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Article

Family Functioning Influences on Smartphone Addiction among Muslim Adolescents in Southern Thailand

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Abstract: This study examines the prevalence and determinants of smartphone addiction (SA) in a sample of 825 Muslim secondary school students from three provinces along the southern border of Thailand. Employing purposive sampling, the research highlights a concerning 70% rate of SA, surpassing the rates observed in other Asian demographics. The investigation reveals a robust link between parental education levels and smartphone usage among adolescents. Utilizing a structural equation model (SEM), family functioning dimensions such as 'Emotional Status' and 'Discipline' are shown to have a considerable impact on SA. Contrary to expectations, enhanced 'Family Support' has emerged as a potential risk factor, suggesting nuances in family dynamics that may contribute to SA. The findings advocate for the reinforcement of family functioning and call for initiatives to improve digital literacy and foster open communication between parents and children. However, the reliance on self-reported measures and the cross-sectional nature of the study underlines the necessity for more expansive future research to validate these findings and explore underlying mechanisms.

Keywords: adolescents; family functioning; Muslim; smartphone addiction; Thailand

1. Introduction

Today, smartphones have emerged as transformative tools, reshaping personal communication and how we access information. Their omnipresence, especially among adolescents, integrates them seamlessly into daily activities (Goswamee and Banerjee 2021; MP and Kamala 2021; Kaur et al. 2019). These devices are no longer mere communicative gadgets but gateways to myriad of online services, redefining societal norms and youth interactions (Goswamee and Banerjee 2021; Kaur et al. 2019).

Yet, the advantages that smartphones bring can also be double-edged. The line between constructive and detrimental use becomes ambiguous when individuals can't modulate their engagement, negatively impacting their social ties, professional life, and overall well-being (Para 2020; Panova and Carbonell 2018). As a result, terminologies such as 'smartphone addiction (SA)' and 'problematic smartphone use (PSU)' have emerged in academic discourse. The former implies deep-seated dependence, while the latter signifies extreme use without necessarily denoting addiction, although they are frequently used interchangeably (Busch and McCarthy 2021).

'Nomophobia' further captures the contemporary zeitgeist, highlighting the anxiety of being without a smartphone (Notara et al. 2021) And while the DSM-IV doesn't recognize 'smartphone addiction' as a distinct ailment, its behavioral symptoms align closely with the criteria set for other

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addictions (American Psychiatric Association 2000). This study needs to draw from both terminologies, offering a balanced view of smartphone engagement without labeling it outright as addictive.

The COVID-19 pandemic exacerbated smartphone reliance, reinforcing that smartphone are primary tools for remote learning, sustaining social bonds, and indoor entertainment during prolonged confinements (Indrasvari et al. 2021). A recurring theme in this discussion is self-regulation. A lack of it, especially in managing smartphone interactions, can cultivate persistent and detrimental habits (Busch and McCarthy 2021).

The adolescent phase is marked by profound cognitive, emotional, and social shifts (Steinberg 2005). Given their still-developing self-control mechanisms, adolescents are particularly susceptible to instant gratifications, often overlooking potential long-term consequences (Somerville and Casey 2010). In this landscape, smartphones—with their ceaseless notifications and entertainment options—act as potent lures. Excessive indulgence can disrupt vital facets of adolescent growth, including social development, restful sleep, and scholastic performance (Twenge and Campbell 2018).

Considering this, comprehending the intricacies of SA in adolescents is paramount. It's not just about understanding the addiction dynamics in this demographic, but also formulating precise interventions and preventive measures catering to their developmental context (Hinnant and O'Brien 2007). Consequently, pinpointing the antecedents of SA is pivotal, as discerning these factors is a stepping stone towards reducing its prevalence among adolescents.

1.1. Negative effects of SA

Research highlights the varied consequences of smartphone addiction. A series of recent meta-analysis studies (Busch and McCarthy 2021; Shahjehan et al. 2021; Mulinauskas and Malinauskiene 2019) revisited previous findings and reported that SA predominantly impacts emotional health more than physical health. Notably, there's a paucity of research on the physical health impacts compared to emotional health (Goswamee and Banerjee 2021).

