Prevalence, determinants and consequences of problematic smartphone use among preschoolers (3–5 years) from Dhaka, Bangladesh: a cross-sectional investigation

Prevalence, Determinants and Consequences of Problematic Smartphone Use among Preschoolers (3-5 Years) from Dhaka, Bangladesh: A Cross-sectional Investigation

Abstract

The problematic smartphone use (PSU) has been becoming a challenging health issue for preschoolers aged 3-5 years as it has severe adverse effect on their psychological, physical, and cognitive development. The scarcity of scientific research on this issue in the context of Bangladesh motivated the authors for conducting this cross-sectional study to explore the prevalence of PSU with its influential factors and adverse effects on preschooler's psychological and physical development based on primary data collected from 400 mothers. The multivariable ordinal logistic regression (OLR) was used to compute the adjusted likelihoods. The estimated prevalence of PSU was approximately 86%, where about 29% were severely problematic user. The likelihood of preschoolers' PSU was observed to increase with more than 1 hour/day usage of smartphone by children (Adjusted Odds Ratio (AOR): 3.92). Other important factors were parental smartphone use, education, profession, family income, and mother's age. Both of moderate and severe PSU had adverse effect on preschoolers' health- severe PSU was found to increase the likelihood of psychological and physical problems by 6.03 and 3.29 times, respectively. The preschoolers with PSU reported to suffer from many physical and mental health problems such as attention deficit and hyperactivity disorder (ADHD), emotional instability, aggressiveness, depression, lack of control, impaired vision and hearing, obesity, body imbalance, and lack of brain development. It is now prime time to undertake strategic policies considering the findings for limiting the preschoolers' usage of smartphone, which will make Bangladesh susceptible to protect its future generation from harmful effects of PSU.

Keywords: Smartphone; Problematic Smartphone Use; Preschooler; Cognitive Development; Mental and Physical Health Problem; Bangladesh

Introduction

Nowadays, smartphone users are rapidly growing worldwide (Park and Park, 2021). As of December 31, 2022, there were 6.65 billion smartphone users worldwide, representing 83.07% of

the world's population own smartphone. This figure started increasing significantly from 2016, when there were just 3.67 billion smartphone users around the globe, or 49.40% of the world's population. The number of smartphone users almost doubled during 2016 and 2022. The global smartphone users is expected to reach 7.33 billion in 2025 (BankMyCell, 2022) . In Bangladesh, about 48% of mobile phone users had a smartphone in 2022 (Hasan, 2022). There were 53.3 million smartphone users by December 31, 2022 in Bangladesh, which was 32.36% of the total population (BankMyCell, 2022). Still, the rate is rising due to the availability of smartphones at an affordable price, which is 50% cheaper than the original price of smartphones (Park and Park, 2014). According to the Global System for Mobile Communications Association (GSMA) projection, 62% of mobile phone users will have a smartphone by 2025, however, Bangladesh Telecom and ICT Minister believe Bangladesh will surpass this projection (Bhuiyan, 2021). A smartphone is an indispensable tool in everyday life and it allows people to benefit from life-enhancing opportunities (Park and Park, 2014). A smartphone is useable for any population irrespective of age, gender, and education.

Despite the different advantages of smartphone, the growing use of this device is a burning issue nowadays (Park, 2019) as excessive use of smartphone leads to several physical and mental health hazards. Scientifically, problematic smartphone use (PSU) is also known as Nomophobia, which is explained as the fear of being without a mobile phone (Gonçalves et al., 2020). This addiction causes dopamine release in the brain, which leads to a feeling of good in our body but consequently pushes us to use smartphone for longer times (Park and Park, 2014). The term PSU refers to the excessive use of smartphones describing as a multi-faceted phenomenon entailing a variety of dysfunctional manifestations (e.g., addictive, anxiety, antisocial and dangerous use) when the phone is not available, or neglect of other activities (Pivetta et al., 2019; Sohn et al., 2019; Yang et al., 2021). It shares some conceptual similarities with more typically recognized addictions, including excessive use, failure of impulse control, feelings of dependency, use in risky and/or physically hazardous situations, and potential for negative affect when not using one's smartphone (Harris et al., 2020). PSU has some potential health and behavioral risks due to excessive use (Canadian Paediatric Society Ottawa, Ontario, 2017; Domoff et al., 2019a; Garriguet et al., 2016; Huang et al., 2021, 2020; S. Lee et al., 2022; Mustonen et al., 2022; Xie et al., 2020; Yang et al., 2020). The electromagnetic wave of smartphone damages physical health and affects the

psychological health of the users. Moreover, spending more time on smartphone causes loneliness being self-centred, and breaking the emotional relationship with the outer world (Park and Park, 2014).

Previous studies reported that the average age of first exposure to a smartphone is 3-5 years (Genc, 2014; Jang and Jeong, 2015; Lee and Park, 2018), which is the significant stage in the cognitive, linguistic, and psychosocial development of the preschool children (Ricci et al., 2017) and the age of first exposure is gradually decreasing among the preschoolers (Baek et al., 2013; Domoff et al., 2019b; Kabali et al., 2015). According to recent research, preschoolers may develop habits, early overexposure increases the likelihood of later overuse, and family media use and health routines can be formed more easily in early childhood than later on (Duch et al., 2013; Hamilton et al., 2016). According to global hypothesis and recommendation by the American Academy of Pediatrics, World Health Organization, the American Psychological Association, the American Academy of Child and Adolescent Psychiatry, Department of Health and Aged Care of Australian Government, the Ministry of Health of New Zealand, Canadian Sedentary Behaviour Guidelines, and many other literatures, preschoolers may use one hour of smartphone daily, however, more than the recommended usage time may pushes them into problematic user of smartphone (Canadian Paediatric Society Ottawa, Ontario, 2017; Hill et al., 2016; Ministry of Health, 2017; Mustonen et al., 2022; Pappas, 2022; Sommer et al., 2021; The American Academy of Child and Adolescent Psychiatry, 2020; The Department of Health and Aged Care, 2018; Xie et al., 2020). Preschool children's average cumulative screen time per day is higher than the recommended amount of time in many countries including USA, Canada, China, Korea, India, Finland, and Thailand (Canadian Paediatric Society Ottawa, Ontario, 2017; Chaibal and Chaiyakul, 2022; Mustonen et al., 2022; Park and Park, 2021; Shah et al., 2019; Tandon et al., 2011; Xie et al., 2020), indicates that preschool children are turning into more problematic user of smartphone. Recent studies also revealed that only 15% of preschoolers meet screen time guidelines of <1 hour/day in Canada (Canadian Paediatric Society Ottawa, Ontario, 2017; Carson et al., 2020).

Different factors are associated with PSU, but the key determinants are the high frequency and longtime smartphone use patterns (Fischer-Grote et al., 2019). Nowadays, parents hand out the phones to pacify crying babies and to children by their demands irrespective of their job situation,

young children use smartphone more frequently, leading to PSU (Park and Park, 2014). In addition, the excessive use of entertainment apps (e.g., games, music, etc.), instant messengers, and social networking enhances the addiction rate (Chang et al., 2019; Choi et al., 2017; Fischer-Grote et al., 2019; Jeong et al., 2016; Kuss and Griffiths, 2011; Lee and Busiol, 2016; Liu et al., 2016; Lopez-Fernandez et al., 2018; Sohn et al., 2019) because some of the applications are designed in such a way to target the young generation (Sarwar and Soomro, 2013). Even many primary caregivers, mostly parents around the world, often consider the ability to use smartphone as their children's intelligence (Benedetto, 2021). Therefore, they appreciate using smartphone as a part of their children's education and play (Genc, 2014; Hinkley and McCann, 2018; Jang and Jeong, 2015; Kabali et al., 2015; Lee et al., 2015; Lee and Park, 2018; Sarwar and Soomro, 2013). Furthermore, the advanced digital lifestyle of parents makes a tremendous negative impact on preschoolers' life (Park and Park, 2014). Additionally, lockdown, maintaining social distance, closure of educational institutions, and online teaching practice during COVID-19 also boost the rate of PSU.

Excessive use of smartphone may disconnect preschoolers from actual social interaction, including interactions with other children and the people around them (Park and Park, 2021; Sarwar and Soomro, 2013), leading to a low quality of life (Lu et al., 2019) and low quality of friendship (Kim et al., 2018). More importantly, PSU may adversely affect preschoolers' physical and psychological health and cognitive development (Hill et al., 2016; Park and Park, 2014). Consequently, they suffer from poor vision, poor sleep quality, as well as psychological dependence such as depression, anxiety, and stress (Adams et al., 2020; Fischer-Grote et al., 2019; Green et al., 2020; Kliestik et al., 2020; Lazaroiu et al., 2020; Panova and Carbonell, 2018; Sarwar and Soomro, 2013; Sohn et al., 2019). Moreover, the most accessible and excessive use of smartphone increases difficulties in deep thinking impede brain development and educational attainment (Fischer-Grote et al., 2019; Panova and Carbonell, 2018; Sohn et al., 2019). Furthermore, excessive screen time could increase the risk of ADHD of preschoolers (Park and Park, 2014; Tamana et al., 2019). Even if smartphone use does not meet the addiction criteria, excessive use could influence preschoolers' lives and have severe negative consequences (Sarwar and Soomro, 2013). Therefore, the drawbacks of smartphone use on preschool children should receive further attention in recent years.

PSU is an increasing epidemic causing severe health and social problem for children and adolescent throughout the world (Binghamton University, 2017; Poznyak, 2018; van Velthoven et al., 2018; Weinstein and Siste, 2022). Consequently, the third Sustainable Development Goal (SDG-3) related to 'good health and wellbeing' is becoming more challenging to achieve specifically in the developing countries like Bangladesh. Preschoolers' usage of smartphone of more than recommended time/day harmfully affects their mental and physical health and cognitive development but little is known on this underlying issue in the setting of Bangladesh. In a prior study, it was discovered that when moms used negative parent-child conflict resolution strategies, such as psychological violence and physical assault, there was a stronger correlation between their inconsistent mediation and problematic smartphone use among preschoolers (Yang et al., 2022). A study showed a substantial correlation between problematic parental smartphone use and executive function issues in children, including preschoolers (Yang et al., 2023). The usage of smartphones and daily screen time of more than one hour among preschoolers were independently linked with the father's higher level of education (Rathnasiri et al., 2022). Using a smartphone or tablet more frequently was linked to later bedtimes, later wake up times, and less reliable sleep patterns among preschoolers in Finland (Hiltunen et al., 2021). In Turkey, pre-school children's use of smartphones for longer periods of time was found to be positively correlated with dependence, marital conflict, and strictness and authoritarianism parameters (Sarı et al., 2021). Mothers' poor parenting practices had both direct and indirect positive correlations with preschoolers' dependence on smart devices as well as a direct positive relationship with the attachment instability of preschoolers (Lee and Kim, 2022). There are some other studies that were conducted on PSU among preschoolers (Genc, 2014; Jang and Jeong, 2015; Lee et al., 2015; Lee and Park, 2018; Park, 2019; Park and Park, 2021; Tamana et al., 2019; Tandon et al., 2011). There also exists some studies conducted on PSU focusing adolescent or older people (Arefin et al., 2017; Chandrima et al., 2020; Hosen et al., 2021; Islam et al., 2021; Jahan et al., 2021; Mahmud et al., 2020). A cross-sectional study reported that about 86.9% of the Bangladeshi students scored to be problematic smartphone users (Hosen et al., 2021). Moreover, another study found that, 28% of the university students are addicted to the smartphone which weakens attachment to their family, close friends, and relatives despite having more communicational and interactional benefits from them (Mahmud et al., 2020). Further, some researchers revealed that PSU and problematic social

media use were positively associated with lower age, poor sleep, social media use, watching television, anxiety, and depression among Bangladeshi college and university students (Islam et al., 2021). A structured interview study has been conducted considering problematic internet use among Bangladeshi high school students residing in Dhaka for determining its associated socio-demographics, internet use behaviors, and the parental mediation role (Chandrima et al., 2020). According to the review of literature, the prevalence and risk factors of PSU and its consequences among preschool children were not yet well studied in Bangladesh. Consequently, developing countries like Bangladesh need an urgent evidence-based guideline on the preschoolers' smartphone use to safe their physical and mental health from the adverse effects of PSU. Thus, investigating answers of some research questions e.g., how prevalent is PSU among preschoolers?; why do preschoolers have access to smartphone?; what are the determinants influence preschoolers' PSU?, and so on (Appendix 1) is imperative in developing evidence-based appropriate guideline on preschoolers' smartphone use in order to control their rate of PSU. Therefore, this cross-sectional study was conducted to explore possible solutions of above-mentioned research questions through justifying a set of statistical hypotheses (Appendix 1). It is anticipated that the findings of this study will help the policymakers, education and development practitioners, community development and youth welfare workers, and social scientists in designing appropriate strategies to control the excessive use of smartphone among preschoolers.

