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Effects of a Family Function Program on Excessive Digital Use in Thai Female Muslim Adolescents

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Abstract

This study assessed the effects of a family function (FF) program on excessive digital behaviors—smartphone overuse (SO) and phubbing—and psychological needs—anxiety, loneliness, and fear of missing out (FoMO)—among 28 Thai female Muslim adolescents randomly assigned to the experimental (M_{age} = 15.7) and control (M_{age} = 15.2) groups. The experimental group received two 1.5 h morning sessions of the FF program weekly over four weeks (eight sessions in total). Baseline assessments confirmed group homogeneity. Using repeated-measures ANOVA with Bonferroni correction ($p < 0.008$), the results indicated a significant improvement in family function for the intervention group (F (1,26) = 11.91, $p = 0.002$, $\eta^2_p = 0.31$), with a strong time-by-group interaction (F (1,26) = 19.51, $p < 0.001$, $\eta^2_p = 0.43$). While the program did not significantly reduce SO overall, a notable interaction effect suggested group differences (F (1,26) = 10.31, $p = 0.004$, $\eta^2_p = 0.28$). Phubbing remained unaffected. For psychological outcomes, interaction effects were found for the FoMO (F = 10.00, $p = 0.004$) and loneliness (F = 8.67, $p = 0.007$), though no main effects emerged. Anxiety levels did not significantly change after correction. These findings suggest that the program effectively enhances family functioning and partially alleviates psychosocial risks, but further refinements are needed to address digital overuse and anxiety more effectively.

Keywords: female Muslim adolescents; family function program; psychological needs; phubbing; smartphone addiction

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Academic Editor: Luca Cerniglia

Received: 1 May 2025
Revised: 23 July 2025
Accepted: 24 July 2025
Published: 30 July 2025

Citation: Kim, Y.; Dhammasaccakarn, W.; Laeheem, K.; Rinthaisong, I. Effects of a Family Function Program on Excessive Digital Use in Thai Female Muslim Adolescents. *Adolescents* **2025**, *5*, 39. https://doi.org/10.3390/adolescents5030039

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1. Introduction

Smartphones have revolutionized contemporary society, fundamentally transforming business operations, educational delivery, healthcare systems, and social connectivity [1]. While these devices undeniably enhance productivity and communication, their ubiquitous presence has prompted intense scholarly debate regarding their psychological and societal implications. Current research emphasizes the importance of contextual factors, demonstrating that smartphone effects vary significantly across individuals and usage patterns [2].

The phenomenon of excessive smartphone use—particularly such behaviors as smartphone overuse (SO) and phubbing—has emerged as a significant public health concern.

Some researchers have conceptualized these behaviors within behavioral addiction frameworks [3,4], though this classification remains controversial. Critics argue that the "addiction" paradigm may oversimplify complex usage behaviors and potentially pathologize normal technology use [5]. This study, therefore, employs the operational term "excessive digital use"—encompassing both SO and phubbing behaviors—to characterize problematic engagement patterns while maintaining conceptual neutrality regarding potential clinical classifications.

Empirical research has consistently linked maladaptive smartphone use with negative psychosocial outcomes, including heightened anxiety, sleep disturbances, and interpersonal difficulties [6]. These behaviors may attain clinical relevance when marked by loss of control, continued use despite adverse consequences, and significant disruptions to daily functioning—criteria often reflected in diagnostic frameworks [7]. Notably, excessive smartphone use has been associated with reduced subjective well-being, such as increased perceived stress, anxiety, and symptoms of depression [8]. These effects appear particularly pronounced among adolescents and young adults, likely due to developmental vulnerabilities in self-regulation and socioemotional processing [9].

Recent scholarship, however, emphasizes the need to approach this issue with greater nuance. Methodological rigor is essential: Ellis [10] warns against conflating mere usage frequency with actual harm, a concern supported by large-scale studies conducted by Orben and Przybylski [4], who found that digital technology use accounted for only 0.4% of the variance in adolescent well-being. These findings illustrate the limitations of cross-sectional, correlational research that fails to account for moderating contextual and individual factors [11]. Furthermore, growing evidence supports a bidirectional model where psychological distress functions as both an antecedent and a consequence of problematic smartphone use. It is essential to recognize that recent meta-analyses have indicated no significant correlation between social media use and adolescent mental health [12,13]. This complexity suggests that the relationship between psychological needs and smartphone use is nuanced and may vary across different contexts [11–13].

On the other hand, the compulsive use of smartphones has introduced a modern social dilemma, "phubbing" (phone snubbing), where individuals prioritize their devices over in-person interactions [14]. This behavior has become ubiquitous, with studies showing that 90% of people use smartphones during social gatherings, while 86% notice others doing the same [15]. Such patterns undermine the quality of face-to-face communication, leaving interaction partners feeling ignored and devalued. Research confirms that even the mere presence of a phone during conversations can reduce perceived closeness and trust between individuals [14,15].

Phubbing carries significant emotional consequences, often triggering feelings of jealousy, resentment, and a deflated mood [16,17]. These reactions stem from the implicit message that a device holds greater importance than the person being ignored. Over time, repeated phubbing erodes relationship satisfaction, as partners report feeling less valued and more socially disconnected [14,18]. The cumulative effect of these micro-rejections can weaken social bonds, making meaningful interactions increasingly difficult to sustain.

