2022 to 99.9% in 2023.[1] The popularity of smartphones has gradually changed people's lifestyles, but the problems caused by smartphone addiction are also becoming more and more prominent.[2] Smartphone addiction is defined as "a condition where the use of a smartphone fulfils a deep need (dependent, habitual, and addictive behavior) to the extent that the individual has difficulty conducting basic activities of daily life without the concurrent use of a smartphone and, as such, neglects other aspects of their life".[2] In modern society, communication between people in real life may decrease due to their smartphone addiction. For example, some parents may neglect communication with their preschool children because of their smartphone addiction. Preschool children refer to children aged 3-6 years old.[3] Parental smartphone addiction negatively affects preschool children's healthy development.[4] Parental smartphone

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addiction can damage the development of the parent–child relationships.[5] Ante-Contreras[5] indicated that parental phubbing in parent–child interactions could indirectly impair the development of preschool children's attachment relationships, leading to a decline in the quality of parent–child communication.[6-11] The impact of parental phubbing on the quality of parent–child communication is mainly manifested in 2 aspects: reducing parents' responses to children's demands for attention[7-10] and widening the psychological distance between parents and children.[6,9,11] Parental smartphone addiction may increase the risk of accidental injury to preschool children. For example, Simon et al[12] found that parents left preschool children under 5 years old unattended in water for 1-5 minutes due to phone calls and other reasons, which put them at risk of drowning. Hiniker et al[13] indicated that many parents pay less attention to the physical environment around their preschool children when playing with their smartphones, and some parents tend to overestimate their ability to effectively supervise their preschool children while using smartphones. Responsive parenting contributes to the development of preschool children's language abilities,[14] especially when parents respond to preschool children's interests in a consistent way.[15] In contrast, the timeliness and intensity of parental responses in parent–child interactions are negatively affected by smartphone interference.[16] In addition, parental smartphone addiction may lead to an increase in problematic behaviors in preschool children, due to the fact that the healthy development of preschool children's emotions and sociality depends on sensitive parental responses during parent–child interactions.[4] However, parental phubbing during parent–child interactions makes it difficult for parents to identify and respond in a timely manner to the various needs of their preschool children, which easily leads to a series of problem behaviors.[17]

Emotional regulation is defined as "the process of monitoring, evaluating, and correcting emotional responses to achieve individual goals."[18] Emotion is the cornerstone of life experience, and being able to effectively handle emotions is an important prerequisite for achieving personal goals and adapting to society.[19] Children learning how to deal with their emotions and using effective emotional regulation strategies have a significant impact on their smooth integration into society, the development of a stable support system, and the establishment of good social relations.[20] Previous studies have indicated that preschool children have a low level of emotional regulation.[21,22] A survey among 2090 Chinese preschool children found that the proportion of preschool children with abnormal emotional regulation was 4.8-12.2% among children of different ages.[21] To address this issue, in September 2012, the Ministry of Education of China issued the Learning and Development Guide for Children Aged 3-6, which clearly put forth the goal of "emotional stability and happiness" in health education and asked adults to maintain a good emotional state and try their best to help their children learn to properly express and control their emotions.[23] Parental smartphone addiction may be closely related to children's emotional regulation, and some theories support a relationship between them. The displacement hypothesis proposes that individuals with smartphone addiction are more likely to suffer from anxiety and depression.[24] The amount of time parents spend on mobile devices reduces meaningful parent–child interactions, and replacing offline social interaction with online social interaction is likely to have a negative impact on the parent–child relationship[24] and furthermore is likely to trigger negative emotions in children and adolescents such as anxiety and depression.[25-27] According to the expectancy violations theory, children have certain expectations for their parents' behavior.[28] When the frequency of parental phubbing increases, children feel less emotional warmth, thus violating their expectation that parents should put down their smartphones and respond positively to their needs, which can have a negative impact on the parent–child relationship and lead to anxiety and other emotional instability problems.[28] To sum up, both the displacement hypothesis and the expectancy violations theory emphasize that parents reduce parent–child interaction due to the problematic use of smartphones, which has a negative impact on the parent–child relationship and is not conducive to the development of children's emotional regulation.[24-28] As for how the parent–child relationship affects children's emotional regulation, existing studies have found that parent–child interaction in life directly affects the development of children's emotional regulation,[29,30] and its mechanisms include emotional contagion, social reference and imitation, parents' supportive feedback on children's emotions, and teaching them emotional regulation strategies.[30,31] If the parent–child relationship is very poor, it is difficult for parents and children to have good parent–child interactions, which is inevitably detrimental to the development of children's emotional regulation. Currently, although no studies have directly explored the relationship between parental smartphone addiction and preschool children's emotional regulation, some studies have revealed that parental smartphone addiction may affect preschool children's emotional regulation.[32,33] For example, some scholars have suggested that parental phubbing significantly and positively predicts preschool children's emotional instability.[32] Sharaievska and Stodolska[33] found that parental phubbing in parent–child interactions may trigger children's anger responses. Based on the above theories and studies, the first hypothesis of this study is proposed: parental smartphone addiction can significantly and negatively predict preschool children's emotional regulation.