Methods and Materials

Factors Affecting PSU and Its Consequences – A Conceptual Framework

The study was conducted following a conceptual framework illustrated in Fig 1 which was constructed from the proposed conceptual model on smartphone addiction among early childhood (Park and Park, 2014). The framework attempts to relate several factors (e.g., smartphone dependencies, attitudes to smartphone use and parental usage of smartphone, socio-demographic and economic factors) with the children's PSU. It also identified the consequences of PSU on the physical and mental health of the children. The description of the factors affecting PSU, psychological and physical health problems is presented in Appendix 2.

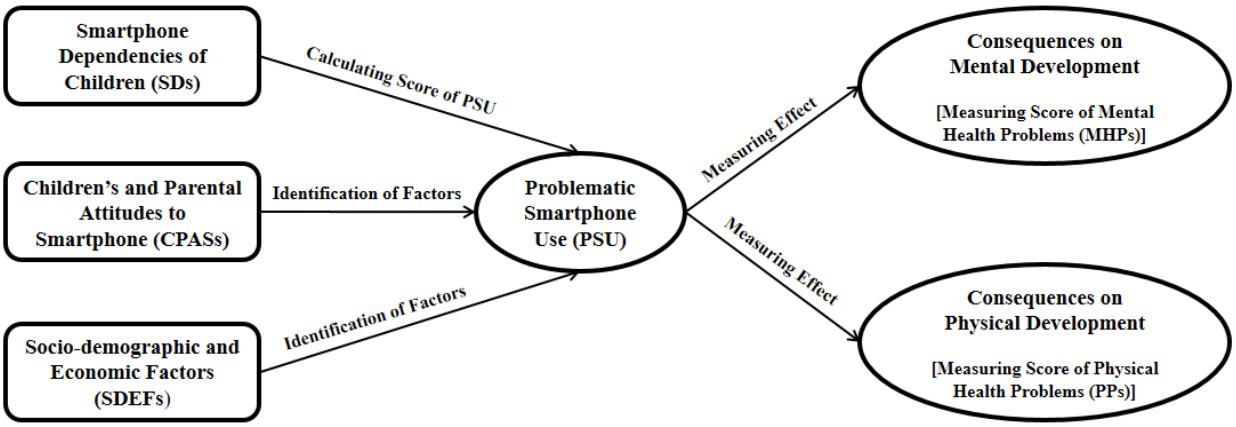

Fig 1. Conceptual framework of the study

Study Design

A cross-sectional study design was used that complied with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement (von Elm et al., 2014).

Study Setting and Participants

Mothers of children aged three to five years and who had a smartphone were included in this study. The study was conducted in Uttara, Dhaka district of Bangladesh. Due to limited resources, and as the study was funded by authors themselves, selecting nationwide samples for a large-scale study was not possible. However, it is expected that, being the capital city of Bangladesh, the study will generate adequate evidences to help designing appropriate strategies for reducing smartphone use among preschoolers in Bangladesh.

Sampling and Sample Size Determination

The study setting (Uttara) is consisted of a total 14 sectors, one sector was randomly selected for conducting this study. Simple random sampling was used to select the households from the selected sector. Since the prevalence of PSU was unknown, therefore considering 50% prevalence of PSU, the estimated total sample size required for statistically representative sample for this study was approximately 405 at 95% level of confidence with precision of 5% and non-response rate of 5%.

Ethical Approval and Informed Consent

Ethical clearance for conducting this study was taken from a local ethics committee named 'Biosafety, Biosecurity & Ethical Committee' under the Faculty of Biological Sciences at Jahangirnagar University, Savar, Dhaka-1342, Bangladesh. With the prerequisite of written consent from each respondent/legal guardian, the committee issued a certificate of ethical clearance with the reference number: BBEC, JU/M2022/7(3), dated on July 18, 2022. The consent of the respondents was taken through a written consent form before starting the interview by giving assurance of confidentiality that the information gathered would be used anonymously and exclusively for research purposes and aggregated to make estimates for publication. The interview took place only for the respondents who agreed and signed or thumb on the written consent form.

Data Collection

The data were collected through face-to-face interviews with the only mothers of the preschoolers using a semi-structured questionnaire from July 26 to August 08, 2022 by medical graduates. The mothers were interviewed at their household. In case of no eligible mother, the household was discarded and on the other hand, if there were multiple eligible mothers in the household, only one of them was interviewed. After completing the whole data collection task, researchers checked the questionnaires for errors, edited, and coded the open-ended questions. At the cleaning stage, a total of 5 questionnaires were discarded for incompleteness and errors. The final cleaned dataset consists of 400 observations.

Measurements

A score for PSU was calculated by assigning 1 to the positive responses and 0 to the negative or neutral responses of the indicators used for assessing PSU. The lowest score was zero and the highest score was eight. Like the PSU score, score variables for both the mental and physical health problems were calculated. For both of the score variables, the lowest score was zero and the highest score was ten. Afterwards, an ordinal categorical response variable was defined for each of PSU, mental health and physical health problems based on their respective calculated scores. The PSU score was categorized according to previous studies (Csibi et al., 2018; Hosen et al., 2021; Mahmud et al., 2020), and the categorization of mental and physical health problem scores was

made by using self-judgment. The detailed categorization of these response variables are available in Appendix 3.

Predictor Variables

In this study, preschoolers' characteristics such as daily usage of smartphone, age, and the number of siblings; parental characteristics e.g., daily smartphone usage, education, profession, mother's age; as well as family income were considered as covariates. The categories of the preschooler's daily usage of smartphone were defined using the recommendation on their daily use (Canadian Paediatric Society Ottawa, Ontario, 2017; Hill et al., 2016; Ministry of Health, 2017; Mustonen et al., 2022; Pappas, 2022; Sommer et al., 2021; The American Academy of Child and Adolescent Psychiatry, 2020; The Department of Health and Aged Care, 2018; Xie et al., 2020), and the parental daily usage of smartphone was categorized as stated in the previous study (Sohn et al., 2021). The categories of all predictor variables are summarized in Appendix 3. In the case of assessing the consequences of PSU on mental and physical health, the ordinal categorical response variable for PSU was considered as a predictor variable.

Data Analysis

Cronbach's alpha was used to measure the internal consistency, i.e., reliability of multiple Likert scaling questions used for measuring PSU and other relevant indicators (Cho, 2016; Cronbach, 1951). The statistical significance of the indicators was ensured by confirmatory factor analysis (CFA). Descriptive (frequency and percentage) analysis was performed for some variables such as prevalence of PSU, purposes of using smartphone, reasons of giving access preschoolers to smartphone, and parent's perception about the causes of the preschoolers' PSU. The bivariate associations of PSU with selected factors were analyzed using the chi-square test. Moreover, the multivariable Ordinal Regression Model (OLR) model analysis was conducted to avoid selection bias that may affect the significance of the results in simple regression and determine the Adjusted Odds Ratios (AORs) of the significant factors of PSU. The chi-square test was also performed for assessing the bivariate association between PSU and mental and physical health problems. Furthermore, the risks of mental and physical health problems due to PSU were assessed through simple OLR modeling. The cut-off p-value for significance was considered at 5% level of significance. Statistical Package for Social Sciences program (IBM SPSS, version 25.0 and

AMOS, version 23.0) was used for analyzing the data. The mathematical formulation of Cronbach's alpha, CFA, and OLR are described in Appendix 4.

Reliability of Data and Significance of the Indicators

The Cronbach's alpha, which measures the reliability of data, was 0.76 for the indicators of PSU, 0.82 for the indicators of mental health problems, and 0.80 for the indicators of physical health problems. The reliability score for all indicators, as indicated by the Cronbach's alpha, was estimated to 0.91. The value of Cronbach's alpha shows the high reliability of the data.

The results of the CFA are visualized in Fig 2. The criteria of the fitted CFA were GFI=0.86 and RMSEA=0.06. The estimates and statistical significance of the indicators are presented in Appendix 5. The outcomes indicated that all the considered indicators were statistically significant except PP7 (suffering from headache) and PP9 (suffering from hand and back pain) with factor loadings less than 0.71.