Despite its negative impact, phubbing persists due to self-reinforcing social norms. As smartphone use becomes habitual, individuals grow desensitized to its intrusiveness, normalizing distracted interactions [19]. This creates a paradox where people simultaneously resent being phubbed yet continue the behavior themselves. The result is a decline in conversational depth and empathy, as frequent phone checks fracture attention and diminish active listening [16–19].

These findings highlight the urgent need for interventions that promote mindful smartphone use, particularly in social settings. Addressing phubbing requires both individual

behavior change and broader cultural shifts to reestablish norms of undivided attention [8]. Without such efforts, the quality of human connections may continue to deteriorate in favor of superficial digital engagement [9].

Numerous studies have focused on adolescents—a particularly vulnerable population due to their developing self-control and regulation—who may experience negative effects during this critical developmental period from childhood to adulthood. Considering the critical developmental needs of adolescents, excessive digital use has become a significant issue [20]. Research in Korea indicates that excessive smartphone use among adolescents can signal psychological, social, and behavioral problems, potentially leading to serious consequences such as suicide [21]. Studies have shown that SO negatively impacts sleep, relationships, time management, happiness, and overall well-being [22]. It is also linked to physical issues such as neck/shoulder and lower back pain [23].

In Thailand, excessive smartphone use among undergraduates has been linked to lower psychological well-being [24]. Additionally, it has been found to negatively impact academic performance and increase procrastination, with studies noting significant relationships between smartphone addiction and poor academic outcomes [25,26]. This trend underscores a potential cycle of poverty, as excessive digital use can impede academic success and future opportunities. Recent research has revealed that over 70% of adolescent Muslim students experience smartphone addiction [27], suggesting a potentially higher risk compared to other contexts, even within other provinces of Thailand. Despite these findings, no interventions have been implemented to address this issue in the specific context of Muslim adolescents in Thailand.

Psychological Needs Predicting Excessive Digital Behaviors

Previous research aimed at identifying predictors of excessive digital behaviors has shown that psychological needs such as anxiety, fear of missing out (FoMO), and loneliness play significant roles in influencing SO and phubbing. These psychological factors drive individuals to seek solace and connection through their devices, leading to increased dependence and problematic usage patterns. Anxiety can make people turn to their smartphones as a coping mechanism, while the FoMO can drive constant checking and engagement with social media to stay updated with peers. Similarly, loneliness can lead to excessive smartphone use as individuals seek digital interactions to fill the void of social connections in their lives.

Anxiety is one of the most prevalent psychiatric issues among school-aged children and teenagers [28]. While anxiety is a universal experience, cultural beliefs and practices significantly influence its manifestation and expression [29,30]. In India, a study by Deb, Chatterjee, and Walsh [31] found that 20.1% of male adolescents and 17.9% of female adolescents experienced high levels of anxiety, a finding that contrasts with the previous research, which typically showed higher anxiety rates among females. Moreover, emerging evidence points to a possible link between anxiety and certain patterns of digital behavior, with some studies observing associations between elevated anxiety symptoms and frequent or problematic smartphone use among young adults [32,33].

Generally, social loneliness pertains to the adequacy of relationships and is linked to the lack of a sufficient social network, while emotional loneliness is connected to feelings of attachment and intimacy within relationships [4]. Recent findings by Twenge et al. [9] highlighted a rapid increase in school-related loneliness among adolescents from 2012 to 2018. This trend was observed in 36 out of the 37 surveyed countries. Additionally, this study identified a strong correlation between smartphone use and feelings of loneliness.

The FoMO is a significant psychological factor closely linked with social media use [34]. It describes the anxiety that social media users feel when they perceive that their peers are experiencing more enjoyable activities, attending exclusive events, or possessing valuable

items while they are not [35,36]. This fear drives individuals to constantly stay informed and engaged with others' activities. The FoMO is associated with a strong urge to remain online, continuously receive media messages, and engage—either passively or actively—in information exchange through social networking sites (SNS), online gaming, and other internet platforms [37].

The Present Study

The primary purposes of this study were to develop a preventive program targeting excessive smartphone use, SO, and phubbing, as well as the related psychological needs among Muslim adolescents in Southern Thailand, and to evaluate its effectiveness. The intervention was grounded in the family systems theory [38–41] and the structural family theory [42–48], designed to address and simultaneously reduce problematic psychological and behavioral levels. By focusing on the dynamics within family relationships, the program aimed to create a supportive environment that could mitigate the underlying psychological needs contributing to excessive smartphone use.

The two theories are foundational for understanding families as systems and for highlighting the critical role these systems play in individual development. According to the family systems theory, the problems or symptoms experienced by individuals often stem from dysfunctional family interactions and unresolved conflicts within the original family system, which can perpetuate across generations [38–41]. Additionally, the structural family theory emphasizes that individuals' psychological and behavioral problems result from dysfunctional family dynamics, occurring when the subsystems that compose a family structure do not function properly.

Particularly, as recent research by Kim, Dhammasaccakarn, Laeheem, and Rinthaisong [27] indicated that two family functions—emotional status and discipline—had a significant reductive impact on smartphone addiction among Muslim adolescents in Southern Thailand, this study focused on these two aspects in the program design.

These theories underscore the profound influence of family functioning on each member's well-being and development. They suggest that the dynamics among family members significantly affect individual behaviors, personalities, and psychological outcomes, particularly during adolescence. Based on the family function framework, this research proposed the following hypotheses: (1) the family function program will enhance family functioning; (2) the program will decrease excessive digital use, including SO and phubbing; and (3) the program will reduce the psychological needs associated with excessive smartphone use, such as anxiety, FoMO, and loneliness.

