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Mediating and moderating effects of cognitive flexibility in the relationship between social media addiction and phubbing

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Abstract

Presently, social media is widely used worldwide among different populations. Therefore, phubbing rapidly became a popular phenomenon in our daily life. However, little is known about the underlying mechanism and interaction between social media use and phubbing. Therefore, this research examines the mediating and moderating role of cognitive flexibility in the association between social media addiction and phubbing. Participants were 385 university students (280 females) studying at a state university in eastern Turkey and completed the self-reported measures of cognitive flexibility, social media addiction, and phubbing. The results showed that cognitive flexibility mediated and moderated the effect of social media addiction on phubbing. These findings may contribute to the discussion around the psychological consequences of using social media alongside increasing awareness about factors affecting and explaining the association between social media use and phubbing, which have important implications for research and practice.

Keywords Social media addiction · Phubbing · Cognitive flexibility · Mediation effect · Moderation effect

Introduction

Humans communicate in various ways and maintain this communication as social beings. Communication methods are also diversifying and developing in parallel with technological developments (Ateş et al., 2018; Yıldırım & Çiçek, 2022). There has been an increase in time spent on the Internet because of the increased use of the Internet in social life (Gowda et al., 2020; Özaslan et al., 2022; Siste et al., 2020). Moreover, the increasing use of the Internet in the post-COVID-19 era, which caused a wide range of devastating psychosocial consequences (Albertova & Bolekova, 2022; Arslan & Burke, 2021; Green, 2022; Waters & Johnstone, 2022; Yıldırım & Şanlı, 2022), and its possible negative consequences have caused immense concerns among people (Arslan et al., 2022; Chen et al., 2022; Karakose et al., 2022; Yıldırım et al., 2022). Social media sites such as Facebook, Instagram, and Twitter constitute a significant part of this time (Kümpel, 2020). Social media sites offer their users the opportunity to create profiles with the help of their applications (Batmaz et al., 2022). These allow them to make visual and written content with the created profiles (Al-Bahrani & Patel, 2015; Öçal et al., 2021; Wang, 2021). While more than 3.6 billion people worldwide were using social media in 2020, it is estimated that this figure will reach 4.41 billion by 2025 (Statista, 2021).

The use of social media is frequently encountered in daily life, especially with its increasing popularity among young people, and its usage areas are diversifying in parallel with the developments in technology (Atteh et al., 2020). Social media is used for various purposes, such as interpersonal communication, socialization, and marketing (Mason et al., 2021; Yu et al., 2021; Yost et al., 2021). Besides, the tools used to reach out on social media are diversified (Hysing et al., 2015). This situation may provide various benefits but could also create adverse consequences, such as cyberbullying and victimization (Batmaz et al., 2022; Oksanen et al., 2020), anxiety (Vannucci et al., 2017), and burnout (Liu & Ma, 2020). It can be said that the increase in time spent on social media and the diversification of its usage purposes

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increase the risk of addiction (Balcı & Baloğlu, 2018; Mansi & Levy, 2013;).

The Diagnostic and Statistical Manual of Mental Disorders (DSM-5) has introduced a new category referred to as "other disorder due to addictive behavior" (APA, 2013). Although this new category includes internet gaming addiction and gambling addiction, it still does not include social media addiction (Stănculescu & Griffiths, 2022). As social media addiction is not clinically defined in the DSM-5, it is frequently referred to as a behavioral problem (Moreno et al., 2022). Social media addiction as a behavioral problem can be defined as excessive use, inability to satisfy the desire to use it, neglect of daily tasks, damage to social relations, and lying about the duration and amount of usage (Savcı & Aysan, 2017). The inability to access social media can further result in negative emotions such as unhappiness, anger, and stress (Longstreet & Brooks, 2017). As a result of the negative emotions created by social media and the preference for social media rather than direct face-to-face interaction, communications, and interactions are negatively impacted (Subramanian, 2017). The fact that individuals focus on social media interactions instead of face-to-face communication and excessive use of social media causes a decrease in their social skills and a deterioration of interpersonal relations (Affouneh et al., 2021; Karimzadeh, 2015).