Physical Effects. Habitual smartphone users often encounter physical challenges. Common issues include 'text neck' and eye strain. More critical problems involve sleep disruptions and a heightened risk of conditions like obesity, reduced physical fitness, and pain and migraines due to extended sedentary behavior (Wacks and Weinstein 2021). A clear link between SA and sleep deprivation was established by Alshobaili and AlYoousefi (2019).

Psychological Effects. The psychological implications can be even more profound. Constant alerts and an unending desire to remain informed can trigger anxiety. The idealized portrayals on social media can breed feelings of inadequacy, resulting in depression and intensified feelings of isolation (Pantic 2014; Seabrook et al. 2016). Harwood et al. (2014) associated SA with depression, while Hartanto & Yang (2016) connected it to anxiety.

Furthermore, smartphones can serve as an escape from negative emotions. For instance, anxiety-ridden individuals might become overly reliant on their phones for communication or seek distractions through entertainment, further amplifying problematic usage patterns (Wang et al. 2018). Wu et al. (2021) noted an increase in PSU which was associated with a rise in depressive symptoms and anxiety, subsequently affecting sleep quality.

Academic effects. Distractions from smartphones can lead to fragmented attention, compromised academic results, and even temptations for academic dishonesty due to easy information access (MP and Kamala 2021). Several studies, such as those by Goswamee and Banerjee (2021) and Sahin (2014), show that excessive smartphone use and high levels of specific app usage can decrease academic performance and increase procrastination. Yang, Asbury and Griffiths (2018) also observed increased academic anxiety and procrastination among university students with heightened SA.

It's important to understand the long-term consequences of these habits, especially during adolescence. This period is a critical stage for personal development, and distractions can lead to potential challenges in personal relationships and future career aspirations. Adolescents are especially at risk due to their ongoing development and limited impulse control (Kim et al. 2022). Yet, not all studies view smartphone use as detrimental. Lopez-Fernandez et al. (2018) suggested that regular mobile gamers might not necessarily be more prone to SA.

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1.2. Family functioning and SA

Families, pivotal in shaping behavioral and belief trajectories, intertwine individual actions with familial dynamics, as proposed by Bowen's Family Systems Theory (Bowen 1978). This theory paints families as intertwined emotional systems, suggesting that adolescent SA might reflect deeper family interactions rather than isolated events. Central to this theory are two elements: the 'Differentiation of Self', indicating how individual autonomy can influence susceptibility to family emotional climates and, consequently, external lures like smartphone overuse (Kerr and Bowen 1988); and the 'Emotional Triangle' which suggests that intense familial tensions might push adolescents towards smartphones as emotional shields (Bowen 1966).

Moreover, structural family theory highlights the importance of well-defined family boundaries, effective communication, and encouraging offline interactions as pivotal in fostering balanced digital behaviors among adolescents. For example, a study by Kim et al. (2022) revealed how such positive family dynamics can bolster self-control, which is a critical determinant of SA.

The McMaster Model, rooted in family systems theory, provides a nuanced perspective on family dynamics, highlighting specific structures and transactional patterns associated with family challenges (Epstein et al. 1982; Miller et al. 2000; Supphapitiphon et al. 2019). While it does not encompass all dimensions of family functioning, the model delineates six critical areas: problem-solving, communication, family roles, affective responsiveness, affective involvement, and behavior control (Miller et al. 2000). A study conducted in Thailand further refined this by introducing a measurement of family functionality, comprising five distinct dimensions: discipline, communication and problem-solving, relationship, emotional status, and family support (Supphapitiphon et al. 2019).

Synthesizing Bowen's Family Systems Theory with the structural family theory and the McMaster Model provides a holistic lens to decipher adolescent SA. It spotlights the interplay between familial structures and individual behaviors, advocating for a comprehensive examination of family dynamics in addressing the complex issue of SA in the younger generation.

1.3. Smartphone use in Thailand

Thailand's smartphone dynamics echo global patterns, but they're infused with distinct cultural and societal idiosyncrasies. The nation's swift urban transition and economic surge intermingle with deep-rooted Thai principles that prioritize communal and family connections (Harfield et al., 2014). Balancing these age-old cultural values with the temptations of the digital universe presents both potential and challenges for Thailand's younger generation (Chinwong et al. 2023). To truly grasp the dimensions of Thai adolescent smartphone habits, it is vital to delve into these interwoven elements.