2. Materials and Methods

2.1. Research Design

This study employed a quasi-experimental design to investigate the effectiveness of a family function enhancement program, targeting reductions in SO and phubbing behaviors among adolescent female Muslim students in Southern Thailand. The primary objective was to explore how the intervention influences SO and phubbing, alongside the associated psychological needs such as anxiety, FoMO, and loneliness. The participants were divided into two categories: the experimental group, which partook in the intervention, and the control group, which did not receive the intervention. Initial assessments of both digital behaviors and psychological factors were conducted through pre-tests across both groups. After the program's execution, post-tests were carried out for all the participants to evaluate any shifts or enhancements, thus measuring the intervention's effect on SO and phubbing behaviors, as well as on the psychological states of the participants.

2.2. Research Participants and the Sample

This study focused on female students in the Grades 8 and 9 from an Islamic school in Southern Thailand. A volunteer sampling method was employed to assemble two groups: an experimental group, which would participate in the entire program, and a control group, which would not. The primary researcher visited the school to obtain informed consent from both the principal and the students. Subsequently, 28 students were chosen as the participants after they, along with their parents, consented to involvement in the program, as evidenced by the signed consent forms. Coordination for conducting the program was established with a facilitator, a teacher appointed by the school. Additionally, the researcher liaised with the school to secure a suitable hall for hosting the program sessions for the experimental group. The final composition of the groups included 14 students in the experimental group and an equal number in the control group.

2.3. Measurements

2.3.1. Family Function

Family function was assessed using the Family State and Functioning Assessment Scale in Thai (FSFAS-25) developed by Supphapitiphon, Buathong, and Suppapitiporn [49]. The FSFAS-25, a 4-point Likert scale with 25 items, reflects five sub-factors: family support, discipline, communication, emotional status, and relationship. Both positive and negative statements are included, with reverse scoring for negative items. The scale's total score ranges from 25 to 100, with higher scores indicating better family function. Tested on 1200 participants, the FSFAS-25 showed good reliability (total scale alpha = 0.87; subscale alphas = 0.70–0.84). In this study, the scale's reliability, indicated by a Cronbach's alpha, was 0.82.

2.3.2. Anxiety

The Thai version of the Depression, Anxiety, and Stress Scale—21 Items (DASS-21) [50] was used to measure anxiety levels. The DASS-21 has been adapted to assess each symptom with 7 items, rated from 0 ("did not apply to me") to 3 ("applied to me very much"). This study utilized the anxiety subscale, with such examples as "I was aware of dryness of my mouth" and "I felt scared without any good reason." Anxiety levels are categorized as normal (0–7), mild (8–9), moderate (10–14), severe (15–19), and extremely severe (20+). The anxiety subscale had a Cronbach's alpha of 0.81 in this study, indicating good reliability.

2.3.3. Fear of Missing Out (FoMO)

The Fear of Missing Out Scale (FoMO) [36] was employed to assess the FoMO levels. This 10-item self-report questionnaire uses a 5-point Likert scale (1 = "Not at all true of me" to 5 = "Extremely true of me"). The scale's reliability has been confirmed in various contexts (Cronbach's alphas = 0.87–0.90). Sample items include "I fear my friends have more rewarding experiences than me" and "When I have a good time, it is important for me to share the details online." The scale had strong reliability, with a Cronbach's alpha of 0.81 in this study.

2.3.4. Loneliness

The De Jong Gierveld Loneliness Scale [51] was used to measure loneliness among adolescent Muslims in Southern Thailand. This 6-item scale identifies levels of social and emotional loneliness, with responses ranging from 0 ("totally disagree") to 4 ("totally agree"). Examples of items include "There are many people I can trust completely" and "I often feel rejected." The scale's reliability has been established in various contexts (Cronbach's alphas = 0.93–0.95), with a recent study [4] showing alphas of 0.66 and 0.86 for

emotional and social loneliness, respectively. The scale's internal consistency, as measured by Cronbach's alpha, was reported at 0.56.

2.3.5. Smartphone Overuse (SO)

The study utilized the Thai version of the Smartphone Addiction Scale—Short Version (SAS—SV) to measure SO. Developed by Hanphitakphong and Thawinchai [52], this self-report questionnaire comprises 10 items rated on a 6-point Likert scale (from 1 = "strongly disagree" to 6 = "strongly agree"), with total scores ranging from 10 to 60. Higher scores indicate a greater risk of SO. Originally adapted from the 33-item Smartphone Addiction Scale (SAS) in Korean, the SAS—SV has demonstrated strong internal consistency (Cronbach's alpha = 0.911). The Thai version, tested on 200 individuals aged 10–18 years, showed a reliability coefficient of 0.85. The scale showed good reliability, with a Cronbach's alpha of 0.78 in this study.

2.3.6. Phubbing

The revised 8-item Phubbing Scale developed by Blachnio et al. [53] was employed to measure phubbing behavior. This instrument, adapted from the original 10-item scale created by Karadağ et al. [54], was refined to improve cross-cultural validity and demonstrated superior model fit across samples from 20 countries [55]. The internal consistency reliability of the revised version has been reported to range from 0.71 to 0.95. In the present study, the scale yielded a Cronbach's alpha of 0.78, indicating acceptable reliability.

2.4. Research Procedure

2.4.1. Developing a Program

The initial program of this study was developed using insights from the al-Qur'an and foundational studies [56–58] alongside the family systems theories, including Bowen's family systems theory [38–41] and the structural family theory [42–48].