Attachment theory suggests that children's early development and parent–child relationships shape their perceptions and expectations of interpersonal relationships, influencing the individual's development in terms of behavioral styles and social cognition, and helping to explain the individual's dispositions and tendencies in the development of interpersonal relationships.[34,35] With regard to attachment building, in general, the attachment relationship established between mothers and children is stronger than the attachment relationship established between fathers and children, and the role of mothers in influencing the formation of secure attachments in

MAIN POINTS

- *This study found that girls' emotional regulation was significantly stronger than boys'.*
- *In this study, the emotional regulation of preschool children in the older class was significantly stronger than that of preschool children in the intermediate class and primary class.*
- *This study revealed that fathers' smartphone addiction and mothers' smartphone addiction were significant negative predictors of preschool children's emotional regulation. It was further found that mothers' smartphone addiction had a significantly stronger predictive effect on preschool children's emotional regulation than fathers' smartphone addiction.*

children is much stronger than that of fathers.[35] Consequently, compared with fathers' smartphone addiction, mothers' smartphone addiction may be more likely to impair the development of secure attachment in children, which is detrimental to the development of parent–child relationships. Accordingly, the second hypothesis of this study is proposed: the effect of mothers' smartphone addiction on preschool children's emotional regulation is significantly stronger than the effect of fathers' smartphone addiction on preschool children's emotional regulation.

This study aimed to explore the relationship between fathers' smartphone addiction, mothers' smartphone addiction, and preschool children's emotional regulation and compare the influence of fathers' smartphone addiction and mothers' smartphone addiction on preschool children's emotional regulation. The conceptual model of this study is shown in Figure 1.

Material and Methods

Participants

A total of 832 preschool children and their fathers and mothers from 3 public kindergartens (1 rural kindergarten, 1 town kindergarten, and 1 city kindergarten) in Jinan City, Shandong Province, China, were selected as subjects using a convenience sampling method. The Chinese version of the Mobile Phone Problem Use Scale (MPPUS-CV) and the Chinese version of the Emotional Regulation Checklist (ERC-CV) were distributed to the fathers and mothers of the preschool children based on the consent of the fathers and mothers of the preschool children, and both parents were asked to complete the MPPUS-CV, while the ERC-CV was to be completed by the fathers or mothers who had a better understanding of the emotional regulation of their children. In order to ensure the authenticity of the questionnaires completed by the parents, the researcher emphasized to the parents before they completed the questionnaires that participation in the questionnaire survey was anonymous and voluntary. A total of 818 survey data related to the children and their parents were collected. There were 426 female children (52.08%) and 392 male children (47.92%), 271 children (33.13%) in the primary class, 282 children (34.47%) in the intermediate class, and 265 children (32.40%) in the older class. The mean age of the children was 4.09 years (SD [standard deviation] = 0.70). The age of the children ranged from 3 to 6 years old. The age of the parents ranged from 26 to 48 years old. Ethical information is as follows: Ethics committee approval was received for this study from the Ethics Committee of Shandong Women's University (Approval no: 20230418, Date: April 18, 2023).