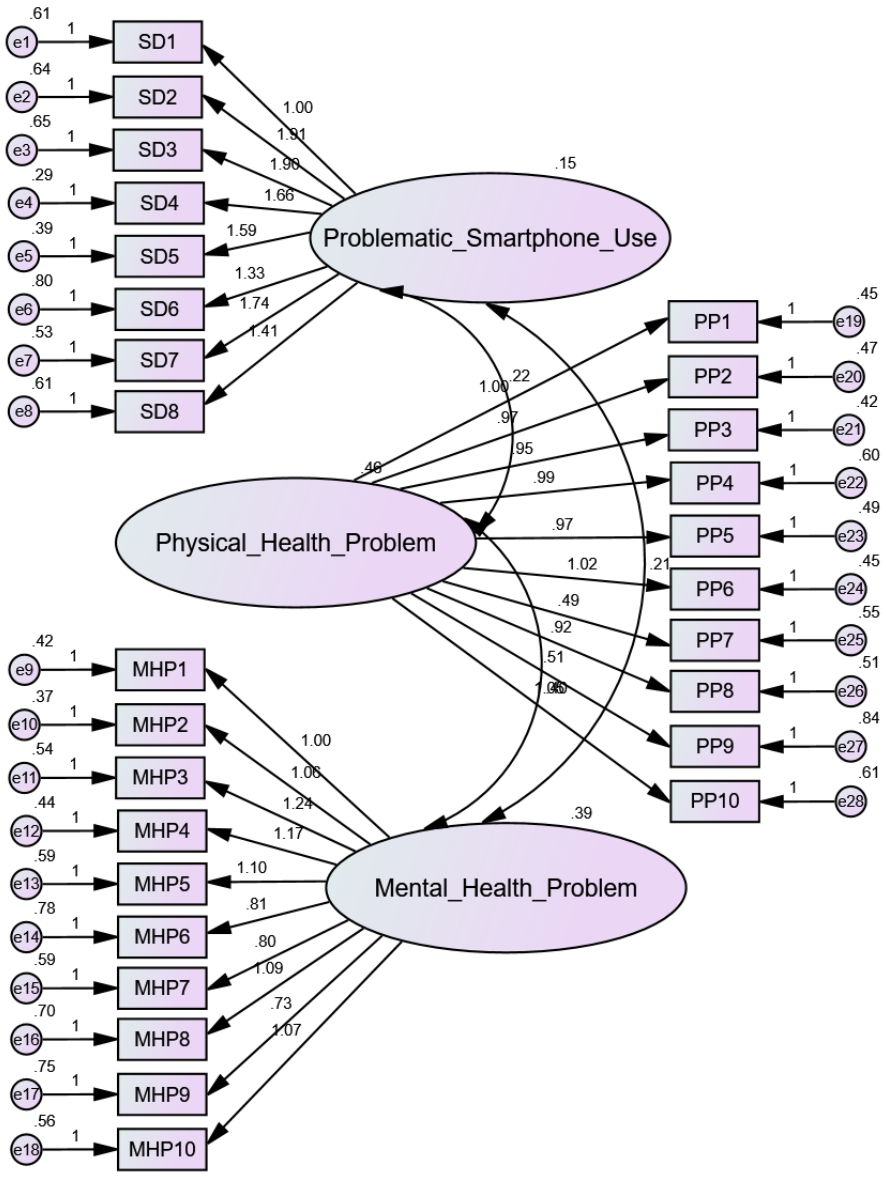

Fig 2. CFA through indicators used for assessing PSU, mental health and physical problem, all acronyms are presented in Appendix 2.

It is also observed from the results that the scales have significantly positive correlation one another. The estimated correlation of the group of items for PSU with the groups of items for mental and physical health problem were found to be 0.89 and 0.84, respectively.

Results

It is revealed that all the selected preschool children aged 3-5 years had to access to a smartphone. Although 92% of the preschool children reported using their parent's smartphone, interestingly 8% of them had their own smartphone. The survey results also reveal that almost 86% of the preschool children were problematic user to the smartphone with 23% mild, 35% moderate, and 29% severely problematic user (Fig 3(a)). The preschoolers of PSU group used smartphone on average 2.74 hours (standard deviation: 1.76 hours) per day. An overwhelming majority (79%) of the preschool children reported using smartphone for watching cartoons or fiction followed by playing games (49%), watching television (TV)/video or listening to music (45%), and 14% of the children also use smartphone for study purposes (Fig 3(b)).

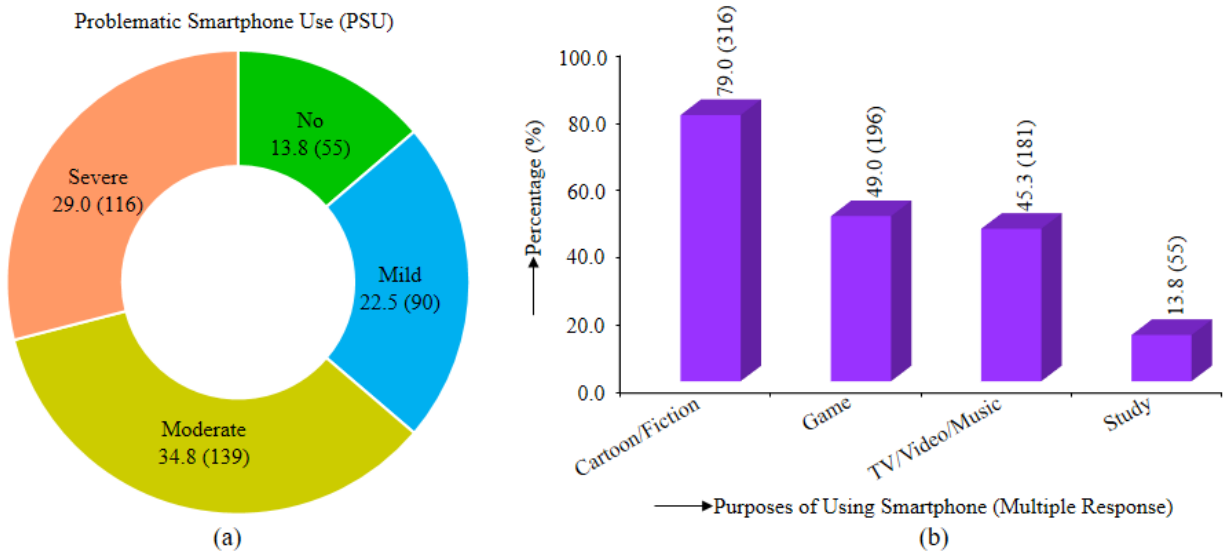

Fig 3. Prevalence and purposes of using smartphone

In response to the question 'why do you allow your children to use smartphone?', 73% of the caregivers said that they made their children busy with a smartphone to do their work without disturbance. Additionally, 70% of respondents gave their children smartphone because their children like to use smartphone. Furthermore, parents gave access to a smartphone to their child for feeding (67%) and putting the child to sleep (31%). Moreover, about 49% of the mothers also believe that their child could learn more by using smartphone (Fig 4(a)). While investigating the reasons for such PSU, 85% of the mothers mentioned that 'parents give less time to the child' was

the main reason for children's addiction to smartphone, followed by unavailability of playground (52%) and lack of playing partners (42%) (Fig 4(b)).

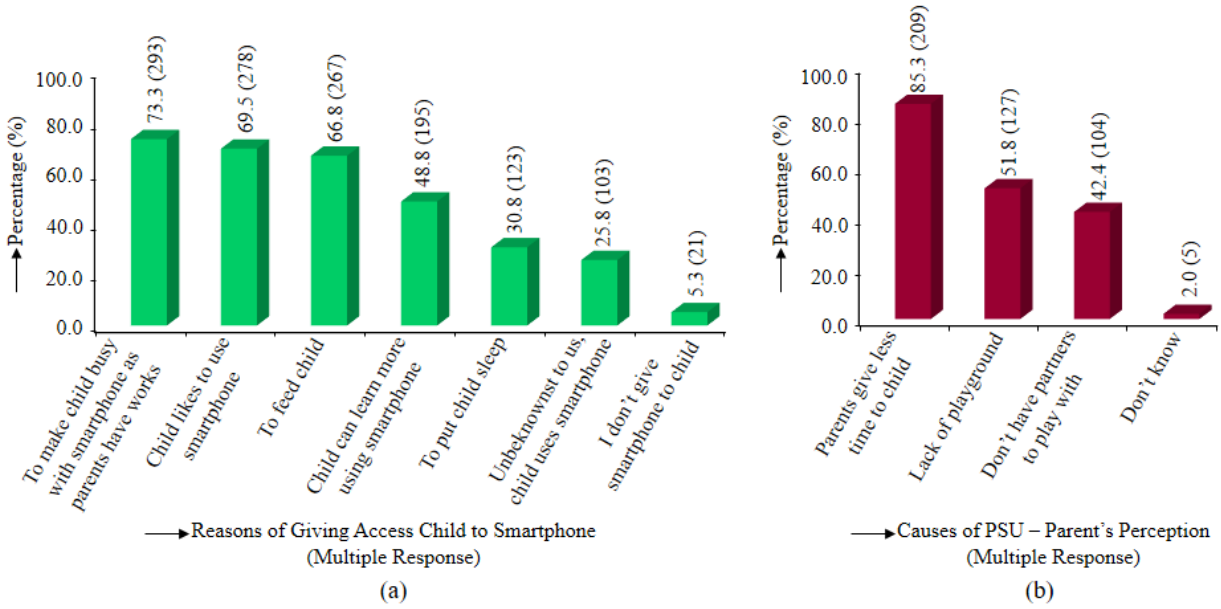

Fig 4. Causes of getting access to smartphone and reasons of preschoolers' PSU

More than half (61.3%) of the mothers believe that their children were problematic user of smartphone. However, among the caregivers (38.7%) who thought their children were not problematic user, 42.6% reported about their child's usage of smartphone for more than one hour per day, which was found higher than the recommended time limit.

Table 1 illustrates the bivariate analysis results of preschool children's PSU with selected socio-demographic and economic factors. It was revealed that PSU of preschool children was significantly influenced by the children's daily usage of smartphone of more than one hour and parents' daily usage of smartphone of more than three hours. Almost two-third of the respondents pointed out about their children's use of smartphone of more than one hour a day and one-third respondents reported about parental daily usage of smartphone of more than three hours. Parental education and profession, family income, age of mother, and number of siblings were also found significant in influencing the rate of PSU. Preschooler's daily use of smartphone of more than one hour and their parent's everyday use of smartphone of more than three hours made them a higher level of problematic user of smartphone. The preschoolers' problematic use rate of a smartphone

increased along with their parental education, professional rank, living standards, age of mother, and number of siblings.

Table 1. Bivariate analysis for determining the significant influential factors of PSU of the preschoolers

Factors	Categories	PSU % (n)				Total	Chi-square	p-value
		No	Mild	Moderate	Severe			
Preschoolers' Daily Use of Smartphone	≤ 1 Hour	83.6 (46)	62.2 (56)	25.9 (36)	5.2 (6)	36.0 (144)	135.031	<0.001
	> 1 Hour	16.4 (9)	37.8 (34)	74.1 (103)	94.8 (110)	64.0 (256)		
Mother's Daily Use of Smartphone	≤ 3 Hour	89.1 (49)	88.9 (80)	50.4 (70)	53.4 (62)	65.3 (261)	56.685	<0.001
	> 3 Hour	10.9 (6)	11.1 (10)	49.6 (69)	46.6 (54)	34.8 (139)		
Father's Daily Use of Smartphone	≤ 3 Hour	85.5 (47)	92.2 (83)	61.2 (85)	50.9 (59)	68.5 (274)	51.003	<0.001
	> 3 Hour	14.5 (8)	7.8 (7)	38.8 (54)	49.1 (57)	31.5 (126)		
Mother's Education Level	Primary	100.0 (55)	15.6 (14)	21.6 (30)	14.7 (17)	29.0 (116)	168.015	<0.001
	Secondary	0.0 (0)	73.3 (66)	54.0 (75)	60.3 (70)	52.8 (211)		
	Higher Secondary or Above	0.0 (0)	11.1 (10)	24.5 (34)	25.0 (29)	18.3 (73)		
Father's Education Level	Primary	100.0 (55)	41.1 (37)	26.6 (37)	28.4 (33)	40.5 (162)	109.541	<0.001
	Secondary	0.0 (0)	55.6 (50)	58.3 (81)	51.7 (60)	47.8 (191)		
	Higher Secondary or Above	0.0 (0)	3.3 (3)	15.1 (21)	19.8 (23)	11.8 (47)		
Mother's Profession	Housewife	74.5 (41)	81.1 (73)	79.9 (111)	32.8 (38)	65.8 (263)	96.806	<0.001
	Labor/Worker	7.3 (4)	10.0 (9)	3.6 (5)	6.0 (7)	6.3 (25)		
	Job/Service	18.2 (10)	8.9 (8)	16.5 (23)	61.2 (71)	28.0 (112)		
Father's Profession	Labor/Worker	69.1 (38)	68.9 (62)	56.1 (78)	33.6 (39)	54.3 (217)	33.522	<0.001
	Business	16.4 (9)	17.8 (16)	23.0 (32)	31.9 (37)	23.5 (94)		
	Job/Service	14.5 (8)	13.3 (12)	20.9 (29)	34.5 (40)	22.3 (89)		
Family Income (BDT)	<15000	36.4 (20)	43.3 (39)	29.5 (41)	9.5 (11)	27.8 (111)	95.768	<0.001
	15000-25000	60.0 (33)	46.7 (42)	48.9 (68)	31.9 (37)	45.0 (180)		
	≥ 25000	3.6 (2)	10.0 (9)	21.6 (30)	58.6 (68)	27.3 (109)		
Age of the Child (Years)	3	21.8 (12)	37.8 (34)	31.7 (44)	29.3 (34)	31.0 (124)	8.132	0.229
	4	40.0 (22)	38.9 (35)	34.5 (48)	31.9 (37)	35.5 (142)		
	5	38.2 (21)	23.3 (21)	33.8 (47)	38.8 (45)	33.5 (134)		
Age of Mother (Years)	18-25	47.3 (26)	43.3 (39)	41.7 (58)	33.6 (39)	40.5 (162)	13.020	0.043
	26-30	29.1 (16)	38.9 (35)	38.8 (54)	31.0 (36)	35.3 (141)		
	≥ 31	23.6 (13)	17.8 (16)	19.4 (27)	35.3 (41)	24.3 (97)		
	1	38.2 (21)	35.6 (32)	34.5 (48)	37.1 (43)	36.0 (144)	11.301	0.079