A key prior study [54] influenced the program's focus on family emotional status and discipline, identified as crucial preventive predictors of SO and phubbing among Muslim students in Southern Thailand. Additionally, the session structure was inspired by the self-active learning approach of the Peace Generation program [59], which has demonstrated significant effectiveness across 11 countries and has been implemented in 108 cities and districts in Indonesia.

The program's validity and feasibility were endorsed by two experts in behaviorism familiar with Muslim contexts who had experience developing preventive programs. After refining the content and methods based on their feedback, a revised program was tested with two adolescents to evaluate the timing, flow, content, and methods of each session. The final family function program was thus established.

Table 1 outlines the family function program on excessive digital behaviors. The program addresses the four key areas: (1) definitions and impacts of excessive digital behaviors, SO, and phubbing; (2) the significance of family functioning as depicted in the al-Qur'an; (3) the roles within dysfunctional families based on the family theories; and (4) strategies for restoring resilience in dysfunctional families to prevent excessive digital behaviors.

Table 1. Outlines of the family function program on excessive digital behaviors.

Phase		Objects	Contents	Activities	Time (min)
Goal setting and motivation	1st	Grasping the program's structures and fostering closeness and trust among participants	– Introducing program objectives and process – Conducting a pre-test – Making relationships	– Welcoming – Icebreaking – Conducting a pre-test – Orientation – Sharing and encouraging	5 20 30 25 10
	2nd	Identifying my pattern of smartphone use, understanding the costs of excessive smartphone usage, and establishing personal goals	– Offering insights into the consequences of excessive smartphone use – Self-reflecting on personal usage patterns – Setting achievable objectives	– Theme games – Educating – Reflecting my patterns and sharing – Making personal goals and sharing	15 25 30 20
Family significance affirmation	3rd	Comprehending the foundation and significance of family and gaining insights into the family systems theory and the use of genograms	– Highlighting the significance of family in the al-Qur'an and through the family systems theory – Learning the process of creating a genogram	– Theme games – Educating – Reflecting my family and sharing – Understanding the symbols of a genogram	20 20 10 40
	4th	Analyzing personal family dynamics and grasping the connections among family members through three generations via a genogram	– Exploring personal family structures – Comprehending the interrelations among family members across three generations using a genogram – Encouraging one another	– Theme games – Drawing an own family genogram – Sharing in small and large groups – Encouraging	10 40 30 10
Self and family recognition	5th	Grasping the concept of functional and dysfunctional families as depicted in the al-Qur'an and learning about the four roles in dysfunctional family dynamics	– Presenting the first family narrative found in the al-Qur'an – Teaching about the dynamics of dysfunctional families – Explaining the four roles typically observed in dysfunctional family structures	– Theme activities – Storytelling – Educating – Self-reflecting – Sharing and encouraging	20 10 30 20 10
	6th	Identifying the personal role within the four common family roles and analyzing one's own role(s) in the family dynamics	– Acknowledging my personal roles and psychological needs – Reflecting on past experiences – Offering encouragement	– Theme activities – Identifying my roles – Sharing own stories in small groups – Reflecting on myself – Sharing personal feelings and encouraging	10 20 30 10 20

Table 1. *Cont.*

Phase		Objects	Contents	Activities	Time (min)
Future-focused action and decision-making	7th	Understanding the connection between family dynamics and excessive smartphone usage and aiming to become a key individual in fostering peace within various relationships: with oneself, within the family, among friends, and at school	– Mastering strategies to repair dysfunctional relationships, emphasizing apologies and gratitude – Aiming to be instrumental in promoting peace in personal, family, and school relationships – Understanding the link between family dynamics and smartphone overuse	– Theme activities – Educating on the relationships between a dysfunctional family and excessive smartphone use – Sharing personal experience in small groups – Sending messages to family members and friends – Sharing and encouraging	10 20 30 10 20
	8th	Making decisions for improved family functions and responsible smartphone use	– Revisiting previous lessons – Highlighting program benefits and offering suggestions – Setting future goals – Implementing a post-test – Closing	– Reviewing past sessions – Discussing the program's advantages and suggestions – Committing through a future-focused self-letter – Administering a post-test – Concluding the program	10 15 20 30 15

This family function program is specifically designed for adolescent female Muslim students and is structured into four distinct phases. Each phase builds progressively on the previous one, increasing in complexity and depth to ensure a thorough understanding of family dynamics and personal development. The program consists of two sessions for each phase, with each session lasting one and a half hours. This format allows the participants to engage deeply with the material, fostering an environment conducive to learning and personal growth. By the end of the program, the students will have developed essential skills and insights that can positively impact their family relationships and overall well-being, preparing them to navigate the complexities of family life within their cultural context.

2.4.2. Application of the Program

The family function program was conducted at an Islamic secondary school in Southern Thailand from February 1 to March 31, 2023, for a period of approximately two months. It commenced after obtaining approval from the principal of the school and the assistance of a designated teacher who cooperated with the research. The principal investigator went to great lengths to ensure that each participant acknowledged the goals and protocol of the trial. This included thorough explanations of their rights, including the right to withdraw their participation in the study at any time without repercussions and the assurance of privacy and anonymity in the management of private information.