The deterioration of social skills and problems in communication can be associated with a new phenomenon, phubbing (Beukeboom & Pollmann, 2021; Vanden Abeele & Postma-Nilsenova, 2018). Phubbing can be defined as paying attention to the smartphone while communicating with another person, resulting in an inability to pay attention to interpersonal communication (Al-Saggaf & O'Donnell, 2019; Şata & Karip, 2017; T'ng et al., 2018). The Macquarie Dictionary revealed it in 2013 by combining the words "phone" and "snubbing" (Chotpitayasundth & Douglas, 2016). People who tend to phubbing prefer virtual interaction instead of face-to-face interaction (Wang et al., 2021). Besides, phubbing behavior takes place between the individual called "Phubber," who ignores the person accompanying him in social interaction, and the individual named "phubbee," who is ignored to use a smartphone or to be controlled in this interaction (Chotpitayasunondh & Douglas, 2016).

Phubbing behavior is related to social media, and individuals exhibit phubbing behavior while spending time on social media (Hall et al., 2019). Those who practice this behavior psychologically harm those exposed to it and negatively affect themselves (Bulut & Nazir, 2019). People who show phubbing behavior may not be fully aware of their behaviors and situations. In addition, they prefer to pay attention to their phones rather than the people around them and do not make eye contact with them when they use their mobile phones (Bulut & Nazir, 2019; McDaniel & Wesselmann, 2021). This may result in feelings of exclusion and dissatisfaction. That is why those around them may call it rude, disrespectful, and cold.

The phubbing behavior creates a normative situation that predicts how much people will be exposed to phubbing and becomes self-reinforcing by ensuring that this behavior enters a vicious circle (Chotpitayasunondh & Douglas, 2016). In other words, phubbing behavior may lead it to become widespread. Particularly, the tendency of young people to use smartphones rather than face-to-face interaction with others and to ignore those who are accompanying them is no longer seen as rude and is more accepted (Chotpitayasunondh & Douglas, 2016; Miller-Ott & Kelly, 2017). This behavior, which tends to be socially accepted, can be seen in various areas, such as meetings, meals, and social environments with family and friends (Nazir & Pişkin, 2016). This may lead phubbing to occupy a prominent place in people's lives and its effects to spread to all areas.

Phubbing affects individuals' social lives and psychological and physical health (Tandon et al., 2022). Its effects have been found on individuals' romantic relationships (Zonash et al., 2020), communication and social skills (Ayar & Gürkan, 2021; Karaca & Sarigül, 2021), emotional problems (Nuñez et al., 2020), and behavioral (Liu et al., 2021). Therefore, phubbing constitutes a problematic behavior that may adversely affect both the phubber and the phubbee (Chotpitayasunondh & Douglas, 2016). Previous studies have found that cognitive flexibility reduces behavioral problems (Patwardhan et al., 2021; Sagar, 2021). In this respect, cognitive flexibility may effectively mitigate the behavioral issues associated with phubbing.

Cognitive flexibility is the human ability to adapt to the environment with cognitive processing strategies to face new and unexpected circumstances (Cañas et al., 2003). Similarly, Dennis and Vander Wal (2010) defined it as the ability of individuals to change their mental patterns and adapt to new environmental variables in response to environmental changes. Changing people's cognitive patterns is a central part of the functions that enable them to adapt successfully to environmental changes by overcoming their automatic responses (Diamond, 2013). Cognitive flexibility allows individuals to make decisions confidently and facilitates their adaptation to the new conditions of the environment (Bilgiç & Bilgin, 2016). Adaptive individuals often show decision-making behavior while meeting their needs (Di Fabio & Tsuda, 2018; Taormina, 2014).

Cognitive flexibility allows individuals to take responsibility, make sense of their experiences, become entrepreneurs, and show interest in their environment, helping them feel more secure in their environmental relationships (Bilgin, 2017). Since cognitive flexibility requires planning related to perception, memory, and behavioral processes (Üzümcü & Müezzin, 2018), these individuals have a high level of ability to plan events related to their environment and manage

processes. It is positively associated with favorable situations and emotions such as happiness (Asıcı & İkiz, 2015), creativity (Dreu et al., 2011), and academic achievement (Arán Filippetti & Krumm, 2020). On the other hand, it is negatively associated with negative situations and emotions such as online gambling addiction (Verdejo-Garcia et al., 2015) and smartphone addiction (İnal & Serel Arslan, 2021), anxiety, and depression (Yu et al., 2020).