Emerging studies highlight the profound role smartphones play in the daily lives of Thai youth. Smartphones stand out as the favored device among Thai schoolchildren, with PCs not far behind. In contrast, tablets do not share the same appeal, with infrequent usage patterns (Harfield et al. 2014). Delving into the specifics, while students typically access PCs or tablets just 1-2 times a week, an impressive 64% turn to their smartphones daily, underlining their indispensable role (Harfield et al. 2014).

Recent research by D'souza and Sharma (2020) revealed parity in SA levels between Thai and international students studying in Thailand. In another study, Tangmunkongvorakul et al. (2020) noted that an overwhelming 99.1% of university attendees in Northern Thailand owned a smartphone, and nearly half of these students devoted at least five hours daily to their devices.

Despite the extensive research on adolescent behavior, there remains a noticeable void regarding the Muslim adolescent population in Thailand. Considering Thailand's diverse cultural tapestry, it is crucial to delve into this specific demographic for a holistic understanding of the matter. To the best of the researchers' knowledge, this subgroup has yet to be extensively studied.

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2. Materials and Methods

2.1. Research design and participants

The study's design was cross-sectional. A total of 825 students from six private Islamic schools in three provinces of Southern Thailand was enrolled in the study using a purposive sampling method. The inclusion criteria were Thai Muslim students in junior and senior schools, aged 12 to 20 (Grades 7 to 12), who were currently attending school and using a smartphone. These eligible students voluntarily participated in the study by completing a set of paper-based questionnaires.

2.2. Research Instruments

2.2.1. Socio-demographics and family background

Participants' socio-demographic details were gathered using a questionnaire that encompassed attributes like gender, age, grade level, and family background. This latter category delved into specifics such as parenting status, educational backgrounds of both parents, and the family's monthly income.

2.2.2. Thai version of Smartphone Addiction Scale–Short version (THAI-SAS-SV)

In this study, the THAI-SAS-SV, formulated by Hanphitakphon and Thawinchai (2020), was used to gauge SA. Adapted from Kwon et al.'s 2013 Smartphone Addiction Scale-Short Version (SAS-SV), this tool features specific thresholds of 31 for males and 33 for females. It contains 10 items rated on a 6-point Likert scale, from Strongly Disagree=1 to Strongly Agree=6, with higher scores indicating increased smartphone addiction. The scale showcased commendable reliability, reflected by Cronbach's alpha coefficient of 0.780.

2.2.3. Family State and Functioning Assessment Scale in Thai (FSFAS-25)

The FSFAS-25 (Supphapitiphon et al., 2019), an amalgamation of elements from the Family Assessment Device within the McMaster Model of Family Functioning, Chulalongkorn Family Inventory, and the Thai Family Functional Scale, offers an in-depth evaluation of family functioning. It encompasses five crucial dimensions: discipline, communication and problem-solving, relationship, emotional status, and family support. The 25-item scale uses a 4-point Likert response system, ranging from Strongly Disagree=1 to Strongly Agree=4, accommodating both positive and reversed-scored negative statements. A cumulative score between 25 and 100 is obtained, where a higher score is indicative of superior family functionality. With Cronbach's alpha of 0.844, the tool boasts commendable reliability.

2.3. Data collection

Participants were given an informed consent form to sign after understanding the study's purpose and the assurance of their response confidentiality.The study commenced with an official request for approval sent to six selected secondary schools in three southern provinces of Thailand. Participants in this research included students spanning from Grade 7 to Grade 12. Within each school, a facilitator assisted the principal researcher in entering classrooms, distributing informed consent forms, and collecting data during designated break times. Respondents were informed that their responses would be kept confidential and analyzed anonymously, with no impact on their personal lives. In this selection, two schools were chosen from each of the three provinces. Once respondents agreed to take part in the survey, they proceeded to complete the questionnaire. It took approximately 30 min to complete the set of questionnaires. IBM SPSS Statistics 29 for descriptive statistics and factor analysis and IBM AMOS 25 was adopted for structural equation modeling (SEM).