To guarantee that the participants made a knowledgeable decision, the various advantages and potential drawbacks of collaborating with the researchers were also thoroughly addressed. The fact that their answers were voluntary was further emphasized, particularly considering the highly confidential information they disclosed. The students who stated they were interested in participating were given informed consent forms, which also required parental approval. The return of these forms, validly completed by the participants and their parents, attested to their informed and voluntary consent to participate in the study, which was used as evidence for the final participant selection.

After confirming their cooperation with their parents through completed consent papers, a total of 28 students were selected to take part in the study. A schoolteacher was designated as a facilitator to assist with the program's implementation. In close collaboration with the school, the researcher secured a hall for use as the experimental group's meeting place. Finally, a balanced design for a comparative examination of the program's effectiveness was ensured through the inclusion of 14 students in each of the experimental and control groups.

2.4.3. Data Collection

The experimental group was subjected to an 8-session family function program for preventing SO and phubbing with internalized problems, anxiety, FoMO, and loneliness, while the control group did not receive any program. Pre-surveys were conducted at the beginning of the program for the experimental group, and post-surveys were conducted at the end of the program. The control group underwent pre- and post-surveys at the same time as the experimental group, and after the post-survey, they were given a brief explanation along with the educational materials that had been distributed to the experimental group.

2.5. Data Analysis

This study assessed the effectiveness of the family function program in reducing SO and phubbing, along with addressing the related psychological factors—anxiety, FoMO, and loneliness—through a structured analysis process. Initially, descriptive statistics were used to detail the demographic characteristics of the participants. The homogeneity of demographic characteristics between the experimental and control groups was assessed

using Pearson's chi-squared test (χ^2). Baseline equivalence of all continuous study variables was established through independent samples *t*-tests, with Levene's test employed to verify homogeneity of variance assumptions. The impact of the intervention on SO, phubbing, and the three psychological needs was then measured using a repeated-measures ANOVA. All data analyses were conducted using the Statistical Package for the Social Sciences (SPSS) version 29.0.

3. Results

3.1. Demographic Characteristics and the Homogeneity Test

This study involved 28 female students, divided evenly into two groups: an experimental group of 14 students who participated in the family function enhancement program, and a control group of 14 students who did not undergo the program. Comparative analysis of both groups revealed no significant differences regarding age [$\chi^2 = 0.015$, $p = 0.985$], parenting status [$\chi^2 = 2.198$, $p = 0.132$], educational levels of fathers [$\chi^2 = 0.249$, $p = 0.781$] and mothers [$\chi^2 = 0.158$, $p = 0.855$], or monthly household income [$\chi^2 = 0.651$, $p = 0.530$], with all comparisons yielding *p*-values greater than 0.05 at baseline (see Table 2).

Table 2. Homogeneity test for the general characteristics of the participants at baseline (n = 28).

Characteristics	Categories	Exp. (n = 14)	Cont. (n = 14)	χ^2	*p*
		n (%)	n (%)		
Age	15	4 (28.6)	12 (85.8)	0.015	0.985
	16	9 (64.3)	1 (7.1)		
	17	1 (7.1)	1 (7.1)		
Parenting status	Both	12 (85.7)	14 (100)	2.198	0.132
	Only the father	1 (7.1)			
	Only the mother	–	–		
	Others	1 (7.1)			
Father's education	Lower primary	6 (42.9)	2 (14.3)	0.249	0.781
	Secondary	7 (50.0)	11 (78.6)		
	University and higher	1 (7.1)	1 (7.1)		
Mother's education	Lower primary	5 (35.7)	1 (7.1)	0.158	0.855
	Secondary	9 (64.3)	12 (85.7)		
	University and higher		1 (7.1)		
Monthly income	Less than 9000	6 (42.9)	5 (35.7)	0.651	0.530
	9001–13,000	5 (35.7)	6 (42.9)		
	Over 13,000	3 (21.4)	3 (21.4)		

In the experimental group, 64.3% of the students were 16 years old, whereas 85.8% of the control group were 15 years old. Most adolescents in both groups were raised in two-parent households—85.7% in the experimental group and 100% in the control group. The father's education was similar across the groups, with 92.9% having secondary education or lower. The mother's education was also aligned, except for one control group mother who exceeded university level (7.1%). Income distributions were comparable, with 42.9% in both groups earning within distinct ranges—less than 9000 Baht for the majority in the experimental group and from 9001 to 13,000 Baht as the most common range in the control.

The analysis revealed no significant differences between the experimental and control groups in terms of family function, digital behaviors such as SO and phubbing, and psychological needs, including anxiety and the FoMO at baseline (see Table 3). However, the level of loneliness in the experimental group (M = 4.64, SD = 0.93) was significantly higher than in the control group (M = 3.82, SD = 1.79), with a *p*-value of 0.005, indicating a statistically significant difference.

Table 3. Homogeneity test for the measured variables at baseline (n = 28).

Variables	Categories	Exp. (n = 14)	Cont. (n = 14)	t	*p*
		M ± SD	M ± SD		
Family Function		71.86 ± 7.04	82.29 ± 9.30	−3.35	0.287
Digital Behaviors	SO	41.00 ± 6.09	40.43 ± 4.77	0.276	0.597
	Phubbing	25.64 ± 3.96	23.14 ± 5.25	1.42	0.428
Psychological Needs	Anxiety	6.86 ± 3.58	7.43 ± 3.09	−0.45	0.139
	Fear of missing out	24.00 ± 7.37	23.43 ± 6.86	0.21	0.702
	Loneliness	4.64 ± 0.93	3.82 ± 1.79	2.70	0.005

Note: Exp.= experimental group, Cont. = control group, SO = smartphone overuse.