Cognitive flexibility is an aspect of executive function that requires switching between multiple and conflicting representations, strategies, or responses in response to changes in task demands (Cañas et al., 2003; Dennis & Vander Wal, 2010). Concentration, choosing, and achievement of primary goals heavily depend on a set of cognitive functions known as executive functions (Best 2012). It includes organizing and planning strategies, minimizing interference disturbance, organization actions, inhibitory control, and cognitive flexibility (Friedman et al., 2016). Individuals use these functions extensively while spending time on the Internet (Turan et al., 2022). However, deterioration in these functions has an essential role in internet-related problems (e.g., social media addiction) (He & Li, 2022). Individuals with low cognitive flexibility cannot flexibly plan and modulate their behaviors to fulfil goal-directed plans and cannot distract themselves from unfavorable stimuli (Hildebrandt et al., 2016), experiencing more externalizing and internalizing problems (Stepanyan et al., 2020). Furthermore, recent studies have shown that Internet-addicted individuals have impairments in these functions (Dong et al., 2014; Ioannidis et al., 2019). The results of one study also showed that higher levels of externalizing problems (e.g., physical aggression, verbal bullying) were consistently associated with lower levels of cognitive flexibility (as measured by a series of behavioral tasks measuring children's ability to suppress and initiate activities) (Patwardhan et al., 2021).

Present study

The present study was framed according to cognitive flexibility theory. Cognitive Flexibility Theory suggests that cognitively flexible thinking involves adapting to situations, switching between thoughts, or approaching different problems with different approaches (Stevens, 2009). In addition, cognitive flexibility enhances the ability of individuals to adapt their behavior in accordance with situational factors, which facilitates appropriate behavioral responses (Martin & Rubin, 1995). The ability to gain this flexibility can reduce the risk of behavioral problems (e.g., social media addiction) (He et al., 2022; Sagar, 2021). The study has been carried out with young adults who are considered to be more at risk for behavioral problems (Blacher & McIntyre, 2006). According to Arnett's (2000) adulthood theory, young adulthood is a time during which individuals acquire skills relevant to adulthood. Consequently, the skills gained or the problems encountered during this period may positively or negatively affect the subsequent developmental phases (Arnett, 2000).

Additionally to the aforementioned theoretical framework, empirical studies have shown that social media addiction predicts phubbing (Chi et al., 2022; Rahman et al., 2022; Xu et al., 2022). Studies also have found a relationship between social media addiction, phubbing, and cognitive flexibility (Gupta & Saha, 2020; He et al., 2022; Rachman, 2021). We propose a new model based on theoretical and empirical evidence, which examines both the mediator and moderator effects of cognitive flexibility in examining the relationship between social media addiction and phubbing in the present study. Considering the theoretical and empirical evidence reported above, we addressed the following hypotheses: (i) Social media addiction predicts phubbing (ii) cognitive flexibility has a mediating effect on the relationship between social media addiction and phubbing, and (iii) cognitive flexibility has a moderator effect on the relationship between social media addiction and phubbing.

Method

Participants

A convenience sampling method was used to recruit participants from two state universities in Turkey. Participants included 385 undergraduate students (105 male and 280 female students) whose ages ranged from 18 to 24 years, with a mean age of 21.6 years ($SD = 3.8$).

Materials

Social media addiction scale (SMAS-AF; Şahin & Yağcı, 2017) was used to assess social media use regarding virtual tolerance and communication. The SMAS-AF includes 20 items, each rated on a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Higher scores indicate greater social media addiction. In the present study, the Cronbach alpha coefficient was .94.

Cognitive flexibility inventory (CFI; Dennis & Vander Wal, 2010) was used to measure the cognitive flexibility of individuals. The CFI consists of 20 items clustered into two factors: "alternatives" and "control." Each item is answered based on a 5-point Likert-type ranging from 1 (*not at all appropriate*) to 5 (*totally appropriate*), with higher scores presenting greater cognitive flexibility. The CFI was adapted to the Turkish language and culture by Gulum and DAĞ

(2012). In the present study, the Cronbach alpha coefficient was .88.