Instruments

Chinese Version of the Emotional Regulation Checklist: The Emotional Regulation Checklist (ERC), developed by Shields and Cicchetti,[36] was translated into Chinese using a forward–backward method, and the Chinese version of the ERC-CV was used to measure the emotional regulation of preschool children. The ERC-CV consists of 2 dimensions: emotional regulation and lability/negativity, with a total of 24 questions scored from 1 to 4, ranging from "totally disagree" to "totally agree." The Cronbach's α coefficients for the 2 dimensions in this study were 0.88 and 0.85, respectively, and the Cronbach's α coefficient for the total scale was 0.91. The confirmatory factor analysis (CFA) results for the total scale were: $\chi^2/df = 1.972$, root mean square error of approximation (RMSEA) = 0.053 (90% CI (confidence interval): 0.041-0.065), Tucker–Lewis index (TLI) = 0.976, comparative fit index (CFI) = 0.979, and standardized root mean squared error (SRMR) = 0.036. The results of the above reliability and validity tests indicated that the ERC-CV was a valid research instrument.

Chinese Version of the Mobile Phone Problem Use Scale: The Mobile Phone Problem Use Scale (MPPUS) developed by Bianchi and Phillips[37] was translated into Chinese using a forward-backward method, and the MPPUS-CV was used to measure fathers' smartphone addiction and mothers' smartphone addiction. The MPPUS-CV consists of 5 dimensions, including tolerance, avoidance of other problems, withdrawal, craving, and negative consequences, with a total of 27 questions. The scale is scored on a 5-point Likert scale, ranging from 1 (totally disagree) to 5 (totally agree). The higher the score, the higher the level of smartphone addiction. The Cronbach's α coefficient for the total questionnaire in this study was 0.89, and the range of the Cronbach's α coefficients for the 5 dimensions was 0.82-0.85. The CFA results for the total scale were: $\chi^2/df = 2.195$, RMSEA = 0.048 (90% CI: 0.037-0.059), TLI = 0.968, CFI = 0.975, and SRMR = 0.039. The results of the above reliability and validity tests indicated that the MPPUS-CV was a valid research instrument.

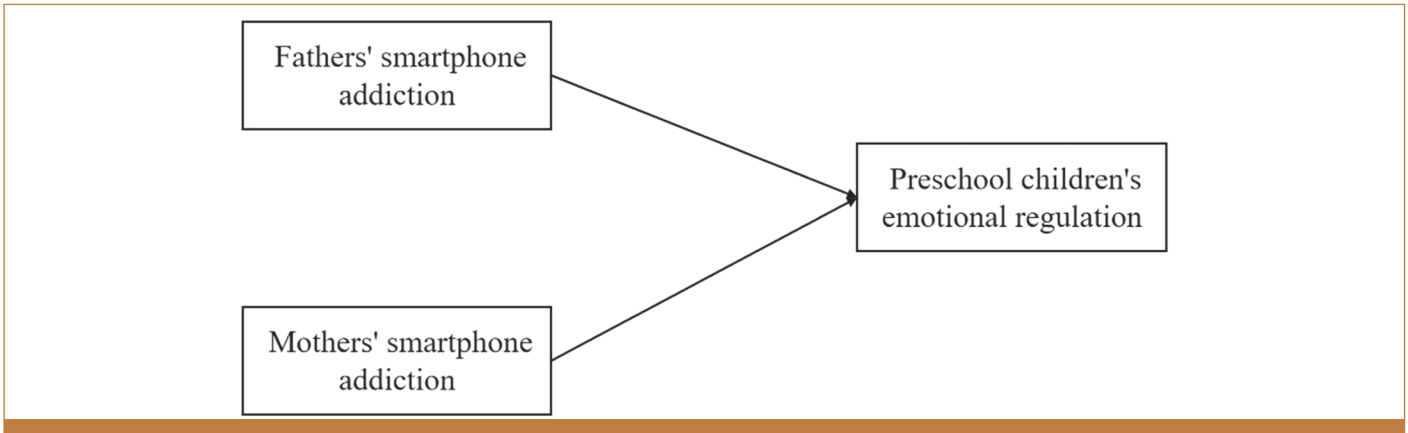

Figure 1. Conceptual model.