3.2. Effects of the Family Function Program

A series of repeated-measures analyses of variance (ANOVAs) were conducted to evaluate the effects of the family function program on the six primary outcome variables: family function, SO, phubbing, anxiety, FoMO, and loneliness. Descriptive statistics, including means and standard deviations for each variable at the pre-test and post-test, are presented in Table 4. Given the two-timepoint design (i.e., pre-test and post-test), the assumption of sphericity was inherently satisfied. However, for consistency with the standard reporting practices, Greenhouse–Geisser corrections were applied, resulting in an epsilon value of $\varepsilon = 1.00$. Furthermore, to reduce the risk of Type I errors associated with multiple comparisons, a more stringent alpha level of $p < 0.008$ was adopted based on Bonferroni correction procedures.

Table 4. Repeated-measures analysis of variance in family function, smartphone overuse, phubbing, anxiety, fear of missing out, and loneliness (n = 28).

Variable	Time	Exp. (n = 14)	Cont. (n = 14)	Source	F	*p*
		M ± SD	M ± SD			
FF	Pre	71.86 ± 7.04	82.29 ± 9.30	Group	0.45	0.507
	Post	73.71 ± 9.72	67.14 ± 10.17	Time	11.91	0.002
				G*T	19.51	<0.001
Excessive digital behaviors						
SO	Pre	41.00 ± 6.09	40.43 ± 4.77	Group	0.97	0.333
	Post	37.86 ± 6.01	42.29 ± 5.28	Time	0.68	0.417
				G*T	10.31	0.004
Phubbing	Pre	25.64 ± 3.96	23.14 ± 5.25	Group	0.01	0.904
	Post	23.29 ± 5.40	25.43 ± 4.11	Time	0.00	0.972
				G*T	5.17	0.031
Psychological needs						
Anxiety	Pre	6.86 ± 3.58	7.43 ± 3.09	Group	5.45	0.028
	Post	6.43 ± 4.09	10.79 ± 2.55	Time	4.21	0.050
				G*T	7.04	0.013
FoMO	Pre	24.00 ± 7.37	23.43 ± 6.86	Group	2.28	0.143
	Post	21.79 ± 7.66	29.29 ± 5.77	Time	2.04	0.165
				G*T	10.00	0.004
Loneliness	Pre	4.64 ± 0.93	3.82 ± 1.79	Group	0.80	0.379
	Post	3.86 ± 1.96	4.71 ± 1.20	Time	1.20	0.284
				G*T	8.67	0.007

Note: Exp.= experimental group, Cont. = control Group, FF = Family Function, SO = Smartphone Overuse, FoMO = Fear of Missing Out, G*T = interaction of time and group.

The analysis revealed that family function showed no difference in the control group ($p = 0.51$), but it showed a statistically significant improvement in family function following

participation in the program (F (1,26) = 11.91, $p = 0.002$, partial $\eta^2 = 0.31$), indicating a large effect size, as well as a significant interaction of time and group (F (1,26) = 19.51, $p < 0.001$, partial $\eta^2 = 0.43$). Post hoc pairwise comparisons using Bonferroni adjustments confirmed that FF scores significantly increased from pre-test to post-test, with an average gain of 1.93 points ($p = 0.05$) in the experimental group.

In examining the effects of the FF program on excessive digital behaviors, the analysis revealed no significant main effects of group ($p = 0.33$) or time ($p = 0.42$). However, a significant interaction effect between time and group was observed (F (1,26] = 10.31, $p = 0.004$, partial $\eta^2 = 0.28$), indicating that the change in excessive digital behavior over time differed between the experimental and control groups. Conversely, for the phubbing behavior, the study found no statistically significant effects for group ($p = 0.90$), time ($p = 0.97$), or the interaction between group and time ($p = 0.30$), suggesting the intervention had no meaningful impact on phubbing.

Among the psychological variables examined, a significant interaction effect between group and time was found for the fear of missing out (FoMO) (F (1,26) = 10.00, $p = 0.004$, partial $\eta^2 = 0.28$), indicating that the change in the FoMO levels over time differed significantly between the experimental and control groups. However, no significant main effects on the FoMO were observed for group ($p = 0.143$) or time ($p = 0.165$) independently. Similarly, for loneliness, the interaction effect between group and time was significant (F (1,26) = 8.67, $p = 0.007$, partial $\eta^2 = 0.25$), suggesting that the FF program differentially affected loneliness over time across groups. Nonetheless, no significant main effects on loneliness were found for group ($p = 0.379$) or time ($p = 0.284$). Furthermore, the FF program did not demonstrate a statistically significant effect on anxiety, as indicated by the p-values for group ($p = 0.028$), time ($p = 0.050$), and the interaction between group and time ($p = 0.013$), all of which exceeded the Bonferroni-adjusted significance threshold.

4. Discussion

This study set out to design and evaluate a culturally grounded family function program, drawing on Bowen's family systems theory, Minuchin's structural family theory, and Qur'anic guidance, to curb excessive smartphone use—specifically SO and phubbing—and to ease the three psychological conditions arguably associated with compulsive phone use: anxiety, FoMO, and loneliness. A recent meta-analysis by Wang et al. [60] reported that the overall severity of digital overuse was significantly lower in family-based therapy interventions, highlighting the academic gap that this study aimed to address.