Phubbing scale (PS; Karadağ et al., 2015) was used to assess phubbing. The PS includes 10 items grouped into two subscales: communication disorder and phone passion. Each item is rated on a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Higher scores on the scale represent a greater level of phubbing. In the present study, the Cronbach alpha coefficient was .92.

Procedure

Before the administration of the study, ethical approval was obtained from the Agrı Ibrahim Cecen University ethic committee (ethic reference number is 7 dated 26.01.2022). Each stage of this study was carried out in line with the Declaration of Helsinki (World Medical Association, 2013). Before the questionnaire was distributed to the participants, a consent form was attached to the first page. Consent forms included information about the study's purpose, the anonymity provisions, the withdrawal option, and the confidentiality and security of the data. Volunteer students using social media for the past year were included in the study. Students who did not use social media nor wished to participate were excluded. The data collection process took approximately 25–30 minutes for each participant. The data collection was held between November 2021 and January 2022.

Data analysis

The present study examined the mediating and moderating roles of cognitive flexibility in the relationship between Social media addiction and phubbing. Before the analysis, the assumptions for mediating and moderating analyses were examined. For this reason, the data should provide univariate and multiple normalities. Besides, the dataset should not have multicollinearity problems. It was considered that a correlation coefficient of .30 and below is a low-level correlation, a value between .30 and .70 is a moderate correlation, and a value of .70 and above is a high-level correlation (Şata, 2020). Firstly, the data set was examined in terms of univariate normality according to the skewness and kurtosis coefficients. The skewness and kurtosis coefficients for the variables were between ±1.5. Then the data were examined using a Scatter Diagram Matrix to determine whether they were for multivariate normality. As an elliptical distribution is observed, it is assumed that the data set meets the multivariate normality assumptions. The analyzes of the study were carried out with the SPSS-25 package program. The mediating and moderating effect was determined using PROCESS macro developed for SPSS by Hayes (2015). Model 1 was used to determine the moderator effect in the present study, and Model 4 was used to determine the mediating effect. SPSS PROCESS macro was developed by Hayes (2015) to test mediation and moderation analyses based on regression.

Results

Descriptive statistics and relationships between variables

The associations between variables are presented in Table 1. The results showed that the associations between the variables are moderate and high. There was a moderate negative correlation between social media addiction and cognitive flexibility ($r = -.37$, $p < .01$), a positive high level between social media addiction and phubbing ($r = .79$, $p < 01$), a moderate negative level between cognitive flexibility and phubbing ($r = -.51$, $p < 01$).

The mediating role of cognitive flexibility

The present study presents the mediating effect of cognitive flexibility in the relationship between social media disorder and phubbing in Table 2 and Fig. 1. Table 2 shows the results of the regression-based mediation effect analysis using the PROCESS macro.

The first stage of the analysis comprises results concerning the regression between social media addiction and cognitive flexibility. In the first model, social media addiction predicted cognitive flexibility significantly and negatively ($F = 64.26$, $R^2 = .14$, $p < .01$). Social media addiction explained 14% of the variance in cognitive flexibility. In the second model, which was established to understand the effect of social media addiction as a predictor of phubbing,

Table 1 Descriptive statistics and correlation analysis for the study variables

Variable	Descriptive statistics				Correlation coefficients		
	Mean	SD	Skewness	Kurtosis	1.	2.	3.
1. Social media addiction	61.81	19.09	−.82	−.01	–	−.37**	.79***
2. Cognitive flexibility	48.33	13.02	−.99	.30		–	−.51**
3. Phubbing	28.90	10.26	−1.14	.24			–