Statistical Analysis

In order to analyze the differences between fathers' smartphone addiction and mothers' smartphone addiction, the inferential statistics of parents' smartphone addiction and mothers' smartphone addiction, the inferential statistics of preschool children's emotional regulation, and the relationship between fathers' smartphone addiction, mothers' smartphone addiction, and preschool children's emotional regulation, the researcher input 818 valid questionnaires into SPSS v 20.0 (IBM Corp., Armonk, N.Y., USA). After data cleaning, descriptive statistical analysis, independent sample *t*-test, one-way ANOVA (analysis of variance), and correlation analysis were conducted. Finally, Mplus v 7.11 (National Institute on Alcohol Abuse and Alcoholism, National Institutes of Health., Los Angeles, CA., USA) was used to analyze the structural equation model. *P* values less than .05 were considered statistically significant.

Results

Differences Between Fathers' Smartphone Addiction and Mothers' Smartphone Addiction

As shown in Table 1, with regard to the difference between fathers' smartphone addiction and mothers' smartphone addiction, the independent sample *t*-test results showed that there was no significant difference between fathers' smartphone addiction and mothers' smartphone addiction ($P > .05$).

Inferential Statistics of Parents' Smartphone Addiction and Mothers' Smartphone Addiction

Regarding the differences in fathers' smartphone addiction based on home location, education level, and monthly income level, the results of one-way ANOVA (Table 1) showed that there were no significant differences in fathers' smartphone addiction in terms of home location ($P > .05$), education level ($P > .05$), and monthly income level ($P > .05$). In addition, there were no significant differences in mothers' smartphone addiction in terms of home location ($P > .05$), education level ($P > .05$), and monthly income level ($P > .05$).

Inferential Statistics of Preschool Children's Emotional Regulation

As shown in Table 2, the independent samples *t*-test results showed that there was a significant sex difference in preschool children's emotional regulation, and girls' emotional regulation was significantly stronger than boys' ($P = .037 < .05$). The results of one-way ANOVA showed that there was a significant class difference in preschool children's emotional regulation ($P = .014 < .05$). The results of post hoc multiple comparisons showed that the emotional regulation of preschool children in the older class was significantly stronger than that of preschool children in the intermediate class ($P = .045 < .05$). The emotional regulation of preschool children in the older class was significantly stronger than that of preschool children in the primary class ($P = .004 < .01$). There was no significant difference in the emotional regulation between intermediate-class children and primary-class children ($P = .213 > .05$).

Correlation Analysis of Fathers' Smartphone Addiction, Mothers' Smartphone Addiction, and Preschool Children's Emotional Regulation

In order to explore the relationship between fathers' smartphone addiction, mothers' smartphone addiction, and preschool children's emotional regulation, a correlation analysis of the 3 variables was carried out. The results (Table 3) showed that there was a very significant negative correlation between fathers' smartphone addiction and preschool children's emotional regulation, and the correlation

Table 1. Differences Between Fathers' Smartphone Addiction and Mothers' Smartphone Addiction and Inferential Statistics of Parents' Smartphone Addiction and Mothers' Smartphone Addiction

	N	*M*	SD	*P*
Parental role				
Father	818	77.73	20.38	.218[a]
Mother	818	81.83	14.76	
Home location of father				
Rural area	281	77.68	21.74	.723[b]
Town	276	73.92	14.23	
Urban area	261	79.95	22.35	
Home location of mother				
Rural area	281	78.41	15.06	.252[b]
Town	281	85.77	13.63	
Urban area	256	81.25	15.31	
Education level of father				
Junior high school or less	141	78.38	21.45	.720[b]
Senior high school	205	73.27	17.98	
College or university	383	75.38	15.45	
Postgraduate	89	81.67	24.53	
Education level of mother				
Junior high school or less	164	77.18	12.91	.344[b]
Senior high school	193	81.25	15.53	
College or university	368	85.03	13.68	
Postgraduate	93	76.71	19.48	
Monthly income level of father				
Below 2000	89	69.00	22.54	.188[b]
2000-4000	164	71.92	14.99	
4000-6000	253	68.50	17.69	
6000-8000	238	86.91	18.66	
Above 8000	74	81.45	23.50	
Monthly income level of mother				
Below 2000	119	76.43	15.13	.484[b]
2000-4000	193	80.00	14.81	
4000-6000	268	81.55	12.34	
6000-8000	193	86.94	15.33	
Above 8000	45	80.00	16.12	

[a]Independent sample *t*-test.
[b]One-way ANOVA. SD, standard deviation; ANOVA, analysis of variance.

