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THE URGE TO OPTIMIZE THINKING PROCESS: THE INFLUENCE OF PARENT AND PEER ATTACHMENT ON PROBLEMATIC INTERNET USE (PIU) MEDIATED BY EXECUTIVE FUNCTION

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Abstract

Attachment relationships are shaped by higher-order cognitive abilities that help individuals regulate their behavior, including internet usage, which is a prevalent activity among students. The purpose of this study is to assess the mediating role of executive function (EF) in the relationship between individual attachment and problematic internet use (PIU) behavior. EF is believed to serve as a buffer against the negative effects of weak attachment between individuals and their parents or peers, thereby helping to suppress PIU behavior. This study employed a quantitative research design with 127 college students from DKI Jakarta. Convenience sampling was used to select participants. Attachment was measured using the Inventory of Parent and Peer Attachment – Revision (IPPA-R), PIU was assessed using the Indonesian Problematic Internet Use Scale (IPIUS), and EF was evaluated using the Amsterdam Executive Function Inventory (AEFI). The mediation regression analysis revealed a significant indirect effect of attachment to parents on PIU, mediated by EF. It is recommended that parents foster early interactions with their children to optimize their cognitive development and take peer influences into consideration when supporting their children's behavior regulation.

Keywords: attachment to parent, attachment to peer, college student, executive function (EF), problematic internet use (PIU)

Urgensi Mengoptimalkan Proses Berpikir: Kontribusi Kelekatan kepada Orang Tua dan Teman Sebaya terhadap *Problematic Internet Use* (PIU) Dimediasi oleh *Executive Function*

Abstrak

Hubungan kelekatan tersusun atas kemampuan berpikir tingkat tinggi yang berkontribusi pada cara anak mengatur perilaku, termasuk penggunaan internet yang saat ini menjadi perhatian di kalangan pelajar. Penelitian ini bertujuan untuk mengidentifikasi peran mediasi fungsi eksekutif dalam hubungan antara kelekatan individu dengan perilaku *Problematic Internet Use* (PIU). Fungsi eksekutif diduga dapat menjadi penyangga terhadap kualitas kelekatan yang kurang optimal dengan orang tua atau teman sebaya, sehingga perilaku PIU dapat ditekan. Penelitian kuantitatif ini melibatkan 127 mahasiswa di wilayah DKI Jakarta. Teknik pengambilan sampel menggunakan *convenience sampling*. Skala yang digunakan meliputi *Inventory of Parent and Peer Attachment - Revision* (IPPA-R) untuk mengukur kelekatan, *Indonesian Problematic Internet Use Scale* (IPIUS) untuk mengukur PIU, dan *Amsterdam Executive Function Inventory* (AEFI) untuk mengukur fungsi eksekutif. Hasil penelitian menunjukkan adanya efek tidak langsung dari kelekatan dengan orang tua terhadap PIU yang dimediasi oleh fungsi eksekutif. Penelitian ini merekomendasikan agar orang tua meningkatkan kualitas interaksi dengan anak sejak dini guna mengoptimalkan kemampuan berpikir anak. Selain itu, pengaruh teman sebaya juga perlu diperhatikan dalam mendukung pengaturan perilaku individu.

Kata kunci: fungsi eksekutif, kelekatan dengan orang tua, kelekatan dengan teman sebaya,penggunaan internet bermasalah

INTRODUCTION

The internet has become an integral part of daily life. In Indonesia, 77 percent of the population was connected to the internet by 2022, with an annual increase of 5–10 percent (Asosiasi Jasa Penyelenggara Internet Indonesia [APJII], 2022). Internet usage in the DKI Jakarta province has been increasing reached 92.14 percent in 2023 (Badan Pusat Statistik, 2024). People of all ages,

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from youngsters to adults, use the internet. Students and college students are the most frequent internet users (APJII, 2022). However, high internet use among children and students is more often associated with accessing social media content rather than educational content (APJII, 2022). Furthermore, the majority of Indonesians spend 1–5 hours per day on the internet (APJII, 2022). This data highlights the significant internet usage among individuals, particularly teenagers and young adults, though it slightly diverges from the expected roles of these groups. According to a report by UNICEF East Asia and the Pacific Region and the Centre for Justice and Crime Prevention (2020), individuals aged 11 to 18 face numerous risks when using the internet, especially in Indonesia. These risks include negative online experiences, interacting with strangers online, receiving sexual messages or images from unknown individuals on social media, and more. This demonstrates the prevalence of internet-related issues among Indonesian pupils and students. These findings are supported by research indicating that in countries such as India, Mexico, the Philippines, and Turkey, increased internet use within their societies correlates with the emergence of maladaptive behaviors (Barrios-Fernandez et al., 2021).