**$p < 0.01$, ***$p < 0.01$

Table 2 Mediation analysis

Dependent variable: Cognitive flexibility							
Model Summary	*R*	R^2	*F*	MSE	df1	df2	*p*
	.37	.14	64.26	145.63	1	383	<.01
Model 1	Coefficient		SE	*t*	*p*	LLCI	ULCI
Constant	64.31		2.08	30.83	<.001	60.20	68.41
Social media addiction	−.25		.03	−8.01	<.001	−.321	−.195
Dependent variable: Phubbing							
Model Summary	*R*	R^2	*F*	MSE	df1	df2	*p*
	.79	.63	668.72	38.46	1	383	<.01
Model 2	Coefficient		SE	*t*	*p*	LLCI	ULCI
Constant	2.41		1.07	2.25	<.05	.30	4.52
Social media addiction	.42		.01	25.85	<.001	.39	.46
Dependent variable: Phubbing							
Model Summary	*R*	R^2	*F*	MSE	df1	df2	*p*
	.82	.68	422.41	32.97	2	382	<.01
Model 3	Coefficient		SE	*t*	*p*	LLCI	ULCI
Constant	14.99		1.85	8.09	<.001	11.35	18.63
Social media addiction	.38		.02	22.79	<.001	.34	.41
Cognitive flexibility	−.19		.02	−8.04	<.001	−.24	−0.14

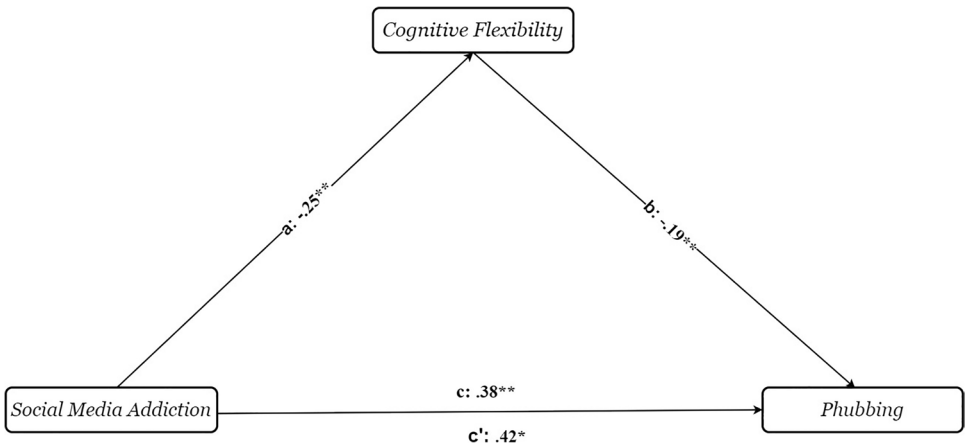


Fig. 1 Partial mediation effect of cognitive flexibility in the relationship between social media addiction and phubbing and standardized coefficient values

social media addiction predicted phubbing positively ($F = 668{,}72$, $R^2 = .63$, $p < .01$). In addition, it was found that it explained 63% of the variation in the total variance of phubbing. In Model 4, the mediating effect of cognitive flexibility in the relationship between social media addiction and phubbing was examined. The proposed model was found to be statistically significant ($F = 422.41$, $R^2 = .68$, $p < .01$). According to Baron and Kenny (1986), a significant decrease in the predictive level of the independent variable to the dependent variable, with the inclusion of the mediating variable in the model, is partly indicated as the mediating effect. The e R-value of social media addiction decreased from .42 to .38. When cognitive flexibility is included in the model, cognitive flexibility had a partial mediating effect on the relationship between social media addiction and phubbing.

Social media addiction predicts phubbing in a positive and significant way [(c') direct effect coefficient = .42, 95% CI: .39, .46, $p < .001$] (see Fig. 1 and Table 2). Besides, it is seen that social media addiction predicts cognitive flexibility significantly negatively [(a) direct effect coefficient = −.25, 95% CI: −.32, −.19, $p < .001$]. Cognitive flexibility is seen to predict phubbing negatively [(b) -.19, 95% CI: −.24, −.14, $p < .001$)]. In the model that emerged with the inclusion of cognitive flexibility, it was found that social media addiction significantly predicted phubbing. Nevertheless, It is seen that there is a decrease in coefficient level, [(c) coefficient = .38, 95% CI: .34, .41, $p < .001$].