Factors	Categories	PSU % (n)				Total	Chi-square	p-value
		No	Mild	Moderate	Severe			
Number of Siblings	2	50.9 (28)	40.0 (36)	46.0 (64)	32.8 (38)	41.5 (166)		
	≥ 3	10.9 (6)	24.4 (22)	19.4 (27)	30.2 (35)	22.5 (90)		

The multivariable OLR model was used to assess adjusted risks of preschoolers' PSU due to the identified significant risk factors. The results of multivariable OLR model are summarized in Table 2. The output of the multivariable regression model revealed that except father's profession and the number of siblings, all other previously identified influential factors had significant contributions to the model for explaining the variability of the preschoolers' PSU. Therefore, besides the daily usage of smartphone for more than one hour by a child, parental daily usage of smartphone of more than three hours, education, profession, family income, and age of mother could enhance the likelihood of PSU of the preschoolers.

Table 2. Assessing risk of PSU due to different factors through ordinal regression modeling

Factors	Categories	Estimate	p-value	AOR [95% Confidence Interval (CI)]
Threshold	No to Mild	0.424	0.044	1.529 [1.012, 2.310]
	Mild to Moderate	1.988	<0.001	7.303 [4.742, 11.247]
	Moderate to Severe	3.718	<0.001	41.165 [23.935, 70.799]
Preschoolers' Daily Use of Smartphone	≤ 1 Hour (Reference)			
	> 1 Hour	1.365	<0.001	3.917 [2.856, 5.371]
Mother's Daily Use of Smartphone	≤ 3 Hour (Reference)			
	> 3 hour	0.792	<0.001	2.208 [1.629, 2.994]
Father's Daily Use of Smartphone	≤ 3 hour (Reference)			
	> 3 hour	0.638	<0.001	1.893 [1.379, 2.600]
Mother's Education Level	Primary (Reference)			
	Secondary	1.016	<0.001	2.762 [2.008, 3.799]
	Higher Secondary or Above	0.701	0.001	2.016 [1.311, 3.100]
Father's Education Level	Primary (Reference)			
	Secondary	0.486	0.001	1.625 [1.206, 2.190]
	Higher Secondary or Above	0.768	0.004	2.156 [1.286, 3.615]
Mother's Profession	Housewife (Reference)			
	Labor/Worker	0.595	0.027	1.813 [1.069, 3.076]

Factors	Categories	Estimate	p-value	AOR [95% Confidence Interval (CI)]
Father's Profession	Job/Service	0.834	<0.001	2.302 [1.607, 3.297]
	Labor/Worker (Reference)			
	Business	-0.132	0.478	0.876 [0.609, 1.262]
	Job/Service	0.128	0.492	1.136 [0.790, 1.634]
Family Income (BDT)	<15000 (Reference)			
	15000-25000	0.229	0.139	1.258 [0.928, 1.704]
	≥ 25000	0.989	<0.001	2.688 [1.724, 4.192]
Age of Mother (Years)	18-25 (Reference)			
	26-30	0.125	0.438	1.133 [0.827, 1.552]
	≥ 31	0.483	0.021	1.621 [1.076, 2.443]
Number of Siblings	1 (Reference)			
	2	-0.071	0.658	0.931 [0.680, 1.276]
	≥ 3	0.135	0.538	1.144 [0.745, 1.758]

After adjusting, the children who used smartphone for more than one hour a day had 3.92 times [95% CI: 2.86-5.37] higher likelihood of PSU than those who used one hour or less per day. Alongside, the children whose mother and father's daily usage of smartphone were more than three hours had 2.21 times [95% CI: 1.63-2.99] and 1.89 times [95% CI: 1.38-2.60] higher likelihood of being problematic users of smartphone than whose mother and father's daily usage of smartphone were less than or equal to three hours, respectively. It is also discovered that higher level of education and profession of mothers are more severe predictors of PSU than father's higher level of education and profession. The odds of preschoolers of being problematic smartphone users were 2.76 times [95% CI: 2.01-3.80], 2.02 times [95% CI: 1.31-3.10], 1.81 times [95% CI: 1.07-3.08], and 2.30 times [95% CI: 1.61-3.30] higher for mothers with secondary education, higher secondary or above education, labor/worker, and job/service, respectively. Furthermore, preschoolers with fathers who completed secondary education and higher secondary or above education had 1.63 times [95% CI: 1.21-2.19] and 2.16 times [95% CI: 1.29-3.62] more likely to be problematic user to the smartphone, respectively. The living standard, which was measured by monthly family income also found an important indicator for PSU of the preschoolers. The findings revealed that the preschoolers with monthly family income of more than 25000 (BDT) were 2.69 times [95% CI: 1.72-4.19] more likely to be problematic user to a smartphone than those from a family with income less than 15000 (BDT) per month. Additionally, mothers of preschoolers who are at least

31 years old would have a 1.62 [95% CI: 1.08-2.44] increase in the likelihood that their child will be a problematic smartphone user (Table 2).

The results of the chi-square test presented in Table 3 confirmed that the PSU of preschoolers was significantly associated with their mental and physical health problems with p-value of <0.001. The findings revealed that problematic user children had various mental health problems such as random mood swings, anger without reason, insufficient and irregular sleeping, absent-mindedness, forgetting whatever s/he observed, language skills are not developing, and communication gap with siblings, parents, peers, and friends. Moreover, they were reported to suffer from several physical problems such as headaches, hand and back pain, loss of appetite and irregular food time, weight and height are not consistent, and hearing and visual problems.

Table 3. Significance of the bivariate association of PSU with mental and physical health problems of preschool children

Response Variables	Categories	PSU % (n)				Total	Chi-square	p-value
		No	Mild	Moderate	Severe			
Mental Health Problem	No	21.8 (12)	17.8 (16)	8.6 (12)	0.9 (1)	10.3 (41)	136.426	<0.001
	Mild	56.4 (31)	62.2 (56)	56.1 (78)	19.8 (23)	47.0 (188)		
	Moderate	20.0 (11)	17.8 (16)	25.9 (36)	31.9 (37)	25.0 (100)		
	Severe	1.8 (1)	2.2 (2)	9.4 (13)	47.4 (55)	17.8 (71)		
Physical Health Problem	No	32.7 (18)	31.1 (28)	28.8 (40)	6.9 (8)	23.5 (94)	107.230	<0.001
	Mild	45.5 (25)	44.4 (40)	43.2 (60)	25.9 (30)	38.8 (155)		
	Moderate	14.5 (8)	22.2 (20)	18.7 (26)	18.1 (21)	18.8 (75)		
	Severe	7.3 (4)	2.2 (2)	9.4 (13)	49.1 (57)	19.0 (76)		

The ordinal regression modeling exhibited that both moderate and severe addiction to smartphone had significant negative effect on mental health. On the other hand, only the severe addiction to smartphone significantly negatively influenced the physical health problems of preschool children. The findings revealed that the severely problematic user children had 6.03 times [95% CI: 3.95-9.19] and 3.29 times [95% CI: 2.22-4.89] higher risk of mental and physical health problems, respectively. Similarly, moderate problematic user children were 1.64 times [95% CI: 1.13-2.37] and 1.14 times [95% CI: 0.77-1.68] more likely to report mental and physical health problems, respectively (Table 4).

Table 4. Effect of PSU on the mental and physical health of preschool children

Factors	Categories	Estimate	p-value	AOR [95% CI]
Effect on Mental Health				
Threshold	No to Mild	-0.394	0.015	0.674 [0.491, 0.925]
	Mild to Moderate	1.336	<0.001	3.804 [2.640, 5.480]
	Moderate to Severe	2.526	<0.001	12.509 [8.240, 18.990]
PSU	No (Reference)			
	Mild	0.084	0.678	1.087 [0.732, 1.617]
	Moderate	0.494	0.009	1.638 [1.132, 2.370]
	Severe	1.796	<0.001	6.026 [3.949, 9.194]
Effect on Physical Health				
Threshold	No to Mild	-0.054	0.749	0.947 [0.679, 1.322]
	Mild to Moderate	1.160	<0.001	3.191 [2.224, 4.579]
	Moderate to Severe	2.029	<0.001	7.604 [5.111, 11.312]
PSU	No (Reference)			
	Mild	0.040	0.852	1.041 [0.684, 1.583]
	Moderate	0.132	0.505	1.141 [0.774, 1.683]
	Severe	1.192	<0.001	3.292 [2.215, 4.893]

Discussion

Nowadays, smartphone usage is extensively upsurging globally irrespective of user's age and this happens due to the advancement of technology, availability, and its easy use. As a consequence, preschoolers are becoming problematic user to smartphone. Therefore, this issue is an emerging concern nationally and globally (Park and Park, 2021; Sohn et al., 2019). Although there is a target under the SDG- 3, no specific strategy is yet undertaken for promoting their mental health and well-being. Besides, lack of proper guidelines concerning the use of smartphone leads to serious child health problems. Based on our knowledge of existing relevant literatures in Bangladesh, there exists no study related to this issue. With this backdrop, the authors intend to determine the prevalence, pattern, determinants, and consequences of PSU among the preschool children in Bangladesh based on primary data.