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2.4. Statistical analysis

First, the study used statistics including frequencies on all the variables in a sample of 825 participants. A series of t-tests and one-way ANOVA were executed to explore how socio-demographic and family background factors related to smartphone addiction differed. Second, a factor analysis was conducted in both family functioning and SA. The underlying mechanisms of the two variables were investigated through principal axis factoring with the promax rotation method. Finally, to identify family functioning factors that influence SA, SEM was conducted.

3. Results

3.1. Socio-demographic profile including family background

Table 1 presents the results of socio-demographic profile including family background factors. The study sample predominantly comprised females, representing 55.7% (n=459), while males accounted for 43.3% (n=422). The participants, on average, were 15 years old (M=15.11, SD=1.78), with a large proportion hailing from the ninth grade (M=9.35, SD=1.69). Diving into the family constructs, a substantial 77.2% (n=630) grew up in a household with both parents. In contrast, single-parent households accounted for 16.5%, broken down further into those with only a father (3.8%, n=31) and only a mother (12.7%). Parental education exhibited certain patterns.

A notable portion of fathers had accomplished educational milestones such as grade 6 (26.2%, n=205), grade 9 (15.2%, n=119), and grade 12 (22.5%, n=176). Similarly, the mothers' education profile revealed that a significant number had finished grade 12 (21.0%, n=164), grade 9 (20.9%, n=163), or grade 6 (20.0%, n=156). Financially, when discussing family monthly income, 35.1% (n=280) had earnings under 7,000 Baht, 20.1% (n=160) fell into the 7,001 to 9,000 Baht bracket, and 12.7% (n=101) ranged between 9,001 and 11,000 Baht.

Table 1. General characteristics of the variables and *p*-value of both t-test and one-way ANOVA.

Variables	Categories	n(%)	M(SD)	*p*
			1.56(0.50)	.899
Gender	Male	365(44.3)		
	Female	459(55.7)		data
			15.11(1.78)	.055
	12	41(5.0)		
	13	142(17.3)		
	14	152(18.5)		
Age	15	154(18.8)		
	16	112(13.6)		
	17	132(16.1)		
	18	76(9.3)		
	19	11(1.3)		
	20	1(.1)		
			3.35(1.69)	012
	Grade 7	146(17.7)		
	Grade 8	152(18.4)		
Grade	Grade 9	163(19.8)		
	Grade 10	118(14.3)		
	Grade 11	124(15.0)		
	Grade 12	122(14.8)		
			1.48(.94)	.683
	Both	630(77.2)		
Parenting Status	Only father	31(3.8)		
	Only mother	104(12.7)		
	Others	51(6.3)		
Father's Education			3.53(1.84)	<.001

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Variables	Categories	n(%)	M(SD)	*p*
	Below grade 6	88(11.2)		
	Grade 6	205(26.2)		
	Grade 9	119(15.2)		
	Grade 12	176(22.5)		
	Diploma	42(5.4)		
	B.A.	94(12.0)		
	M.A.	41(5.2)		
	Ph.D.	18(2.3)		
			3.76(1.85)	<.001
Mother's Education	Below grade 6	71(9.1)		
	Grade 6	156(20.0)		
	Grade 9	163(20.9)		
	Grade 12	164(21.0)		
	Diploma	38(4.9)		
	B.A.	125(16.0)		
	M.A.	39(5.0)		
	Ph.D.	24(3.1)		
			2.91(1.95)	.032
Family Monthly Income	Below 7,000	280(35.1)		
	7,001~9,000	160(20.1)		
	9,001~11,000	101(12.7)		
	11,001~13,000	34(4.3)		
	13,001~15,000	55(6.9)		
	Over 15,000	168(21.1)		

Note: *p*=*p*-value

3.2. Socio-demographic influences on smartphone addiction

Within the vast realm of smartphone usage, the data from 825 Muslim adolescents reveals a compelling narrative on addiction. A pronounced 70.30% (n=580) of participants showcased addiction scores surpassing established benchmarks. Delving deeper, certain socio-demographic and familial markers stand out in their influence. Transitioning to junior high school might be a tumultuous time for some. Notably, 7th graders (M=38.66, SD=8.528) seem to grapple more with smartphone engagement than their 8th-grade counterparts (M=35.14, SD=8.787). However, it's crucial to note that not all grades demonstrate such distinctive patterns.