The moderating role of cognitive flexibility

Table 3 and Fig. 2 show the results of the moderating effect analysis using the PROCESS macro developed for SPSS by Hayes (2015) to reveal the moderator effect of cognitive flexibility. According to the moderating effect analysis results shown in Table 3 and Fig. 2, social media addiction significantly predicted the level of phubbing (coefficient = 6.89, 95% CI: 6.25, 7.53, $p < .001$). Besides, the cognitive flexibility variable also significantly predicted the level of phubbing (coefficient = −2.73, 95% CI: −3.35, −2.10, $p < .001$). Finally, the interaction of social media addiction and cognitive flexibility variable also significantly predicts phubbing (coefficient = −1.13, 95% CI: - 1.78, −.49, $p < .05$). As a result, it is seen that the interactively generated variable is significant, and the cognitive flexibility variable has a moderator effect. Figure 3 shows this effect graphically.

Table 3 Moderation effect for the study variables

		Coefficient	SE	*p*
Social media addiction	b1	6.89	.326	$p < .001$
Cognitive flexibility	b2	−2.73	.317	$p < .001$
Social media addiction X Cognitive flexibility	b3	−1.13	.329	$p < .001$
			$R^2 = .69$. MSE = 32.04 $F(3, 381) = 293.71$ $p < .001$	

Discussion

The present study sought to explore the mediator and moderator effects of cognitive flexibility on the relationship between social media addiction and phubbing. As a result of the findings, Hypothesis 1 was confirmed, as social media addiction was found to be predictive of phubbing in the study. Social media addiction, and its association with phubbing, is largely a reflection of previous research (Rahman et al., 2022; Xu et al., 2022). The variables that contribute to phubbing and social media addiction are similar; in addition, phubbing and social media addiction have been found to be positively related in literature (Baltaci, 2019; Błachnio & Przepiorka, 2019; de Ayala et al., 2015; Wang et al., 2020). Social media addiction and internet addiction are among the leading causes of phubbing, according to Işık and Kaptangil (2018). Similarly, Karadağ et al. (2015) determined that social media addiction is one of the most important predictors of phubbing behavior. However, to our best knowledge, this is the first study to explore the effects of cognitive flexibility as a mediator and moderator of the relationship between social media addiction and phubbing.