Table 2. Differences of Preschool Children's Emotional Regulation in Sex and Class

Variable	N	M	SD	t/F	*P*
Sex					
Boy	426	50.24	14.64	−2.109	.037[a]
Girl	392	55.96	14.96		
Class					
Primary class	241	50.63	7.83	4.410	.014[b]
Intermediate class	371	52.70	7.58		
Older class	206	56.23	7.53		

[a]Independent sample *t*-test.
[b]One-way ANOVA. SD, standard deviation; ANOVA, analysis of variance.

Table 3. Correlation Analysis of Fathers' Smartphone Addiction, Mothers' Smartphone Addiction, and Preschool Children's Emotional Regulation (N = 818)

	1	2	3	Skewness	Kurtosis
1. Fathers' smartphone addiction	1			−0.037	0.040
2. Mothers' smartphone addiction	0.643[a]	1		0.042	−0.206
3. Preschool children's emotional regulation	−0.633[a]	−0.685[a]	1	−0.364	−1.532

[a]$P < .01$.

coefficient was −0.633. There was a very significant negative correlation between mothers' smartphone addiction and preschool children's emotional regulation, and the correlation coefficient was −0.685. In addition, the absolute values of skewness of fathers' smartphone addiction, mothers' smartphone addiction, and children's emotional regulation ranged from 0.037 to 0.364, which were all less than 2, and the absolute values of kurtosis of the 3 variables ranged from 0.040 to 1.532, which were all less than 7. These results showed that the 3 variables of fathers' smartphone addiction, mothers' smartphone addiction, and preschool children's emotional regulation were close to normal distribution.

Relationship Between Fathers' Smartphone Addiction, Mothers' Smartphone Addiction, and Preschool Children's Emotional Regulation

The results of the structural equation modeling analysis showed that fathers' smartphone addiction and mothers' smartphone addiction were significant negative predictors of preschool children's emotional regulation. The standardized regression coefficient of mothers' smartphone addiction on preschool children's emotional regulation was −0.541, and the standardized regression coefficient of fathers' smartphone addiction on preschool children's emotional regulation was −0.250. Mothers' smartphone addiction had a significantly stronger predictive effect on preschool children's emotional regulation than fathers' smartphone addiction on preschool children's emotional regulation. The results are shown in Table 4.

Discussion

This study adds to previous research on parental smartphone addiction and preschool children's emotional regulation by exploring the relationship between parental smartphone addiction and preschool children's emotional regulation. The findings of this study suggest that it is necessary to consider parental smartphone addiction, especially mothers' smartphone addiction, when developing intervention programs to enhance preschool children's emotional regulation.

Table 4. Regression Analysis of Fathers' Smartphone Addiction and Mothers' Smartphone Addiction on Preschool Children's Emotional Regulation

					95% CI of *B*	
	B	*β*	SE	Z	Lower	Upper
MSA	−0.287	−0.541	0.070	−4.089[a]	−0.420	−0.160
FSA	−0.160	−0.250	0.076	−2.105[b]	−0.312	−0.087
MSA vs FSA	−0.127	−0.291	0.063	−2.016[b]	−0.349	−0.102

FSA, fathers' smartphone addiction; MSA, mothers' smartphone addiction; SE, standard error.
[a]$P < .001$.
[b]$P < .05$.