PSU means more dependency on a smartphone; therefore, PSU was measured through eight essential indicators related to preschoolers' daily activities such as taking food, sleeping, reading, playing, behavioural and language development, and access to a smartphone. These eight essential indicators were chosen based on the self-efficacy and some previous studies on PSU (Al-Balushi

and Al-Shihi, 2016; Kwon et al., 2013; Park and Park, 2021). Preschoolers with more PSU are higher likely to have mental-emotional instability, depression, ADHD, anger, lack of attention and self-control, lack of interactions with other children and the people around them (Bonetti et al., 2010; Hill et al., 2016; Hong et al., 2021; Jang et al., 2008; Lee et al., 2015; Park and Park, 2014, 2021; Wang et al., 2017; Yang, 2001; Yoo et al., 2004). Therefore, the effect of PSU on mental health was measured using ten indicators related to the aforementioned mental health problems. In this study, the physical health status of the preschoolers was measured using ten indicators that are related to impairments in visual/hearing senses, poor sleep quality, obesity, body imbalance because these are the consequences for the interruption of the physical development of preschoolers due to higher rate of PSU (Hill et al., 2016; Ko et al., 2005; Lee et al., 2015; Leesukhee, 2010; Park and Park, 2014, 2021). Several factors influence the PSU of preschool children, such as preschoolers' characteristics like daily usage of smartphone, age, and the number of siblings (Cho and Lee, 2004; Leung, 2007; Park and Park, 2014, 2021). In addition, some parental characteristics like daily usage of smartphone, educational status, profession, mother's age, and family income have a potential influence on preschoolers' PSU (Cha and Seo, 2018; Park and Park, 2014).

In the beginning, the reliability of the data was checked by using Cronbach's Alpha (Cronbach, 1951), which lies between 0 and 1, and the value close to 1 provides more reliability (Cortina, 1993). For reliability, the acceptable threshold value of Cronbach's Alpha is 0.70 (Cortina, 1993). In this study, the measures of estimated Cronbach's alpha of more than the threshold value and consistent with previous study findings (Park and Park, 2021) indicates high reliability of our data. Further, the acceptable value of GFI is around 0.90, and RMSEA is less than 0.08 (Fabrigar et al., 1999). In our case, the GFI and RMSEA indicate good fit of the model. Another indicator, the factor loadings should be equal to or greater than 0.71 for good convergent validity (Gefen et al., 2000). The analysis of our findings reveal that, except 'suffering from headache', and 'suffering from hand and back pain', all the indicators related to PSU as well as its mental and physical health consequences of the preschoolers are statistically significant.

The results depict that more than 86% of the preschoolers were problematic user to smartphone. A previous cross-sectional study highlighted that approximately 87% of the Bangladeshi students

were problematic smartphone users which justify our findings (Hosen et al., 2021). The preschoolers of PSU group used smartphone on average 2.74 hours per day which is consistent with the finding of a previous similar study conducted in Korea where the researchers reported that the preschoolers of PSU group used smartphone on average 2.5 hours in a day (Park and Park, 2021). Moreover, the average daily screen time was estimated to 2.7 hours in India (Shah et al., 2019), 4.1 hours in USA (Tandon et al., 2011), 1.4 hours in China (Xie et al., 2020), 1.3 hours in Finland (Mustonen et al., 2022), 1.4 hours in Thailand (Chaibal and Chaiyakul, 2022), and 1.9 hours in Canada (Canadian Paediatric Society Ottawa, Ontario, 2017). This study reveals that, 8% of the children have a separate smartphone, and the rest of the children use their parent's smartphone for watching cartoons/fiction, playing games, and TV/videos/music. A small portion of children also use a smartphone for study purposes. The children who have a separate smartphone are more vulnerable to PSU as they are more likely to have higher daily screen time. Moreover, a recent study highlighted that preschoolers' use of smartphone for entertainment, and other non-educational purposes, is the leading cause of their PSU (Genc, 2014). Another study also reported that using a smartphone for watching videos, gaming, and social networking might impose high risk for PSU (Fischer-Grote et al., 2019; Khan et al., 2021). Moreover, preschoolers' use time of smartphone for social networking services was found to increase the risk of their PSU by 1.52 times (Lee and Kim, 2021).

Surprisingly, about half of the respondents think that their children will learn more using smartphone, and almost two-thirds of respondents have positive attitudes to give their children access to a smartphone. Parents' positive attitudes towards their children's smartphone usage may enhance preschoolers' PSU (Bonetti et al., 2010; Park and Park, 2021). There was a significant positive association between preschoolers' excessive smartphone use and mothers' tendency toward smartphone addiction (r=0.41), parenting stress (r=0.40), unwanted parenting conduct (r=0.35), undesirable parenting attitude (r=0.14), and smartphone usage time (r=0.26) (Lee et al., 2020). Almost three-fourth of the respondents mentioned that they give smartphone to their children keeping them quiet and calm. Moreover, approximately 67% of respondents reported to let their children use their smartphone during feeding followed by 31% of mothers use smartphone to put their children to sleep. Professional parents are more tended to keep quiet and prevent their children from them while they have work, or put them to sleep, or persuade them to eat; therefore,

they give their children more access to their smartphone (Baek et al., 2013; De Decker et al., 2012; Genc, 2014; Kabali et al., 2015) without knowing the possible adverse effects of the preschoolers' smartphone use (De Decker et al., 2012; Genc, 2014; Hinkley and McCann, 2018).

Moreover, lack of playground and playing partners also accelerate PSU prevalence. Due to urbanization and acquiring more land for cultivation causes playground scarcity, and on the other hand, parents tend to isolate their children from kids resulting shortfall of playing partners. Because of the lack of playground and playing partners, the smartphone has replaced traditional toys that was previously used for recreation (Alam, 2021). According to a prior study, having good friendships might constitute a protective factor of PSU (Fischer-Grote et al., 2019). In the context of Bangladesh, day-by-day, the number of nuclear families is increasing (Chakma, 2017; Chowdhury, 2016; Hughes, 2010; Rezvi, 2018; Samad, 2015), and on the other hand, mothers alongside the fathers are also getting involved in income generating activities for financial stability (Centre for Research and Information, 2019). Thus, the parents are getting little quality time for their preschool children, which may increase their PSU in the near future. As a result, parents are suggested to restrict their preschool children from excessive use of smartphone by giving quality time to them (Ricci et al., 2017).

Bivariate analysis reveals that a child's daily usage of smartphone, parental attributes (e.g., daily usage of smartphone, education level, profession, family income, age of mother), and number of siblings substantially impact preschoolers' PSU. On the other hand, it is observed from the results of the multivariable regression model that except father's profession and number of siblings, all other previously identified significant factors can enhance the likelihood of PSU of preschoolers. Our findings are also consistent with several previous study results (Bonetti et al., 2010; Cha and Seo, 2018; Park and Park, 2014, 2021).

Daily smartphone use of more than one hour by a child increases the likelihood of PSU by 3.92 times. This finding is in line with recommendation on the preschoolers' usage of smartphone (Canadian Paediatric Society Ottawa, Ontario, 2017; Hill et al., 2016; Ministry of Health, 2017; Mustonen et al., 2022; Pappas, 2022; Sommer et al., 2021; The American Academy of Child and Adolescent Psychiatry, 2020; The Department of Health and Aged Care, 2018; Xie et al., 2020).

Although there is a slight difference in the duration range of smartphone use, previous studies showed that an increase in the duration of daily use of smartphone significantly increases the risk of PSU (Jang and Jeong, 2015; Lee et al., 2015; Lee and Park, 2018; Park and Park, 2021). Some studies also revealed that the risk of PSU is significantly increasing linearly with the duration when the children's daily use is more than 30 minutes (Jang and Jeong, 2015; Lee et al., 2015; Lee and Park, 2018). Thus, preschoolers' daily excessive use of smartphone is the leading factor for their risk of being a problematic user. Thus, it is recommended to limit the duration of smartphone use to less than 30 minutes in weekdays and less than 1 hour in the weekends (Park, 2019) as well as no screens during meals and for 1 hour before bedtime (Canadian Paediatric Society Ottawa, Ontario, 2017; Hill et al., 2016; Ministry of Health, 2017; Mustonen et al., 2022; Pappas, 2022; Sommer et al., 2021; The American Academy of Child and Adolescent Psychiatry, 2020; The Department of Health and Aged Care, 2018; Xie et al., 2020).

The excessive (daily more than 3 hours) use of smartphone by mothers and fathers also enhances their children's likelihood of PSU by 2.21 and 1.89 times, respectively. An earlier study found that there was a 1.24 times higher likelihood of smartphone overdependency in preschool children whose mothers used their smartphones for 3–4 hours a day (Lee and Park, 2018). Another study reported that preschoolers whose mothers' daily usage of smartphones is more than 1 hour had a higher level of PSU tendency than preschoolers whose mothers use smartphones for less than 1 hour/day (Lee et al., 2015). Moreover, it was reported in an earlier study that children's excessive smartphone use was influenced by their parents' overuse of smartphone (A. R. Lee et al., 2022). Parents' excessive obsession with smartphone may increase interruptions in parent-child interactions, which also affect preschoolers' PSU (Alam, 2021; Cheng et al., 2021). Preschoolers need more time at home with their parents especially over the weekend (Hinkley and McCann, 2018; Jang and Jeong, 2015; Lee and Park, 2018; Park and Park, 2021). Therefore, the parents who are excessive users or problematic user to smartphone lose their control over the child and hence may increase the likelihood of their children being exposed to a smartphone, resulting in a greater prevalence of preschoolers' PSU (Matthes et al., 2021; Park and Park, 2014).

This study also shows that the likelihood of preschoolers' PSU is significantly increasing with the increases of their parent's education, profession, and living standard. A previous study reported

that children from families with higher education, profession, and income are more likely to become problematic user to a smartphone (Cha and Seo, 2018). According to a prior study, children from higher income families were found to be more likely to use smart gadgets (Shamsah et al., 2022). It was reported in a prior study that preschooler smartphone use and mother's employment status had a significant positive association with r=0.18 (Lee et al., 2020). Moreover, the educated parents are more likely to be involved in high-ranked job or business. The study confirmed that the preschoolers with parents having high-ranked jobs or businesses are more likely to become problematic user to smartphone. Professional fathers and mothers usually remain busy with their job or business for longer time. Consequently, they can manage a little time to take care of their children, therefore, becoming more generous about the demands of their children, resulting in the greater vulnerability to PSU (Chou and Hsiao, 2000; Park and Park, 2021). As a result, children do not grow up hearing stories and folk tales from and playing indoor games with their parents, rather they grow up with heavy dependence of smartphone from their early childhood (Alam, 2021). In a prior study, it was found that poor mother-child communication increased the preschoolers' PSU by 1.07 times (Lee and Kim, 2021).

Moreover, children of older mothers are more susceptible to PSU since there is a higher likelihood that older mothers are less aware of the negative impacts of smartphones and more engaged with household activities than their younger counterparts (Busch et al., 2021). A previous study found a significant positive correlation of r=0.12 between mother's age and preschooler's overuse of smartphone (Lee et al., 2020).