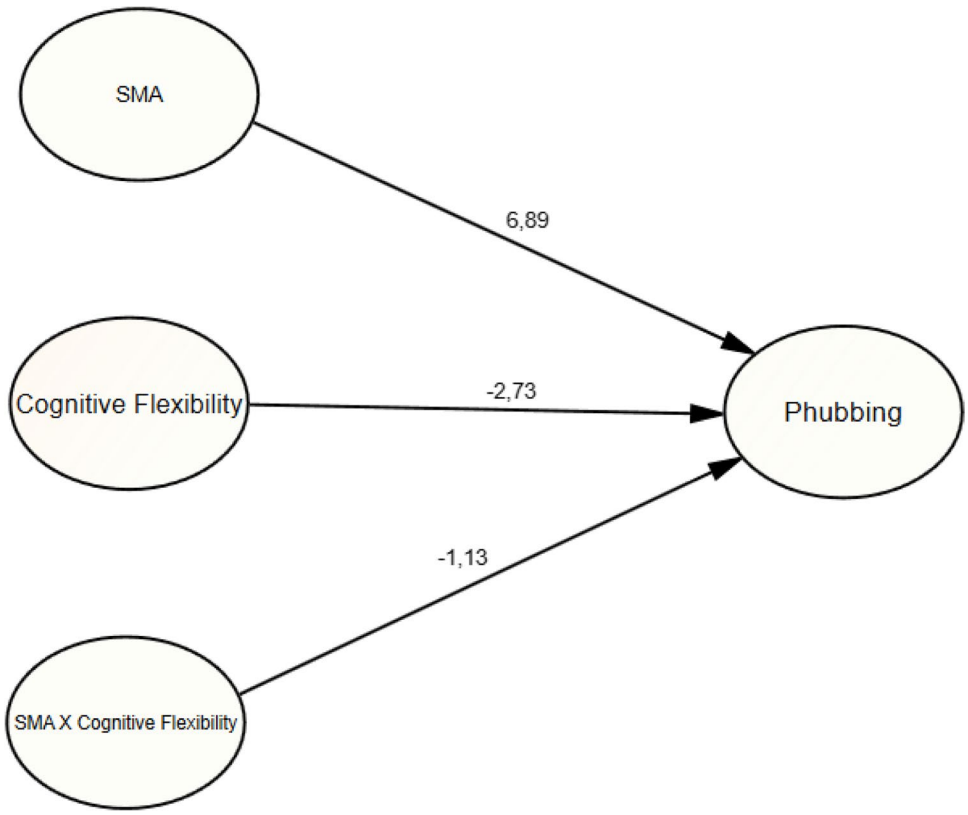
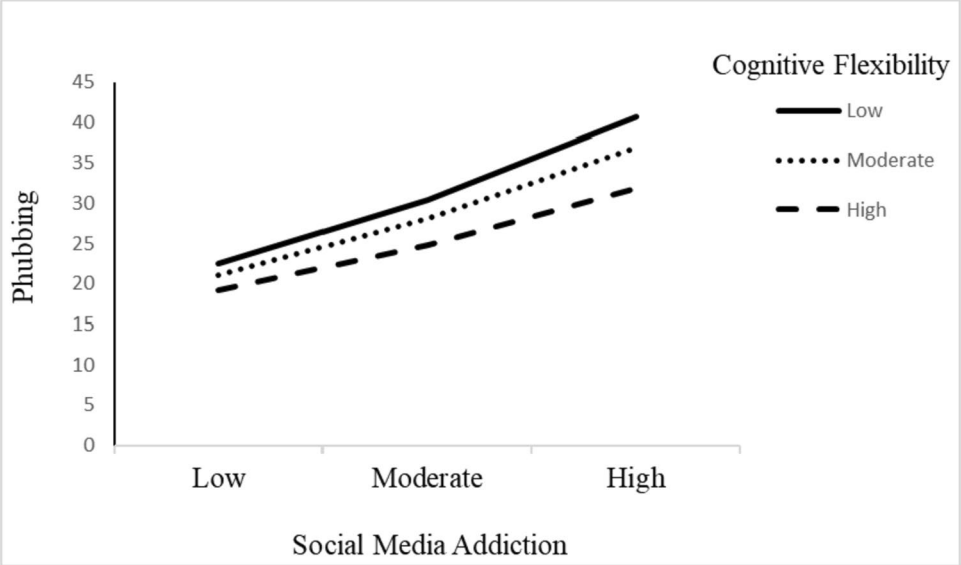


Fig. 2 The proposed moderating effect. Note: SMA: Social Media Addiction, $p < .001$

Fig. 3 Moderating effect graph



Smartphones are the most popular tool for reaching social media (Dekker et al., 2018). Recent studies indicated that social media use and time spent on the internet play a significant role in maladaptive behaviours (Arslan et al., 2022; Tanhan et al., 2022). Increasing the content of social media applications, providing notifications, and providing messaging directs individuals to virtual communication instead of face-to-face communication (Subramanian, 2017). Social media applications constitute most of the time spent on mobile phones (Anderson & Jiang, 2018). Similarly, the amount of time individuals who engage in phubbing behavior or spent on social media spend on their smartphones may provide insight into the nature of their relationship and the direction in which it is heading (Rachman, 2021). Studies have suggested that excessive use of social media may lead to smartphone addiction (Li et al., 2022). Moreover, Ostic et al. (2021) have found an indirect effect of smartphone addiction between social media addiction and phubbing. Smartphones can be distracting to users when it comes to interacting with others and maintaining relationships (Lai et al., 2022). Besides, an association was found between phubbing, online addictive behaviors (social media addiction, internet addiction), and online compulsive behaviors (Guazzini et al., 2019; Rachman, 2021). It is reasonable to conclude that some factors like smartphone use in social media addiction and phubbing, and behavioral addiction may be responsible for the relationship between these two variables.