It appears that a parent's educational background casts a significant shadow. A clear trend emerged, with children of fathers holding a Ph.D. showing remarkably restrained smartphone usage (M=28.94, SD=8.062), contrasting starkly with those whose fathers had lesser academic achievements: below grade 6 (M=39.27, SD=7.678), grade 6 (M=37.60, SD=8.089), grade 9 (M=36.61, SD=8.296), grade 12 (M=37.12, SD=8.062), and M.A. (M=37.00, SD=8.292). Similarly, mothers with a Ph.D. seemed to bestow upon their offspring a protective layer against excessive smartphone use (M=31.75, SD=8.226). Interestingly, it is the pinnacle of education, such as a Ph.D., that holds sway, not just any academic accomplishment. The economic backdrop of a family also plays its part. Adolescents from families with an income exceeding 15,000 Baht exhibited more restraint (M=35.10, SD=8.733) than those in the 7,001~9,000 Baht bracket (M=37.98, SD=7.892). However, it is not a linear relationship between affluence and SA.

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3.3. Family functioning factors influencing SA

3.3.1. Factor analysis for the measurements

In a sample of 825 participants, the construct validity of the THAI-SAS-SV was assessed using a principal axis factoring analysis with Promax rotation. The suitability of the sample size for factor analysis was confirmed by the Kaiser-Meyer-Olkin (KMO) value of .808 and Bartlett's sphericity test ($p<.001$). The factor analysis revealed a two-factor structure.

Factor 1, labeled as 'Smartphone Dependence' by the authors, consisted of 6 items with load values ranging from 0.445 to 0.742. Item 10 was discarded due to the lower factor loading (below .40). Factor 2, denoted as 'Emotional and Physical Problem', comprised 3 items with load values ranging from 0.421 to 0.799. Item 20 was excluded due to low communalities (below .20) and load values (below .30). This two-factor structure explained 49.2% of the total variance, and the internal consistency of the scale was 0.759 with 9 items.

In the same sample of 825 participants, the construct validity of the FSFAS-25 was also examined using a principal axis factoring analysis with Promax rotation. The suitability of the sample size for factor analysis was confirmed by the Kaiser-Meyer-Olkin (KMO) value of .885 and Bartlett's sphericity test ($p<.001$). Factor analysis identified a five-factor structure: 'Discipline', 'Communication and Problem-Solving', 'Relationship', 'Emotional Status', and 'Family Support'.

Factor 1, 'Discipline', included 5 items with load values ranging from 0.464 to 0.810. Factor 2, 'Communication and Problem-Solving', consisted of 5 items with load values ranging from 0.410 to 0.711; three items were deleted due to the lower factor loading (below .40). Factor 3, 'Relationship', encompassed 4 items with load values ranging from 0.576 to 0.655. Factor 4, 'Emotional Status', comprised 2 items with load values ranging from 0.654 to 0.700; three items were deleted due to the lower factor loading (below .40). Factor 5, 'Family Support', included 3 items with load values ranging from 0.490 to 0.825. The researchers derived these factor titles from the sub-factors of the original scale. The five-factor structure explained 51.8% of the total variance, and the internal consistency was 0.816 with 19 items.

3.3.2. Preliminary analyses

Table 2 in the study delineates a detailed statistical overview, providing the means and standard deviations (SD), alongside a comprehensive analysis of Pearson correlations between the variables linked to SA, inclusive of its subdivided factors, and the broader spectrum of family functioning, which itself is broken down into five distinct sub-factors. Notably, the analysis yielded significant negative inter-correlations between SA—more specifically, the identified sub-factors of addiction—and the 'Emotional Status' component of family functioning. This suggests that as the emotional health within a family improves, the tendency toward SA decreases.

Table 2. Pearson correlations results of the variables.