PSU significantly affects preschoolers' psychological, physical, and cognitive development. It is worth mentioning that severe PSU increases the likelihood of mental and physical health problems by 6.03 and 3.29 times, respectively. Further, the likelihood of preschoolers' mental and physical health problems are 1.64 and 1.14 times higher, respectively, when they are moderately problematic user to the smartphone. The study also reveals that, the preschoolers with PSU suffer from many mental and physical health problems such as random mood swings, anger without reason, insufficient and irregular sleeping, absent-mindedness, social relationship gap, language skills not developing, headache, hand and back pain, loss of appetite, irregular food time, weight

and height not consistent with age, hearing and visual problems. Previous studies reported various adverse effects of PSU on preschoolers' physical and psychological health and cognitive development including poor vision and sleep quality (Fischer-Grote et al., 2019; Panova and Carbonell, 2018; Sarwar and Soomro, 2013; Sohn et al., 2019), ADHD (Park and Park, 2014; Tamana et al., 2019), difficulties in deep thinking and brain development (Fischer-Grote et al., 2019; Panova and Carbonell, 2018; Sohn et al., 2019), low quality of life (Lu et al., 2019), low quality of friendship (Kim et al., 2018), and disconnection from social interaction (Park and Park, 2021; Sarwar and Soomro, 2013). In a prior study, PSU was found to significantly increase the risks of depression, anxiety, perceived stress, and poorer sleep quality by 3.17, 3.05, 1.86, and 2.60 times, respectively (Sohn et al., 2019). Another study demonstrated a significant positive association ($r=0.23$) between preschoolers' tendency toward smartphone addiction and their hyperactive-distractible behavior (Lee et al., 2015).

Strength and Limitations

The novelty of this study is one of the significant strengths because no study has been conducted on this topic in Bangladesh yet. Cause and effect analysis is another strength of this study. Besides strengths, this study has some limitations. Firstly, this study has been carried out with self-funding; therefore, the authors could not collect a large amount of data. Secondly, the study did not consider other media devices such as personal computer (PC), Tablet PC or video gaming device. Thirdly, this is a cross-sectional study; therefore, causal inference is not possible. Fourthly, the study results are based on the responses from the mothers of the preschoolers, and it was not possible to observe the preschoolers' every day activities; thus the authors think that there may be some additional factors that cannot be considered in this study, which may influence the study findings. Finally, the modeling approaches suffer from few constraints like multiple testing, random effects, and unbalanced groups, which could misinterpret the study findings.

Conclusion and Recommendation

This study provides novel evidence of preschoolers' PSU along with its determinants and consequences on their development-establishing the hypothesis on the threat of preschoolers' excessive usage of smartphone. The likelihood of PSU is linked with various factors such as a child's daily usage of smartphone and parental attributes like daily usage of smartphone, education

level, profession, family income, age of mother. This study demonstrates that preschoolers' PSU leads to different problems associated with their mental and physical development. In the other way, a child who is problematic user to smartphone is more likely to have problems in cognitive development issues such as attention deficit, emotional instability, aggressiveness, depression, and a lack of control. Physical difficulties such as impaired vision and hearing, obesity, body imbalance, and a lack of brain development are also identified. PSU is likely to persist throughout a child's life, resulting in significant personal and social consequences. As a result, family and community must work together to prevent addiction because children are the most valuable future resources that cannot be replaced with anything else. To begin, parents are recommended to spend enough quality time with their children and ensure their playing environment and partner, in addition, limit their daily usage of a smartphone to the recommended limits. Educational institutions, for example, kindergartens and preschools, should take a responsibility to teach children and their caregivers about the adverse effects of excessive use of smartphone. Therefore, it is urgently needed to develop a national guideline regarding smartphone use after conducting a countrywide study and an elementary textbook section. Moreover, different awareness programs should be conducted at the community level through community leaders and the government to save the future generation from PSU.

References

Adams, C., Grecu, I., Grecu, G., Balica, R., 2020. Technology-related Behaviors and Attitudes: Compulsive Smartphone Usage, Stress, and Social Anxiety. Rev. Contemp. Philos. 19, 71–77. https://doi.org/10.22381/RCP1920207

Al-Balushi, J., Al-Shihi, H., 2016. An assessment of parents happiness and awareness of the effects of mobile devices on children social communication behaviours in Oman. Proc. 27th Int. Bus. Inf. Manag. Assoc. Conf. - Innov. Manag. Educ. Excell. Vis. 2020 From Reg. Dev. Sustain. to Glob. Econ. Growth, IBIMA 2016 2016, 3479–3497. https://doi.org/10.5171/2016.109393

Alam, A., 2021. Save children from smart phone addiction. Indep.

Arefin, M., Islam, R., Ameen, M., Afrin, S., Islam, D.N., 2017. Impact of Smartphone Addiction on Business Students' Academic Performance: A Case Study. Indep. J. Manag. Prod. 8, 955. https://doi.org/10.14807/ijmp.v8i3.629

Baek, Y.M., Lee, J.M., Kim, K.S., 2013. A study on smart phone use condition of infants and toddlers. Int. J. Smart Home 7, 123–132. https://doi.org/10.14257/ijsh.2013.7.6.12

BankMyCell, 2022. How Many People Have Smartphones In The World? [WWW Document]. BankMyCell. URL https://www.bankmycell.com/blog/how-many-phones-are-in-the-world (accessed 12.31.22).

Benedetto, L., 2021. Digital Parenting: Raising and Protecting Children in Media World, in: Ingrassia, M.I.E.-L.B.E.-M. (Ed.), . IntechOpen, Rijeka, p. Ch. 8. https://doi.org/10.5772/intechopen.92579

Bhuiyan, M., 2021. 62% Bangladeshi users to have smartphones by 2025: Report. Bus. Stand.

Binghamton University, 2017. Smartphone addiction leads to personal, social, workplace problems: Females more susceptible to addiction, new research shows [WWW Document]. ScienceDaily. URL www.sciencedaily.com/releases/2017/04/170412180546.htm (accessed 4.12.17).

Bonetti, L., Campbell, M., Gilmore, L., 2010. The Relationship of Loneliness and Social Anxiety with Children's and Adolescents' Online Communication. Cyberpsychol. Behav. Soc. Netw. 13, 279–285. https://doi.org/10.1089/cyber.2009.0215

Busch, P.A., Hausvik, G.I., Ropstad, O.K., Pettersen, D., 2021. Smartphone usage among older adults. Comput. Human Behav. 121, 106783. https://doi.org/https://doi.org/10.1016/j.chb.2021.106783

Canadian Paediatric Society Ottawa, Ontario, D.H.T.F., 2017. Screen time and young children: Promoting health and development in a digital world. Paediatr. Child Health 22, 461–468. https://doi.org/10.1093/pch/pxx123

Carson, V., Langlois, K., Colley, R., 2020. Associations between parent and child sedentary behaviour and physical activity in early childhood. Heal. reports 31, 3–10. https://doi.org/10.25318/82-003-x202000200001-eng

Centre for Research and Information, 2019. Bangladesh: The Role Model in Women's Empowerment. Dhaka, Bangladesh.

Cha, S.-S., Seo, B.-K., 2018. Smartphone use and smartphone addiction in middle school students in Korea: Prevalence, social networking service, and game use. Heal. Psychol. Open 5, 2055102918755046. https://doi.org/10.1177/2055102918755046

Chaibal, S., Chaiyakul, S., 2022. The association between smartphone and tablet usage and

children development. Acta Psychol. (Amst). 228, 103646. https://doi.org/https://doi.org/10.1016/j.actpsy.2022.103646

Chakma, J., 2017. Family size getting smaller. Indep.

Chandrima, R.M., Kircaburun, K., Kabir, H., Riaz, B.K., Kuss, D.J., Griffiths, M.D., Mamun, M.A., 2020. Adolescent problematic internet use and parental mediation: A Bangladeshi structured interview study. Addict. Behav. reports 12, 100288. https://doi.org/10.1016/j.abrep.2020.100288

Chang, F.-C., Chiu, C.-H., Chen, P.-H., Chiang, J.-T., Miao, N.-F., Chuang, H.-Y., Liu, S., 2019. Children's use of mobile devices, smartphone addiction and parental mediation in Taiwan. Comput. Human Behav. 93, 25–32. https://doi.org/https://doi.org/10.1016/j.chb.2018.11.048

Cheng, Y.-C., Yang, T.-A., Lee, J.-C., 2021. The Relationship between Smartphone Addiction, Parent–Child Relationship, Loneliness and Self-Efficacy among Senior High School Students in Taiwan. Sustain. . https://doi.org/10.3390/su13169475

Cho, E., 2016. Making Reliability Reliable: A Systematic Approach to Reliability Coefficients. Organ. Res. Methods 19, 651–682. https://doi.org/10.1177/1094428116656239

Cho, Y.R., Lee, H.J., 2004. A Study on a Model for Internet Addiction of Adolescents. J Korean Acad Nurs 34, 541–551. https://doi.org/10.4040/jkan.2004.34.3.541

Choi, J., Rho, M.J., Kim, Y., Yook, I.H., Yu, H., Kim, D.-J., Choi, I.Y., 2017. Smartphone dependence classification using tensor factorization. PLoS One 12, e0177629. https://doi.org/10.1371/journal.pone.0177629

Chou, C., Hsiao, M.-C., 2000. Internet addiction, usage, gratification, and pleasure experience: the Taiwan college students' case. Comput. Educ. 35, 65–80. https://doi.org/https://doi.org/10.1016/S0360-1315(00)00019-1

Chowdhury, A.R., 2016. The changing Bangladeshi family. Dly. Star.

Cortina, J.M., 1993. What is coefficient alpha? An examination of theory and applications. J. Appl. Psychol. 78, 98–104. https://doi.org/10.1037/0021-9010.78.1.98

Cronbach, L.J., 1951. Coefficient alpha and the internal structure of tests. Psychometrika 16, 297–334. https://doi.org/10.1007/BF02310555

Csibi, S., Griffiths, M.D., Cook, B., Demetrovics, Z., Szabo, A., 2018. The Psychometric Properties of the Smartphone Application-Based Addiction Scale (SABAS). Int. J. Ment.

Health Addict. 16, 393–403. https://doi.org/10.1007/s11469-017-9787-2

De Decker, E., De Craemer, M., De Bourdeaudhuij, I., Wijndaele, K., Duvinage, K., Koletzko, B., Grammatikaki, E., Iotova, V., Usheva, N., Fernández-Alvira, J.M., Zych, K., Manios, Y., Cardon, G., group, T., 2012. Influencing factors of screen time in preschool children: an exploration of parents' perceptions through focus groups in six European countries. Obes. Rev. 13, 75–84. https://doi.org/https://doi.org/10.1111/j.1467-789X.2011.00961.x

Domoff, S.E., Borgen, A.L., Foley, R.P., Maffett, A., 2019a. Excessive use of mobile devices and children's physical health. Hum. Behav. Emerg. Technol. 1, 169–175. https://doi.org/https://doi.org/10.1002/hbe2.145

Domoff, S.E., Radesky, J.S., Harrison, K., Riley, H., Lumeng, J.C., Miller, A.L., 2019b. A Naturalistic Study of Child and Family Screen Media and Mobile Device Use. J. Child Fam. Stud. 28, 401–410. https://doi.org/10.1007/s10826-018-1275-1

Duch, H., Fisher, E.M., Ensari, I., Harrington, A., 2013. Screen time use in children under 3 years old: a systematic review of correlates. Int. J. Behav. Nutr. Phys. Act. 10, 102. https://doi.org/10.1186/1479-5868-10-102

Fabrigar, L.R., Wegener, D.T., MacCallum, R.C., Strahan, E.J., 1999. Evaluating the use of exploratory factor analysis in psychological research. Psychol. Methods 4, 272–299. https://doi.org/10.1037/1082-989X.4.3.272

Fischer-Grote, L., Kothgassner, O.D., Felnhofer, A., 2019. Risk factors for problematic smartphone use in children and adolescents: a review of existing literature. neuropsychiatrie 33, 179–190. https://doi.org/10.1007/s40211-019-00319-8

Garriguet, D., Carson, V., Colley, R.C., Janssen, I., Timmons, B.W., Tremblay, M.S., 2016. Physical activity and sedentary behaviour of Canadian children aged 3 to 5. Heal. reports 27, 14–23.