The focus on Thai female Muslim adolescents was deliberate. Earlier work suggested that girls, particularly in collectivist settings, may be more vulnerable to the social connectivity affordances of smartphones and, therefore, to problematic use [61]. At the same time, female adolescents in South Thailand inhabit a distinctive cultural niche shaped by Islamic values, extended-family networks, and a sociopolitical context marked by intermittent unrest. Designing a program that speaks to those realities was thus both theoretically and practically important.

The eight-session intervention wove together three strands: (a) family systems' concepts such as differentiation of self, clear generational boundaries, and supportive discipline; (b) structural techniques that help families realign subsystems and renegotiate roles; and (c) Qur'anic precepts that emphasize mutual respect, balanced authority, and collective responsibility. The program integrated instructional content with reflective activities, role-playing, and assignments for adolescents to practice new communication skills with their parents and siblings.

Over the course of four weeks, the experimental group demonstrated a statistically and practically significant improvement in the overall family functioning scores, indicated by a

large interaction effect ($\eta^2_p = 0.43$). This finding aligns with a growing body of research—primarily from Western populations—showing that even brief, well-structured family interventions can positively influence the key relational dynamics during mid-adolescence.

Contrary to expectations, the FF program demonstrated limited efficacy in reducing measurable behavioral indicators of excessive smartphone use. Quantitative analysis revealed no significant reduction in SO severity across either group during the four-week intervention period ($p > 0.008$). However, longitudinal comparison showed a marginally significant between-group difference in digital usage patterns ($F(1,26) = 10.31$, $p = 0.004$, $\eta^2_p = 0.28$), suggesting potential delayed program effects that warrant further investigation through extended observation periods.

Phubbing behavior demonstrated resilience to intervention, with no statistically significant reduction observed across measurement periods. This stability suggests that phone-mediated social disengagement may represent a more entrenched behavioral pattern than general smartphone overuse, potentially requiring either longer intervention durations or more targeted approaches addressing specific social contexts.

Given the limited efficacy of the FF program in reducing excessive smartphone use outcomes in the current study, future iterations should consider expanding the intervention framework to incorporate parental involvement. This recommendation aligns with emerging evidence demonstrating that parental mediation strategies significantly influence adolescent digital behaviors, particularly regarding usage motivated by escapism [62]. The inclusion of parent–child dyads may address the intervention's current limitations by (1) targeting family-level dynamics that reinforce problematic use, (2) establishing consistent digital boundaries across home environments, and (3) providing alternative coping mechanisms for avoidance behaviors that drive excessive engagement.

The FF program demonstrated potentially clinically meaningful effects, as shown by significant time × group interactions for both FoMO ($F(1,26) = 10.00$, $p = 0.004$, $\eta^2_p = 0.28$) and loneliness ($F(1,26) = 8.67$, $p = 0.007$, $\eta^2_p = 0.25$). While other effects did not meet the Bonferroni-corrected significance threshold ($p < 0.008$), the observed medium-to-large effect sizes exceeded the conventional benchmarks for psychological interventions [63], suggesting the program may yield practically important improvements in these psychological domains.

The current findings may propose a psychological mediation pathway in which the FF program's effects on excessive smartphone use operate through initial reductions in the FoMO and loneliness. These results provide empirical support for Sela et al.'s [64] family-system mediation model, demonstrating that family-based interventions can cultivate psychological resilience—particularly through mitigating loneliness and anxiety symptoms—which, in turn, facilitates healthier digital behavior patterns. Notably, this mediation mechanism corroborates Kim et al.'s [54] identification of psychological factors as critical mediators between family functioning and problematic smartphone use, reinforcing the value of targeting these emotional factors in family-oriented intervention designs.

The FoMO, a construct tightly linked to social media immersion, also fell significantly, both as a main effect and via a group × time interaction. Qualitative feedback indicated that once the participants felt more seen and valued at home, they were less compelled to monitor their peers' online activities. A meta-analysis of 85 studies quantified this link, finding a high positive correlation (ca. $r = 0.47$) between the FoMO and excessive mobile phone use [65]. In other words, teens who constantly fear missing updates or social events are far more prone to compulsive phone checking and prolonged online use. This relationship appears to have grown even stronger in recent years with the ubiquity of social networking [65]. High-FoMO adolescents feel a need to stay continually connected, which can spiral into problematic usage.

Loneliness exhibited a similar pattern: the experimental group reported lower scores post-intervention, while the control group remained unchanged. Collectively, these findings align with relational buffering models, which posit that nurturing family climates satisfy belonging and competence needs, thereby reducing the motivational pull of digital platforms. Feelings of loneliness or social isolation are both a cause and an effect of smartphone overuse. A lonely teen may latch onto their smartphone to fill social needs—using messaging, games, or social media to escape feelings of solitude [66]. Studies have shown that the lonelier an adolescent feels, the more likely they are to develop smartphone overuse behaviors [67,68]. Notably, a study found that loneliness partially mediated the link between phone addiction and decreased well-being—meaning that smartphone overuse undermined happiness in part by making students feel lonelier [69].

The researchers suggest that interventions aimed at reducing the FoMO and loneliness—such as engaging in meaningful family activities that involve offering affirmations to family members, encouraging personal reflection on religious texts, and facilitating open discussions about personal challenges—may help reduce the risk of excessive digital use.