Variables	M	SD	1	2	3	4	5	6	7
1. SPD	21.79	5.92	1						
2. EPP	11.39	3.31	.298***	1					
3. Discipline	13.00	3.76	-.125***	.003	1				
4. CPS	14.11	3.24	-.044	.433	.555***	1			
5. Relationship	12.69	2.80	-029	-.012	.020	.100***	1		
6. Emotional Status	4.81	1.72	-.173***	-.140**	.076*	.111***	.248***	1	
7. Family Support	8.58	2.14	-007	.051	.384***	.512***	.176***	.183***	1

Note. SPD=Smartphone Dependence; EPP=Emotional and Physical Problem; CPS=Communication and Problem-Solving; ***$p<.001$; *$p<.05$.

In addition, a noteworthy negative correlation was established between the 'Discipline' aspect of family functioning and the 'Smartphone Dependence' sub-factor of SA, indicating that stronger familial discipline is associated with lower levels of dependence on smartphones. However, when

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examining the other elements of family functioning, such as communication, problem-solving, relationship quality, and family support, the study did not find these to be significantly correlated with the sub-factors of SA, pointing to a more complex and perhaps indirect relationship that warrants further investigation.

3.3.3. Testing to determine family functioning factors influencing SA

The study initially tested a model examining the relationship between five family functioning factors and two sub-factors of SA. The results indicated that the model provided a good fit to the data, as evidenced by several fit indices: $\chi2(330) = 979.645$, $p < .001$, GFI = .918, CFI = .891, TLI = .875, SRMR = .058, and RMSEA = .049 (.045; .052). However, after considering modification indices, two additional covariances were included: one between the errors of items 10 and 11 in the 'Discipline' factor and one between the errors of items 15 and 16 in the 'Communication and Problem-Solving' factor. These changes improved the model's fit, reducing the degrees of freedom by 2, resulting in $\chi2(328) = 924.602$, $p < .001$, GFI = .923, CFI = .900, TLI = .885, SRMR = .057, and RMSEA = .047 (.043; .051). Subsequently, four direct pathways from 'Communication and Problem-Solving' and 'Relationship' to 'Smartphone Dependence' and 'Emotional and Physical Problem' were not significant. Additionally, the direct pathway from 'Discipline' to' Emotional and Physical Problem' was marginally significant ($p < .05$).

As a result, these five pathways were removed, leading to the creation of the final model. The final model was re-evaluated and was found to fit the data very well: $\chi2(143) = 469.387$, $p < .001$, GFI = .940, CFI = .914, TLI = .898, SRMR = .059, and RMSEA = .053 (.047; .058).

Figure 1 illustrates the standardized parameter estimates for the structural paths. The final model accounted for 13% of the variance in 'Smartphone Dependence' and 10% of the variance in 'Emotional and Physical Problem', which are the sub-factors of SA.