Continuous internet use that disrupts daily tasks is an indication of problematic internet use (PIU). PIU refers to cognitive, emotional, and behavioral symptoms resulting from maladaptive internet use, which can negatively impact individuals' academic, professional, and social environments (Caplan, 2003). PIU behavior is characterized not only by excessive time spent online but also by a cognitive obsession with being constantly connected (Caplan, 2010). High levels of PIU are associated with psychological stress (Chen et al., 2021; Reiner et al., 2017), feelings of loneliness, reduced social skills, anxiety, and depression (Andangsari et al., 2018), decreased academic performance, and even the development of internet disorders or internet addiction (Vigna-Taglianti et al., 2017). Other negative outcomes include cyberbullying, exposure to pornography, gambling, and other harmful activities related to internet use (Chao et al., 2020). Moreover, the demands of collegiate life often require extensive internet use. College students are considered the dominant group of internet users, relying on it to complete academic tasks and engage in campus life and responsibilities, more so than high school students. They are also seen as more independent, learning to manage their own time and activities. These conditions make the symptoms of PIU more visible among college students.

The emergence of maladaptive PIU behavior can be slowed or even prevented if individuals have a support system as a protective factor. According to Bowlby, Ainsworth, and Bretherton's human attachment theory, attachment behavior is a concept that applies not only in early life but throughout lifespan development (Crain, 2014). Attachment behavior refers to actions that maintain proximity to an attachment figure (Crain, 2014) and interacts with several systems, such as the fear system, exploratory system, and sociable system. The interaction between the attachment behavioral system and the sociable system explains how social factors—such as attachment relationships with parents, peers, close friends, and teachers—help individuals adapt to their environment (Cassidy & Shaver, 2016). When attachment behavior is activated by environmental stimuli, the social system becomes a survival-promoting tendency, allowing individuals to seek proximity to trustworthy others and serving as an affective resource for adaptation. Thus, a support system derived from the social system is crucial for activating attachment behavior, providing resources to support college students in adjusting to various tasks, and preventing the development of maladaptive behaviors like problematic internet use. Additionally, when attachment behavior is activated by stressors encountered in daily tasks, support systems such as parents or peers can serve as alternative attachment figures, offering safety and comfort to prevent excessive, purposeless internet use. Research has shown that stable attachment or secure-quality relationships with parents and peers are linked to lower PIU among teenagers (Mukti & Bustan, 2024), and previous studies have confirmed that secure attachment to parents is associated with low PIU (Asyriati, 2020; Lan & Wang, 2020; Schimmenti et al., 2021; Suzuki et al., 2023). However, some studies report a non-significant association between secure attachment and PIU (Odaci & Çikrikçi, 2014). These inconsistencies may arise from differences in measuring attachment relationships (e.g., using the Relationship Scale Questionnaire [RSQ] or the Inventory of Parent and Peer Attachment [IPPA]) and in assessing PIU (e.g., using the Internet Addiction Test [IAT] or the Generalized Problematic Internet Use Scale [GPIUS]). Variations in participant age may also contribute to differing results, as younger individuals may use the internet primarily for gaming, impacting usage duration, while older individuals use the internet for

diverse purposes, such as escaping adult responsibilities (e.g., gaming, binge-watching), entertainment (e.g., social media apps), or even dating.

Apart from that, there has been little research into the role of peers in PIU behavior, despite peers being the closest social agents capable of influencing individual behavior patterns. This aligns with attachment theory, which describes multiple attachments, suggesting that individuals form attachment relationships with figures beyond their mothers during developmental milestones. As children grow, their social environment expands, and so does the organization of their attachment-related cognitive composition or mental representation, known as the internal working model (IWM). Within the IWM, relationships with friends or peers contribute to organizing the complex attachment behavioral system (Howes & Spieker, 2016 in Cassidy & Shaver, 2016). Investigating peer attachment in the context of PIU behavior is particularly relevant in today's digital society. Peers influence how individuals use the internet, whether for social networking systems (Malay & Nataningsih, 2020), browsing school materials (Dogruer et al., 2011), entertainment, or gaming (D'Aquila et al., 2019; Schimmenti et al., 2012). Furthermore, peers serve as the primary standard for acceptable behavior among college students, who are navigating the transitional phase between adolescence and early adulthood. Previous research has identified a link between peer attachment and PIU (Mukti & Bustan, 2024; Reiner et al., 2017), though inconsistencies remain. Thus, it is essential to examine the quality of attachment individuals have with their parents and peers in relation to the PIU challenges they face.