Gefen, D., Straub, D., Boudreau, M.-C., 2000. Structural Equation Modeling and Regression: Guidelines for Research Practice. Commun. Assoc. Inf. Syst. 4. https://doi.org/10.17705/1cais.00407

Genc, Z., 2014. Parents' Perceptions about the Mobile Technology Use of Preschool Aged Children. Procedia - Soc. Behav. Sci. 146, 55–60. https://doi.org/https://doi.org/10.1016/j.sbspro.2014.08.086

Gonçalves, S., Dias, P., Correia, A.-P., 2020. Nomophobia and lifestyle: Smartphone use and its

relationship to psychopathologies. Comput. Hum. Behav. Reports 2, 100025. https://doi.org/https://doi.org/10.1016/j.chbr.2020.100025

Green, M., Kovacova, M., Valaskova, K., 2020. Smartphone Addiction Risk, Depression Psychopathology, and Social Anxiety. Anal. Metaphys. 19, 52–58. https://doi.org/10.22381/AM1920205

Hamilton, K., Spinks, T., White, K.M., Kavanagh, D.J., Walsh, A.M., 2016. A psychosocial analysis of parents' decisions for limiting their young child's screen time: An examination of attitudes, social norms and roles, and control perceptions. Br. J. Health Psychol. 21, 285–301. https://doi.org/https://doi.org/10.1111/bjhp.12168

Harris, B., Regan, T., Schueler, J., Fields, S.A., 2020. Problematic Mobile Phone and Smartphone Use Scales: A Systematic Review. Front. Psychol. 11. https://doi.org/10.3389/fpsyg.2020.00672

Hasan, M., 2022. 48% mobile phone customers in Bangladesh have a smartphone [WWW Document]. Dly. Star. URL https://www.thedailystar.net/business/telecom/news/smartphone-penetration-fast-approaching-50pc-3031216 (accessed 12.31.22).

Hill, D., Ameenuddin, N., Chassiakos, Y.R., Cross, C., Radesky, J., Hutchinson, J., Boyd, R., Mendelson, R., Moreno, M.A., Smith, J., Swanson, W.S., 2016. Media and young minds. Pediatrics 138. https://doi.org/10.1542/peds.2016-2591

Hiltunen, P., Leppänen, M.H., Ray, C., Määttä, S., Vepsäläinen, H., Koivusilta, L., Sajaniemi, N., Erkkola, M., Roos, E., 2021. Relationship between screen time and sleep among Finnish preschool children: results from the DAGIS study. Sleep Med. 77, 75–81. https://doi.org/https://doi.org/10.1016/j.sleep.2020.11.008

Hinkley, T., McCann, J.R., 2018. Mothers' and father's perceptions of the risks and benefits of screen time and physical activity during early childhood: a qualitative study. BMC Public Health 18, 1271. https://doi.org/10.1186/s12889-018-6199-6

Hong, Y.P., Yeom, Y.O., Lim, M.H., 2021. Relationships between Smartphone Addiction and Smartphone Usage Types, Depression, ADHD, Stress, Interpersonal Problems, and Parenting Attitude with Middle School Students. jkms 36, e129-0. https://doi.org/10.3346/jkms.2021.36.e129

Hosen, I., Al Mamun, F., Sikder, M.T., Abbasi, A.Z., Zou, L., Guo, T., Mamun, M.A., 2021.

Prevalence and Associated Factors of Problematic Smartphone Use During the COVID-19 Pandemic: A Bangladeshi Study. Risk Manag. Healthc. Policy 14, 3797–3805. https://doi.org/10.2147/RMHP.S325126

Huang, L., Schmid, K.L., Yin, X.-N., Zhang, J., Wu, J., Yang, G., Ruan, Z.-L., Jiang, X.-Q., Wu, C.-A., Chen, W.-Q., 2021. Combination Effect of Outdoor Activity and Screen Exposure on Risk of Preschool Myopia: Findings From Longhua Child Cohort Study. Front. public Heal. 9, 607911. https://doi.org/10.3389/fpubh.2021.607911

Huang, L., Yang, G.-Y., Schmid, K.L., Chen, J.-Y., Li, C.-G., He, G.-H., Ruan, Z.-L., Chen, W.-Q., 2020. Screen Exposure during Early Life and the Increased Risk of Astigmatism among Preschool Children: Findings from Longhua Child Cohort Study. Int. J. Environ. Res. Public Health 17, 2216. https://doi.org/10.3390/ijerph17072216

Hughes, D., 2010. The size of the average family is getting smaller. BBC News.

Islam, M.S., Sujan, M.S.H., Tasnim, R., Mohona, R.A., Ferdous, M.Z., Kamruzzaman, S., Toma, T.Y., Sakib, M.N., Pinky, K.N., Islam, M.R., Siddique, M.A. Bin, Anter, F.S., Hossain, A., Hossen, I., Sikder, M.T., Pontes, H.M., 2021. Problematic Smartphone and Social Media Use Among Bangladeshi College and University Students Amid COVID-19: The Role of Psychological Well-Being and Pandemic Related Factors. Front. Psychiatry 12. https://doi.org/10.3389/fpsyt.2021.647386

Jahan, I., Hosen, I., Al Mamun, F., Kaggwa, M.M., Griffiths, M.D., Mamun, M.A., 2021. How Has the COVID-19 Pandemic Impacted Internet Use Behaviors and Facilitated Problematic Internet Use? A Bangladeshi Study. Psychol. Res. Behav. Manag. 14, 1127–1138. https://doi.org/10.2147/PRBM.S323570

Jang, J., Jeong, I., 2015. Related Factors of Smartphone Addiction among Preschool Children. J. Korean Soc. Sch. Community Heal. Educ. 16, 65–81.

Jang, K.S., Hwang, S.Y., Choi, J.Y., 2008. Internet Addiction and Psychiatric Symptoms Among Korean Adolescents. J. Sch. Health 78, 165–171. https://doi.org/https://doi.org/10.1111/j.1746-1561.2007.00279.x

Jeong, S.-H., Kim, H., Yum, J.-Y., Hwang, Y., 2016. What type of content are smartphone users addicted to?: SNS vs. games. Comput. Human Behav. 54, 10–17. https://doi.org/https://doi.org/10.1016/j.chb.2015.07.035

Kabali, H.K., Irigoyen, M.M., Nunez-Davis, R., Budacki, J.G., Mohanty, S.H., Leister, K.P.,

Bonner Jr, R.L., 2015. Exposure and Use of Mobile Media Devices by Young Children. Pediatrics 136, 1044–1050. https://doi.org/10.1542/peds.2015-2151

Khan, B., Janjua, U.I., Madni, T.M., 2021. The Identification of Influential Factors to Evaluate the Kids Smartphone Addiction: A Literature Review, in: 2021 4th International Conference on Computing & Information Sciences (ICCIS). pp. 1–6. https://doi.org/10.1109/ICCIS54243.2021.9676392

Kim, H.-J., Min, J.-Y., Min, K.-B., Lee, T.-J., Yoo, S., 2018. Relationship among family environment, self-control, friendship quality, and adolescents' smartphone addiction in South Korea: Findings from nationwide data. PLoS One 13, e0190896. https://doi.org/10.1371/journal.pone.0190896

Kliestik, T., Scott, J., Musa, H., Suler, P., 2020. Addictive Smartphone Behavior, Anxiety Symptom Severity, and Depressive Stress. Anal. Metaphys. 19, 45–51. https://doi.org/10.22381/AM1920204

Ko, C.-H., Yen, J.-Y., Chen, C.-C., Chen, S.-H., Yen, C.-F., 2005. Gender Differences and Related Factors Affecting Online Gaming Addiction Among Taiwanese Adolescents. J. Nerv. Ment. Dis. 193, 273–277. https://doi.org/10.1097/01.nmd.0000158373.85150.57

Kuss, D.J., Griffiths, M.D., 2011. Online Social Networking and Addiction—A Review of the Psychological Literature. Int. J. Environ. Res. Public Heal. . https://doi.org/10.3390/ijerph8093528

Kwon, M., Kim, D.-J., Cho, H., Yang, S., 2013. The Smartphone Addiction Scale: Development and Validation of a Short Version for Adolescents. PLoS One 8, e83558. https://doi.org/10.1371/journal.pone.0083558

Lazaroiu, G., Kovacova, M., Siekelova, A., Vrbka, J., 2020. Addictive Behavior of Problematic Smartphone Users: The Relationship between Depression, Anxiety, and Stress. Rev. Contemp. Philos. 19, 50–56. https://doi.org/10.22381/RCP1920204

Lee, A.R., Park, Y.W., Oh, J., 2022. Investigating the cause and effect factors of young children's smartphone overuse: focusing on the influence of parenting factors. Information, Commun. Soc. 1–17. https://doi.org/10.1080/1369118X.2022.2027499

Lee, E.J., Kim, H.S., 2021. Effect of Maternal Factors on Problematic Smartphone Use among Elementary School Children. Int. J. Environ. Res. Public Health 18, 9182. https://doi.org/10.3390/ijerph18179182

Lee, G., Kim, S., 2022. Relationship between Mother's emotional intelligence, negative parenting behaviour, Preschooler's attachment instability, and smart device overdependence. BMC Public Health 22, 752. https://doi.org/10.1186/s12889-022-13171-3

Lee, G., Kim, S., Yu, H., 2020. Parental Factors Associated with Smartphone Overuse in Preschoolers: A Systematic Review and Meta-Analysis. J. Korean Acad. Nurs. 50, 349–368. https://doi.org/10.4040/jkan.19186

Lee, H.-J., Chae, S.-M., Bang, K.-S., Choi, H., 2015. Relationships Among Preschoolers' Smartphone Addiction Tendency, Their Problem Behaviors, and Parenting Efficacy of Their Mothers . Child Heal. Nurs Res 21, 107–114. https://doi.org/10.4094/chnr.2015.21.2.107

Lee, M., Park, S., 2018. Factors associated with Smartphone Overdependency in Preschool Children. Child Heal. Nurs Res 24, 383–392. https://doi.org/10.4094/chnr.2018.24.4.383

Lee, S., Kim, S., Yang, S., Shin, Y., 2022. Effects of Frequent Smartphone Use on Sleep Problems in Children under 7 Years of Age in Korea: A 4-Year Longitudinal Study. Int. J. Environ. Res. Public Health. https://doi.org/10.3390/ijerph191610252

Lee, T., Busiol, D., 2016. A Review of Research on Phone Addiction Amongst Children and Adolescents in Hong Kong. Int. J. Child Adolesc. health 9, 433–442.

Leesukhee, 2010. The Study of Aggression and Change to Social Relationship on Early Childhood's Computer Game Addiction. Early Child. Educ. 14, 185–202.