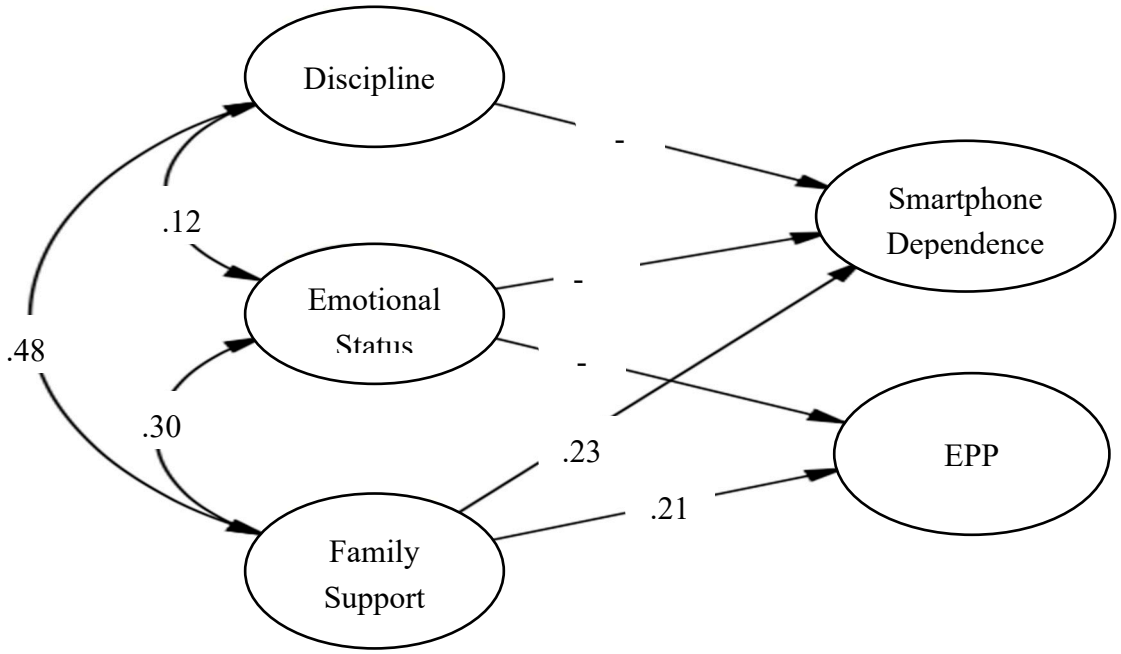

Figure 1. Standardized parameters estimates for the final model of the study. **Note**. EPP=Emotional and Physical Problem.

The structural path of the final model indicates several significant relationships. The study revealed that 'Emotional Status' significantly and negatively predicted both 'Smartphone Dependence' and 'Emotional and Physical problem', $\beta = -.34$, $p < 0.001$ and $\beta = -.32$, $p < 0.001$ respectively. 'Discipline' also had a significant and negative prediction on 'Smartphone Dependence; at the level of $\beta = -.24$, $p < 0.001$. Strangely, 'Family Support' reported the significant and positive

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prediction on both smartphone addictive use, 'Smartphone Dependence 'and 'Emotional and Physical problem', $\beta = .23$, $p < 0.001$ and $\beta = .21$, $p < 0.001$ respectively.

The results suggested that Muslim students whose families presented better discipline and emotional status would be at the lower level of SA in Southern Thailand. The adolescent Muslim students who were more supported by their families would be exposed to a higher risk of addictive smartphone use.

4. Discussion

This study underscores a pronounced prevalence of SA among Thai Muslim students, with a staggering 70% exhibiting signs. Such a figure contrasts sharply with findings from other Asian nations. In India, addiction rates fluctuate between 39% and 67% (Davey and Davay 2014; MP and Kamala 2021). Similarly, only 21.3% of Chinese undergraduates (Long et al. 2016), 11.4% of Indonesian junior high students (Fatkuriyah and Sun-Mi 2021), and 35.2% of South Korean adolescents (Lee and Lee 2017) were reported as addicted. A recent study also pinpointed a 62.6% addiction rate among Filipino adolescents (Buctot et al. 2020). Furthermore, it is noteworthy that even within Thailand, there is a stark contrast between different demographics. A recent study by Chinwon et al. (2023) reported a 49% rate of SA among undergraduates in Northern Thailand. Given this stark disparity, a deeper exploration is needed to discern the factors uniquely contributing to the heightened addiction rates among Thai Muslim students.

The influence of family background, particularly in terms of parental education, on SA is evident from the findings of this study. A noteworthy observation is the distinct association between parents' educational levels and their children's smartphone engagement patterns. Specifically, Thai adolescents with parents who attained lower educational qualifications tend to manifest heightened smartphone use (Tangmunkongvorakul et al. 2019). Such a trend suggests that parental awareness, stemming from their educational exposure, might have a moderating effect on the screen time habits of their offspring. Additionally, while family financial status does influence adolescent SA, its impact remains ambiguous. For instance, family income did not correlate with SA among Korean junior students (Gil et al. 2020).

The findings of this study draw a clear link between family functioning, particularly 'Emotional Status' and 'Discipline', and SA among adolescents. Bowen's Family Systems Theory suggests that emotional challenges within families can push individuals, especially young ones, towards external problems. When teenagers grow up in families marked by intense emotional ties, emotional distance, or unclear family rules, they are more likely to become heavily reliant on smartphones.

The role of parents is pivotal in this equation. A flexible and understanding relationship between parents and their teenage children can serve as a protective barrier against SA. Specifically, when parents maintain an adaptable bond with their adolescents, especially during the crucial high school years, they can more effectively guide their smartphone habits (Kaur et al. 2017). In essence, a balanced family environment with emotional stability and clear boundaries can help prevent excessive smartphone use in teenagers.