The study results also revealed that cognitive flexibility has a mediator and moderator effect on the relationship between social media addiction and phubbing. When Fig. 3 is examined, cognitive flexibility levels impact phubbing and social media addiction. In other words, the cognitive flexibility level moderates social media addiction and phubbing levels. Therefore, Hypothesis 2 and Hypothesis 3 were confirmed. There are several studies propose that individuals with low cognitive flexibility are unable to plan and modulate their behaviors in a flexible way to fulfil their goal-directed plans. This individual may also be unable to distract themselves from unfavorable stimuli (e.g., social media or smartphone) (Hildebrandt et al., 2016). Using smartphones frequently to reach social media triggers the desire of individuals to communicate with the outside world, they unconsciously and behaviorally tend to get the smartphone (Duke & Montag, 2017). Moreover, phubbing behavior occurs due to ignoring companions via smartphone, either intentionally or unintentionally (Chotpitayasunondh & Douglas, 2016).

Social media use and unconscious behaviors can be related in this situation. For this reason, as the level of cognitive flexibility increases, individuals can become aware of the best options in the situations they encounter and pay attention to different solutions while these situations can produce solutions to the problems encountered (Buğa et al., 2018). It is common within social media addiction and phubbing to unintentionally attempt to acquire a smartphone (Duke & Montag, 2017). For this reason, cognitive flexibility was thought to be negatively related to adverse conditions such as phubbing and social media addiction. Similarly, internet addiction (Ateş & Sağar, 2021), social media addiction (Sagar, 2021), and cognitive flexibility were negatively related. In addition, it has been found that smartphone use reduces cognitive flexibility (Hartanto & Yang, 2016). Hadlington (2015) found that individuals who use mobile phones problematically in daily life are more likely to have cognitive difficulties in later life. Moreover, in a study, the mere presence of a smartphone impaired students' cognitive performance, indicating that the mere reminder of one's smartphone may have a detrimental impact on one's

cognitive abilities (Thornton et al., 2014). Overall, considering the effects of social media addiction and phubbing on cognitive functions, cognitive flexibility can regulate this relationship by regulating behaviors, coordinating and planning strategies, minimizing interference, organizing actions, and inhibiting inhibition. The results of the current study will therefore provide substantial evidence that supports the implications and directions for the available and future approaches to prevention and intervention. All these results are compatible with the research results and support each other.

Limitations and directions for future research

The present study has a number of limitations that need to be acknowleged in future studies. First, using convenience of sampling approach reduces the generalazibility of findings to other samples. Also, the current study was conducted using a cross-sectional research design, which precludes the conclusion that a causal relationship exists. Therefore, a causality inference cannot be established between the variables. Thus, using different experimental and longitudinal research designs is required to establish causality. Although the sample was targeted on purpose, as they are in a high-risk group for addiction, these factors may limit the generalizability of the results. As such, it may enhance the generalizability of the data if different age groups are included with varied demographic characteristics (e.g., gender and socio-economic status). Furthermore, other potentially underlying mechanisms could also be involved in the relationship between social media addiction and phubbing. Future research should examine these factors to advance the available knowledge.

Other than the limitations of this study, mental health professionals and other stakeholders are encouraged to pay attention to the findings of this study. It is important for experts working in the field to prepare interventions that may also support the invulnerability of young people by taking into account the effect of cognitive flexibility on behavioral problems. The findings also broaden our understanding of the relationship between social media addiction and phubbing with cognitive flexibility both as a mediator and moderator.

In conclusion, the current study provided support for the role of cognitive flexibility in the relationship between social media addiction and phubbing. In particular, the findings of this study enhanced our understanding of how and under what conditions cognitive flexibility serves as a mediator and moderator between social media addiction and phubbing. These findings would be fruitful to inform research and practice with regard to developing interventions aimed at reducing the impact of social media addiction on phubbing by promoting cognitive flexibility.

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Author contributions Study conception/design; AK, FT, HİÖ, MY. Data collection; AK, HİÖ. Analysis; AK, Drafting of the manuscript; AK, FT, HİÖ, MY; Administrative/technical/material support; MY, Writing – review & editing; MY.

Data availability The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Consent was obtained from all participants included in the study.

Conflict of interest The authors declared no conflicts of interest with respect to the research, authorship, and/or publication of this article.

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