Leung, L., 2007. Stressful Life Events, Motives for Internet Use, and Social Support Among Digital Kids. CyberPsychology Behav. 10, 204–214. https://doi.org/10.1089/cpb.2006.9967

Liu, C.-H., Lin, S.-H., Pan, Y.-C., Lin, Y.-H., 2016. Smartphone gaming and frequent use pattern associated with smartphone addiction. Medicine (Baltimore). 95, e4068. https://doi.org/10.1097/MD.0000000000004068

Lopez-Fernandez, O., Männikkö, N., Kääriäinen, M., Griffiths, M.D., Kuss, D.J., 2018. Mobile gaming and problematic smartphone use: A comparative study between Belgium and Finland. J. Behav. Addict. 7, 88–99. https://doi.org/10.1556/2006.6.2017.080

Lu, L., Xu, D.-D., Liu, H.-Z., Zhang, L., Ng, C.H., Ungvari, G.S., Wu, W.T., Xiang, Y.-F., An, F.-R., Xiang, Y.-T., 2019. Mobile phone addiction in Tibetan and Han Chinese adolescents. Perspect. Psychiatr. Care 55, 438–444. https://doi.org/https://doi.org/10.1111/ppc.12336

Mahmud, A., Adnan, H., Islam, M., 2020. Smartphone Addiction and Bonding Social Capital

Among University Students of Youth Community in Bangladesh. Glob. Soc. Welf. 7, 315–326. https://doi.org/10.1007/s40609-020-00177-1

Matthes, J., Thomas, M.F., Stevic, A., Schmuck, D., 2021. Fighting over smartphones? Parents' excessive smartphone use, lack of control over children's use, and conflict. Comput. Human Behav. 116, 106618. https://doi.org/https://doi.org/10.1016/j.chb.2020.106618

Ministry of Health, 2017. Sit Less, Move More, Sleep Well: Active play guidelines for under-fives. Wellington, New Zealand.

Mustonen, R., Torppa, R., Stolt, S., 2022. Screen Time of Preschool-Aged Children and Their Mothers, and Children's Language Development. Children. https://doi.org/10.3390/children9101577

Panova, T., Carbonell, X., 2018. Is smartphone addiction really an addiction? J. Behav. Addict. 7, 252–259. https://doi.org/10.1556/2006.7.2018.49

Pappas, S., 2022. What do we really know about kids and screens? [WWW Document]. Am. Psychol. Assoc. URL https://www.apa.org/monitor/2020/04/cover-kids-screens# (accessed 12.31.22).

Park, C., Park, Y., 2014. The Conceptual Model on Smart Phone Addiction among Early Childhood. Int. J. Soc. Sci. Humanit. 4, 147–150. https://doi.org/10.7763/IJSSH.2014.V4.336

Park, J.H., 2019. Factors associated with smartphone addiction risk in preschool children 1–13. https://doi.org/10.21203/rs.2.12654/v1

Park, J.H., Park, M., 2021. Smartphone use patterns and problematic smartphone use among preschool children. PLoS One 16, e0244276. https://doi.org/10.1371/journal.pone.0244276

Pivetta, E., Harkin, L., Billieux, J., Kanjo, E., Kuss, D.J., 2019. Problematic smartphone use: An empirically validated model. Comput. Human Behav. 100, 105–117. https://doi.org/https://doi.org/10.1016/j.chb.2019.06.013

Poznyak, V., 2018. Public health implications of excessive use of the Internet and other communication and gaming platforms [WWW Document]. WHO. URL https://www.who.int/news/item/13-09-2018-public-health-implications-of-excessive-use-of-the-internet-and-other-communication-and-gaming-platforms (accessed 9.13.18).

Rathnasiri, A., Rathnayaka, H., Yasara, N., Mettananda, S., 2022. Electronic screen device usage and screen time among preschool-attending children in a suburban area of Sri Lanka. BMC

Pediatr. 22, 390. https://doi.org/10.1186/s12887-022-03452-6

Rezvi, M.R., 2018. Why extended family breaking down in Bangladesh. Dly. Sun.

Ricci, S.S., Kyle, T., Carman, S., 2017. Maternity and pediatric nursing, Edition 3. ed. Wolters Kluwer, Philadelphia.

Samad, M., 2015. Marriage in Changing Family Pattern of Bangladesh: The Present Trends. Int. J. Soc. Work Hum. Serv. Pract. 3, 155–161. https://doi.org/10.13189/ijrh.2015.030404

Sarı, B.A., Taner, H.A., Kaya, Z.T., 2021. Screen media exposure in pre-school children in turkey: The relation with temperament and the role of parental attitudes. Turk. J. Pediatr. 63, 818–831. https://doi.org/10.24953/TURKJPED.2021.05.010

Sarwar, M., Soomro, T.R., 2013. Impact of Smartphone's on Society. Eur. J. Sci. Res. 98, 216–226.

Shah, R.R., Fahey, N.M., Soni, A. V, Phatak, A.G., Nimbalkar, S.M., 2019. Screen time usage among preschoolers aged 2-6 in rural Western India: A cross-sectional study. J. Fam. Med. Prim. care 8, 1999–2002. https://doi.org/10.4103/jfmpc.jfmpc_206_19

Shamsah, A., Al-Tawari, B., Jamal, F., Al-Farhan, L., Al-Mass, M., A Al-Majran, A., Shamsah, S., 2022. Prevalence of Use of Smart Devices in Children Aged Five Years or Less and Associated Factors in Kuwait. J. Pediatr. Perinatol. Child Heal. 06, 254–268. https://doi.org/10.26502/jppch.74050106

Smith, T.J., Walker, D.A., McKenna, C.M., 2020. An Exploration of Link Functions Used in Ordinal Regression. J. Mod. Appl. Stat. Methods 18, 2–15. https://doi.org/10.22237/jmasm/1556669640

Sohn, S.Y., Krasnoff, L., Rees, P., Kalk, N.J., Carter, B., 2021. The Association Between Smartphone Addiction and Sleep: A UK Cross-Sectional Study of Young Adults. Front. Psychiatry 12, 1–10. https://doi.org/10.3389/fpsyt.2021.629407

Sohn, S.Y., Rees, P., Wildridge, B., Kalk, N.J., Carter, B., 2019. Prevalence of problematic smartphone usage and associated mental health outcomes amongst children and young people: a systematic review, meta-analysis and GRADE of the evidence. BMC Psychiatry 19, 356. https://doi.org/10.1186/s12888-019-2350-x

Sommer, I., Nußbaumer-Streit, B., Gartlehner, G., 2021. WHO Guideline: Physical Activity, Sedentary Behavior and Sleep for Children under 5 Years of Age, Gesundheitswesen. https://doi.org/10.1055/a-1489-8049

Tamana, S.K., Ezeugwu, V., Chikuma, J., Lefebvre, D.L., Azad, M.B., Moraes, T.J., Subbarao, P., Becker, A.B., Turvey, S.E., Sears, M.R., Dick, B.D., Carson, V., Rasmussen, C., Investigators, C. study, Pei, J., Mandhane, P.J., 2019. Screen-time is associated with inattention problems in preschoolers: Results from the CHILD birth cohort study. PLoS One 14, e0213995. https://doi.org/10.1371/journal.pone.0213995

Tandon, P.S., Zhou, C., Lozano, P., Christakis, D.A., 2011. Preschoolers' total daily screen time at home and by type of child care. J. Pediatr. 158, 297–300. https://doi.org/10.1016/j.jpeds.2010.08.005

The American Academy of Child and Adolescent Psychiatry, 2020. Screen Time and Children [WWW Document]. Am. Acad. Child Adolesc. Psychiatry. URL https://www.aacap.org/AACAP/Families_and_Youth/Facts_for_Families/FFF-Guide/Children-And-Watching-TV-054.aspx (accessed 12.31.22).

The Department of Health and Aged Care, 2018. Physical activity and exercise guidelines for all Australians [WWW Document]. Dep. Heal. Aged Care, Aust. Gov. URL https://www.health.gov.au/topics/physical-activity-and-exercise/physical-activity-and-exercise-guidelines-for-all-australians (accessed 12.31.22).

van Velthoven, M.H., Powell, J., Powell, G., 2018. Problematic smartphone use: Digital approaches to an emerging public health problem. Digit. Heal. 4, 2055207618759167. https://doi.org/10.1177/2055207618759167

von Elm, E., Altman, D.G., Egger, M., Pocock, S.J., Gøtzsche, P.C., Vandenbroucke, J.P., 2014. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: Guidelines for reporting observational studies. Int. J. Surg. 12, 1495–1499. https://doi.org/https://doi.org/10.1016/j.ijsu.2014.07.013

Wang, B. qian, Yao, N. qi, Zhou, X., Liu, J., Lv, Z. tao, 2017. The association between attention deficit/hyperactivity disorder and internet addiction: A systematic review and meta-analysis. BMC Psychiatry 17, 1–12. https://doi.org/10.1186/s12888-017-1408-x

Weinstein, A., Siste, K., 2022. Editorial: Excessive and problematic smartphone usage. Front. Psychiatry 13. https://doi.org/10.3389/fpsyt.2022.972613

Woods, C.M., Edwards, M.C., 2007. 12 Factor Analysis and Related Methods, in: Rao, C.R., Miller, J.P., Rao, D.C.B.T.-H. of S. (Eds.), Epidemiology and Medical Statistics. Elsevier, pp. 367–394. https://doi.org/https://doi.org/10.1016/S0169-7161(07)27012-9

Xie, G., Deng, Q., Cao, J., Chang, Q., 2020. Digital screen time and its effect on preschoolers' behavior in China: results from a cross-sectional study. Ital. J. Pediatr. 46, 9. https://doi.org/10.1186/s13052-020-0776-x

Yang, C.-K., 2001. Sociopsychiatric characteristics of adolescents who use computers to excess. Acta Psychiatr. Scand. 104, 217–222. https://doi.org/https://doi.org/10.1034/j.1600-0447.2001.00197.x

Yang, G.-Y., Huang, L.-H., Schmid, K.L., Li, C.-G., Chen, J.-Y., He, G.-H., Liu, L., Ruan, Z.-L., Chen, W.-Q., 2020. Associations Between Screen Exposure in Early Life and Myopia amongst Chinese Preschoolers. Int. J. Environ. Res. Public Health 17, 1056. https://doi.org/10.3390/ijerph17031056

Yang, H., Liu, B., Fang, J., 2021. Stress and Problematic Smartphone Use Severity: Smartphone Use Frequency and Fear of Missing Out as Mediators. Front. psychiatry 12, 659288. https://doi.org/10.3389/fpsyt.2021.659288

Yang, H., Ng, W.Q., Yang, Y., Yang, S., 2022. Inconsistent Media Mediation and Problematic Smartphone Use in Preschoolers: Maternal Conflict Resolution Styles as Moderators. Children. https://doi.org/10.3390/children9060816

Yang, X., Jiang, P., Zhu, L., 2023. Parental Problematic Smartphone Use and Children's Executive Function: The Mediating Role of Technoference and the Moderating Role of Children's Age. Early Child. Res. Q. 63, 219–227. https://doi.org/https://doi.org/10.1016/j.ecresq.2022.12.017

Yoo, H.J., Cho, S.C., Ha, J., Yune, S.K., Kim, S.J., Hwang, J., Chung, A., Sung, Y.H., Lyoo, I.K., 2004. Attention deficit hyperactivity symptoms and Internet addiction. Psychiatry Clin. Neurosci. 58, 487–494. https://doi.org/https://doi.org/10.1111/j.1440-1819.2004.01290.x