While the current study identifies the FoMO and loneliness as potential mediators between family functioning and smartphone overuse, contemporary research presents conflicting evidence. Recent research [70,71] found that digital technology use may not correlate with psychological well-being positively or negatively, while Ellis et al. [10,71] demonstrated that self-reported usage correlates poorly with actual behavior. These findings, coupled with methodological concerns about inflated effect sizes in psychological–digital research, suggest the need for [2,61,72]: (1) multi-method designs combining self-reports with behavioral tracking; (2) longer intervention windows to detect delayed effects; and (3) stricter controls for familial confounding variables. Furthermore, it is important to consider that empirical research has shown inconsistent results regarding the relationship between psychological needs and smartphone use [12,13]. Consequently, it can be expected that the impact of this FF program may be limited.

The study unexpectedly revealed that the FF program did not significantly affect anxiety levels among adolescent female Muslim students. Given the established correlation between anxiety and excessive digital behaviors, as highlighted in the systematic review by Elhai et al. [20], it is imperative to revise the content of the FF program to enhance its effectiveness in addressing anxiety-related issues among participants. Adolescents experiencing anxiety often resort to their smartphones as a coping mechanism, seeking distraction or comfort through constant connectivity. This phenomenon was particularly evident during the COVID-19 lockdowns, where increased anxiety levels were associated with heightened reliance on mobile devices [66]. Therefore, adapting the FF program to better address these dynamics may yield more significant outcomes in alleviating anxiety among the target population.

While the program did not lead to immediate reductions in SO or phubbing, it arguably addressed the underlying emotional and psychological factors associated with excessive digital engagement. These outcomes align with the social cognitive theory [73], which suggests that meaningful behavioral change often follows shifts in emotional regulation, self-efficacy, and cognitive awareness, particularly when supported by social and environmental reinforcements.

From this perspective, the findings indicate that improvements in digital well-being may be achievable without directly targeting phone usage itself, a view supported by the emerging research that questions the utility of screen time reduction as a primary goal. Rather than focusing solely on limiting device use or implementing phone-free zones, this

study underscores the potential of emotionally grounded, family-based interventions to foster healthier relationships with technology.

The four-week intervention was sufficient to initiate psychological improvements even without significant behavioral change, suggesting that interventions can be impactful without producing immediate reductions in digital engagement. Future adaptations may benefit from emphasizing sustained emotional support, regular booster sessions, and improved family communication, rather than assuming that reducing phone use is necessary for positive outcomes. Additionally, engaging parents and community members as supportive role models may further reinforce healthy digital habits, not by restricting technology, but by promoting mindful and balanced usage in daily life.

Several limitations must be acknowledged. First, the small sample size (N = 28) limits statistical power and generalizability. Second, the reliability of the loneliness measure was suboptimal ($\alpha = 0.56$), which may have affected the accuracy of related findings. Future research should consider using more robust instruments, such as the UCLA Loneliness Scale [74], and recruit larger, more diverse samples to strengthen external validity. In addition, employing longitudinal or mixed-methods research designs that recruit participants at multiple levels—such as entire families, teachers, and other stakeholders—would offer richer insights into the long-term efficacy of such interventions and help clarify the mechanisms underlying behavioral change. Finally, the relationships between psychological needs and excessive digital use remain the subject of ongoing scholarly debate. Therefore, the chain effects intended by the FF program may be limited—particularly among digital-native generations, who may engage with and internalize technology use in ways that differ significantly from previous cohorts.

Despite these limitations, the study offers practical implications for policymakers and educators. Islamic schools, community organizations, and religious leaders may find value in adapting this faith-sensitive framework to encourage healthier digital habits among adolescents. By integrating family-centered psychological support with community-based norm-setting—such as emphasizing the importance of family bonds, parental role modeling, and creating regular opportunities for emotional communication—interventions can more effectively address both individual and environmental factors that contribute to sustained smartphone overuse.

Ultimately, this research underscores the importance of early, culturally grounded prevention efforts in mitigating digital overuse among adolescents. While behavioral change requires sustained effort, the findings suggest that strengthening family cohesion and emotional regulation can serve as a critical first step. Collaborative action among families, schools, and religious institutions will be essential to foster balanced technology use and safeguard adolescent well-being in an increasingly connected world.

5. Conclusions

This pilot study demonstrates that a culturally adapted family intervention can effectively reduce SO, FoMO, and loneliness among adolescent Muslim girls by strengthening family cohesion and discipline, though its impact on phubbing remained limited. The findings provide a foundation for scalable, faith-sensitive programs that schools, mosques, and policymakers could integrate into youth well-being initiatives, particularly if future iterations address phubbing through targeted communication exercises and extend intervention duration to reinforce behavioral change. Collaborative efforts among educators, religious leaders, parents, and health professionals will be essential to translate these findings into sustainable strategies for promoting balanced digital habits in Muslim adolescent communities.

Author Contributions: Conceptualization, Y.K. and W.D.; methodology, Y.K. and K.L.; formal analysis, Y.K. and I.R.; investigation, all authors; writing—original draft preparation, Y.K.; writing—review and editing, Y.K. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: This study was approved by the Institutional Review Board for Human Subjects Research at Sirindhorn College of Public Health, Yala (IRB No. SCPHYLIRB-2565/113) on 21 October 2022.

Informed Consent Statement: Informed consent was obtained from all the subjects involved in the study.

Data Availability Statement: Data are available from the authors upon reasonable request, subject to ethical approvals/privacy considerations.

Conflicts of Interest: The authors declare no conflict of interest. Funding sources were not involved in the study's design, data collection, analysis, interpretation, manuscript composition, or the choice to submit the findings for publication.

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