Moreover, different attachment qualities are associated with varying cognitive processes, which influence how individuals regulate their behavior (Mukti & Hendrawan, 2018). Bowlby's basic attachment theory (Cassidy & Shaver, 2016) proposed that the organization of the attachment behavioral system involves a cognitive component called mental representations of the attachment figure. The quality of attachment—whether secure or insecure—is facilitated by distinct executive function (EF) abilities. Research has shown that individuals with secure attachment differ from those with insecure attachment in their cool EF abilities (Rahmawati, 2018). Cognitive processes, in turn, affect how individuals manage their internet behavior. However, research in this area remains limited. For example, Pichardo et al. (2021) found that EF, specifically cognitive flexibility, directly affects PIU. This is consistent with earlier research showing impaired cognitive flexibility in individuals addicted to the internet (Dong et al., 2014). However, Gao et al. (2019) found no significant differences in inhibitory control, a specific EF ability, among individuals who excessively use social media and the internet. These findings highlight the role of EF skills in regulating behavior, which subsequently determines individual internet behavior patterns.

The objective of this research is threefold. First, it aims to determine the contribution of parents and peers within the context of attachment in relation to PIU, identifying which relationship plays a more dominant role in influencing internet usage behavior. While previous studies have primarily focused on the role of parents (Gao et al., 2019; Lan & Wang, 2020; Odaci & Çikrikçi, 2014; Schimmenti et al., 2021), this research seeks to address the gap by incorporating the influence of peers. Second, the study intends to assess PIU by exploring the emotional aspects individuals experience when using the internet, utilizing the IPIUS scale adapted from Andangsari et al. (2019). This contrasts with other research employing the IAT or GPIUS, which often excludes emotional components in the analysis of internet use behavior (Natanael, 2021). Third, this research seeks to uncover the cognitive processes underlying differences in attachment quality, particularly how these differences may influence individuals' ability to regulate their behavior when engaging with the internet. It is hypothesized that EF, which underpins cognitive processes, may act as a buffer for individuals with poor-quality attachments to parents or peers, mitigating the negative impact on internet usage behavior. To the best of the researchers' knowledge, no previous studies have explored this specific interplay of attachment, EF, and PIU.

METHODS

Research Design, Location, and Time

This study employed a quantitative research design to examine the influence of individual attachment to parents and peers on problematic internet usage (PIU), with executive function (EF) abilities hypothesized to mediate this relationship. Researchers propose that EF abilities play a critical role in helping individuals regulate their internet usage, such that individuals with poor attachment quality to parents or peers may still avoid maladaptive internet use if they possess strong EF abilities. The study was conducted between July and

October 2023 in DKI Jakarta. This location was chosen based on data showing that the increase in internet users in DKI Jakarta has outpaced that of other cities since 2019.

Sampling Technique

A convenience sampling method was employed. The study included 127 university students (M_{age} = 21.16, SD = 4.01) from the DKI Jakarta area, comprising 100 women and 27 men.

Procedure for Data Collection

The data collection process began with obtaining informed consent from participants, followed by a screening process to collect biodata and assess for physical or psychological disorders, significant developmental injuries (e.g., brain injuries), and demographic information. Participants were then asked to complete three self-report questionnaires: (1) Inventory of Parent and Peer Attachment (IPPA), (2) Indonesian Problematic Internet Use Scale (IPIUS), and (3) The Amsterdam Executive Function Inventory (AEFI). The original measurement instruments were adapted following the guidelines proposed by Beaton et al. (2000). Content validity was ensured through expert assessments, and reliability was evaluated using Cronbach's Alpha. Additionally, demographic data and information about neurological disorders were collected. The demographic variables included age, gender, domicile, school origin, duration of internet use, daily internet activities, most frequently used social media platforms, activities impacted by the pandemic, relationship status, group friendships, parental education, and parental income. Initial screening questions assessed the presence or absence of brain injuries, mental disorders, and/or clinical conditions (e.g., ADHD, depression) that could potentially affect PIU performance.

Measurement and Assessment of Variables

Outcome Variable: Problematic Internet Use (PIU). Problematic Internet Use (PIU) is defined as a psychological symptom involving cognitive, emotional, and behavioral characteristics resulting from inappropriate internet use, leading to difficulties in academic, work, and social environments (Caplan, 2003). Caplan (2010) emphasizes that PIU behavior is not just about the amount of time spent online but also about cognitive preoccupancy with the internet, often worsened by psychosocial issues. In this study, PIU was assessed using the Indonesian Problematic Internet Use Scale (IPIUS), developed by Andangsari et al. (2019). This scale consists of 63 items measuring six dimensions of PIU: (1) Preference for Online Interaction (POSI), (2) Escaping, (3) Cognitive Preoccupation, (4) Compulsive Internet Use, (5) Negative Outcome, and (6) Emotional Reactivity. Each item is rated on an 8-point Likert scale, ranging from 1 (does not describe me at all) to 8 (describes me very much). The reliability of this scale is 0.916 (Cronbach's alpha).