By comparing the differences between fathers' smartphone addiction and mothers' smartphone addiction and analyzing their demographic characteristics, we found no significant differences in fathers' smartphone addiction and mothers' smartphone addiction in terms of home location, education level, and monthly income level. These results showed that fathers' smartphone addiction and mothers' smartphone addiction have become common problems. Smartphones have the following functional characteristics: (a) collectivity of functions,[38] (b) personalization and customization of content,[39-41] and (c) accessibility and convenience.[42,43] Previous studies have found that the functional characteristics of smartphones can lead to smartphone addiction.[38,42,44,45] Specifically, in addition to the basic functions of traditional mobile phones, smartphones can also be equipped with various functional Apps to satisfy the need for social interaction, entertainment, games, study, and life in general.[38,45] Smartphones have become an inextricable part of users' daily lives, but it is easy for individuals to overuse them, which easily leads to addiction.[43] Smartphones can be used for a variety of purposes, including social interaction, trade, education, entertainment, and gaming,[39-41] and users can download and install Apps based on their personal preferences and use their preferred functions, thus realizing personal customization of the content and functions.[46] At the same time, individuals can experience more pleasure and immersion during the use of Apps, which leads to more smartphone use behaviors.[47] Consequently, the combination of active customization and personalization causes individuals to reinforce certain behavior patterns, leading to addiction.[44,48] In addition, smartphones are portable, allowing users to perform a variety of activities at any time and location, such as checking emails, shopping, and surfing social networking sites.[42,43] This feature allows people to spend less energy while using their smartphones, which can help them work and study more efficiently, thus increasing their dependence on the use of smartphones and further leading to smartphone addiction.[49] Thus, based on the above discussion, it is no surprise that there was no significant difference between fathers' smartphone addiction and mothers' smartphone addiction; fathers' smartphone addiction and mothers' smartphone addiction were independent of the demographic variables of home location, education level, and monthly income level.

This study found that girls' emotional regulation was significantly stronger than that of boys, which is consistent with the research results of Yao[50] and Li.[51] Zeman and Garber[52] suggested that in the face of negative emotions, girls often choose direct expression or seek help from others to regulate their emotions, while boys often choose implicit ways to regulate their emotions. The reason for this phenomenon may be primarily related to social expectations.[52] In the face of children's emotional venting, society often offers girls more tolerance and understanding.[52,53] Secondly, because of the difference in physical development between boys and girls (girls' physical

development is earlier than boys'), girls will express their negative emotions by crying or pouring them out, while boys will express their negative emotions in a more direct and even aggressive way.[52,53] In addition, there was a significant class difference in preschool children's emotional regulation. Specifically, the emotional regulation of older class children was significantly stronger than that of intermediate class children. The emotional regulation of older-class children was significantly stronger than that of primary-class children. The emotional regulation of intermediate-class children was stronger than that of primary-class children, but there was no significant difference between them. Du[53] indicated that there may be several reasons for the above-mentioned class differences in preschool children's emotional regulation. First, young children's emotional recognition ability is relatively weak, and when facing others' sad emotions, young children often cannot accurately recognize them, which easily leads to their inability to make appropriate emotional responses. However, with the increase in preschool children's age, the frequency of such phenomena will gradually decrease. Second, it may be caused by the rapid development of preschool children's language ability. Language is one of the most important tools for children's social development. It can not only help children to express their thoughts, feelings, and wishes but also help them to understand others' feelings by listening to others' opinions and to improve their social communication ability. Third, with the increase in preschool children's age, children gradually learn to regulate their own emotions by using emotional regulation strategies.