These findings are in line with studies from Korea and China, which highlight the positive impact of cohesive family settings on diminishing SA (Gil et al. 2020; Shi et al. 2017). Mangialavori et al. (2021) also identify family challenges, such as disengagement and chaos, as prominent risk determinants. Furthermore, a strong parent-child bond has been shown to curb excessive smartphone usage among Chinese teenagers (Niu et al. 2020). Notably, this research presents a unique observation: increased family support was linked to a heightened risk of addiction, a sentiment reinforced by Castaño-Pulgarín et al. (2021).

Moreover, while smartphones can foster family connections, a majority still prioritize virtual interactions over face-to-face family time (Iqbal et al. 2021). This trend could be due to adolescents' shifting social dynamics, where peer influence begins overshadowing family guidance, leading them towards online risks (Castaño-Pulgarín et al. 2021). Additionally, it's worth noting that for some young adults, SA might be a coping mechanism against a tumultuous family backdrop (Mangialavori et al. 2021; Kim and Koh 2018; Kim et al. 2017).

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Yet, the role of smartphones is not universally negative. For many, they act as a bridge, fostering family connections, even if some prefer virtual interactions over physical ones (Iqbal et al., 2021). This dynamic underscore the idea that smartphones can be both a symptom of and a solution to family disconnect. Ultimately, while smartphones can serve as a refuge from family strife, offering confidence or anxiety relief (Mangialavori et al. 2021; Kim and Koh 2018; Kim et al. 2017), it is evident that robust family functioning, characterized by time spent together and adaptability, plays a protective role against SA among adolescents (Gil et al., 2020).

5. Conclusions

5.1. Implications of the findings

SA has been highlighted because of poor self-regulation, especially among adolescents transitioning from childhood to adulthood (Yang, Asbury, and Griffiths 2018). It is crucial to bolster self-control mechanisms among this demographic, as their multidimensional development is at stake.

This study accentuates the role of family environments, particularly among Thai Muslim students, in predicting smartphone addictive behaviors. Muslim adolescents in Southern Thailand emerge as a high-risk group, especially those with parents of lower educational backgrounds. Such findings underscore the need for targeted educational initiatives and awareness programs to equip parents with strategies to combat this addiction.

Robust family dynamics can act as a safeguard against SA. Previous research, such as the study conducted in South Asia, indicates that positive family functioning can curtail internet addiction among adolescents (Sutrisna et al. 2020). In stark contrast, healthier family dynamics mitigate the risks of addiction and foster improved academic performance. Specifically, adolescents hailing from well-functioning families are four times less likely to succumb to internet addiction than those from dysfunctional families (Sutrisna et al. 2020).

These findings should guide policymakers, educators, and parents in formulating strategies to address SA. Emphasizing digital literacy, promoting open parent-child communication, and organizing workshops that highlight the perils and preventive measures against SA become paramount.

5.2. Limitations and recommendations for future research

This research has several limitations. First, this study employed a cross-sectional design, which offers only a snapshot of the phenomenon under investigation. Subsequent studies should consider implementing longitudinal or experimental designs to establish causality and further validate the observed relationships. Second, the research relied on self-reported questionnaires, which can be prone to biases and may not always capture the true depth or breadth of a subject. Future investigations should leverage standardized and validated measures of internet and SA to ensure more reliable results. Third, assessments of family functioning were based solely on adolescents' self-reports, potentially providing a one-dimensional perspective. A more holistic approach would entail sourcing data from various family members, such as parents and siblings, to provide a multi-faceted understanding. This could also involve the use of additional tools like dysfunctional family measurements. Fourth, the explained variance in this study was relatively low, suggesting that other factors might be at play. Future studies should delve deeper into potential underlying mechanisms and variables to offer a more comprehensive insight into SA. Lastly, the study presented conflicting results, where some family functioning factors were predictive of SA while others, like family support, positively influenced addiction tendencies. Subsequent research should aim to replicate these findings and explore the underlying reasons for such discrepancies.

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