The results of the correlation analysis showed that there was a very significant negative correlation between fathers' smartphone addiction and preschool children's emotional regulation. There was a significant negative correlation between mothers' smartphone addiction and preschool children's emotional regulation. Further structural equation model analysis showed that both fathers' smartphone addiction and mothers' smartphone addiction could significantly negatively predict preschool children's emotional regulation, which is supported by attachment theory, displacement hypothesis, and expectancy violations theory to some extent. Specifically, attachment theory holds that the children's parent–child relationship shapes their perception and expectation of interpersonal relationships; affects the development of individuals in behavior, social cognition, emotions, and other aspects; and helps to explain the tendency of individuals in the development of interpersonal relationships.[34,35]When children are in a harmonious family atmosphere, children trust and rely on their parents, and parents will respond positively to their trust. Such a good interactive relationship can help children to be more confident in expressing positive emotions and effectively regulating negative emotions.[34,35] Previous studies have found that caregivers' smartphone use behavior during parent–child interactions may indirectly damage the development of children's security attachment relationship and individual growth,[5,54] which is not conducive to the development of preschool children's emotional regulation. The displacement hypothesis suggests that when people overuse media, the time for other activities such as face-to-face communication will be correspondingly reduced, which will have a negative impact on parent–child relationships.[24] Parents of preschool children are important nurturers of preschool children. If they often use smartphones at home, it easily leads to parent–child alienation, which is not conducive to the emotional stability of preschool children and further hinders the development of emotional regulation of preschool children. According to the expectancy violations theory,[28] children have certain expectations for parent–child communication, that is, in the process of parent–child communication, they hope their parents can put down their smartphones and actively respond to their psychological needs instead of being obsessed with smartphones, which may damage the healthy development of the parent–child relationship. Relevant research reveals that good communication between parents and children helps both parents and children to understand each other and form a close emotional connection.[55] Adequate parent–child communication is an effective resource that enables children to feel support from their parents, and this support helps them to choose positive ways of coping when facing problems.[56] Moreover, the parent–child communication mode in the family is the basis of children's communication with their peers, and many children's experiences learned from the communication mode with their parents can be generalized to other relationships.[57] Through parent–child communication interactions, children can learn about the ways in which their parents resolve emotional problems in the process.[58] Children imitate and learn by observing how their parents regulate their emotions in a variety of situations, thus developing their own coping patterns.[59] In the present study, the results also revealed that the predictive effect of mothers' smartphone addiction on preschool children's emotional regulation was significantly stronger than that of fathers' smartphone addiction. According to attachment theory, generally speaking, the attachment relationship between mother and child is stronger than that between father and child, and the influence of mothers on the formation of children's security attachment is far stronger than that of fathers.[34] Therefore, mothers' smartphone addiction is more likely to damage the development of preschool children's security attachment relationship than the fathers' smartphone addiction and thus have a negative impact on preschool children's emotional regulation.

Conlcusion and Limitation

This study found that fathers' smartphone addiction and mothers' smartphone addiction were significant negative predictors of preschool children's emotional regulation. It was further found that mothers' smartphone addiction had a significantly stronger predictive effect on preschool children's emotional regulation than fathers' smartphone addiction. This study has important implications. First, from the perspective of theoretical significance, this study adds to previous research on parental smartphone addiction and preschool children's emotional regulation by exploring the relationship between fathers' smartphone addiction, mothers' smartphone addiction, and preschool children's emotional regulation, as well as by comparing the influence of fathers' smartphone addiction and mothers' smartphone addiction on preschool children's emotional regulation. Second, in terms of practical implications, the findings can provide targeted guidance for improving preschool children's emotional regulation by addressing fathers' and mothers' smartphone addiction. The results of this study showed that the predictive effect of mothers' smartphone addiction on children's emotional regulation was significantly stronger than that of fathers' smartphone addiction on preschool children's emotional regulation. Thus, in order to enhance preschool children's emotional regulation, it is important to focus on mothers' smartphone addiction when implementing specific interventions.

However, there are some limitations to this study. First, all participants in this study were preschool children and their parents in China. Future research needs to examine preschool children and their parents in other countries and cultures. Second, although the hypotheses of this study were based on a number of theories, the research design of this study was cross-sectional. We will conduct a longitudinal study in the future to examine the causal relationship between fathers' smartphone addiction, mothers' smartphone addiction, and preschool children's emotional regulation. Third, the study only examined the effects of parental factors on preschool children's emotional regulation, although individual development is influenced by many different systems.[60] In the future, it will be important to further examine how school factors, peer factors, and personal factors systematically influence preschool children's emotional regulation.

Availability of Data and Materials: *The data that support the findings of this study are available upon request from the corresponding author.*

Ethics Committee Approval: *Ethics committee approval was received for this study from the Ethics Committee of Shandong Women's University (Approval no: 20230418, Date: April 18, 2023).*

Informed Consent: *Informed consent was obtained from the individuals who participated in this study.*

Peer-review: *Externally peer-reviewed.*

Author Contributions: *Concept – T.S., H.Z., S.R., M.F.; Design – T.S., H.Z., S.R., M.F.; Supervision – S.R., M.F.; Resources – T.S., H.Z.; Materials – T.S., H.Z.; Data Collection and/or Processing – T.S.; Analysis and/or Interpretation – T.S., H.Z., S.R., M.F.; Literature Search – T.S., H.Z., S.R., M.F.; Writing – T.S., H.Z.; Critical Review – T.S., H.Z., S.R., M.F.*

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Declaration of Interests: *The authors have no conflicts of interest to declare.*

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