Predictor Variables: Attachment to Parents and Peers. Attachment behavior is defined as the tendency to seek proximity to attachment figures for protection and comfort. This behavior varies with age but consistently serves the same function—seeking closeness to ensure protection and support (Cassidy, 2016; Marvin et al., 2016). In this study, the quality of attachment to parents and peers was assessed using a modification of the Inventory of Parent and Peer Attachment (Armsden & Greenberg, 1987), a self-report measure that evaluates three dimensions: (1) Trust, (2) Communication, and (3) Alienation. The Inventory includes 28 items to measure attachment to parents and 25 items for attachment to peers. Participants responded on a Likert scale ranging from "Strongly Disagree" to "Strongly Agree." Cronbach's alpha for this instrument is 0.93.

Moderator Variable: Executive Function (EF). Executive Function (EF) refers to the neurocognitive processes that consciously control thoughts, emotions, and behaviors to achieve goals (Zelazo & Carlson, 2012). EF is classified into two types: (1) Cool EF: Involves problem-solving in neutral and abstract contexts, and (2) Hot EF: Involves regulating behavior in emotionally charged and incentive-driven situations (Zelazo & Muller, 2012). For this study, EF is measured by three components: (1) Attention (ability to maintain focus), (2) Planning (ability to create and follow plans), and (3) Self-control and Monitoring (ability to manage and monitor one's behavior). The Amsterdam Executive Function Inventory (AEFI) (Baars et al., 2015) is used, with 10 items for each of the three components. Participants respond with "Not True," "Partially True," or "True." The Cronbach's alpha for the AEFI is 0.876.

Data Analysis

The data analysis for this study was conducted using SPSS 25 with regression analysis. Multiple regression was employed to analyze the contribution of demographic data, independent variables, and the mediator variable to the dependent variable (PIU). Additionally, mediator

regression was used to examine both the direct and indirect effects of the mediator variable (EF) on the relationship between attachment to parents/peers and PIU. This approach helps assess the role of EF in moderating the effects of attachment quality on internet usage behaviors.

RESULTS

Descriptive Analysis

In this section, the descriptive statistics for students' attachment to parents and peers, executive function (EF), problematic internet use (PIU), and demographic data are summarized in Table 1.

Hypothetical Analysis

Hypothesis Test I: Multiple Regression. The first hypothesis test examined the influence of independent variables (attachment to parents and peers, EF) and demographic factors on PIU. The results are displayed in Table 2, showing the outcomes of the multiple regression analysis.

Based on Table 2, the independent variables that have a significant influence on PIU are attachment with peers and executive function, while attachment with parents and other variables show no significant influence. The author also conducted post-hoc comparisons between category groups for demographic characteristics; however, no demographic characteristics were found to have a significant influence. The EF variable had the

Table 1 Descriptive analysis of students' attachment to parents and peers, executive function (EF), problematic internet use (PIU), and demographic data (n=127)

Predictor	Mean	Standard Deviation	Frequency	%
Problematic internet use	258.81	68.59		
Attachment with parent	94.43	19.14		
Attachment with peer	89.96	10.94		
Executive function	21.35	2.55		
Age (year)	21.16	4.01		
Father education	3.00	1.31		
Mother education	2.85	1.23		
Gender				
Female			100	78.7
Male			27	21.3
Duration of internet usage				
1–3 hours			13	10.2
3–5 hours			29	22.8
>5 hours			85	66.9
Parent marital status				
Divorce			20	15.7
Married			92	72.4
Unidentified			15	11.8
Parent income (rupiah)				
0–1 million			41	33.1
1–5 million			34	27.4
5–10 million			38	30.6
> 10 million			11	8.9
Having a boyfriend/girlfriend				
No			81	63.8
Yes			46	36.2

Table 2 Multiple regression analysis results of students' attachment to parents and peers, executive function (EF), and background variables with problematic internet use (PIU) (n=127)

Predictor	Estimate	Standard error	t-value	p-value	Standardized Estimate
Intercept [a]	506.60	82.346	6.15	0.00	
Attachment with parent	0.16	0.36	0.43	0.66	0.043
Attachment with peer	-1.18	0.58	-2.03	0.04*	-0.189
Executive Function	-7.10	2.44	-2.90	0.00**	-0.260
Age	-2.00	1.61	-1.24	0.22	-0.118
Father's educational background	1.40	9.20	0.15	0.88	0.016
Mother's educational background	-8.54	9.51	-0.89	0.37	-0.093
Gender					
Female – Male	5.44	14.38	0.37	0.70	0.080
Duration					
1–3 – 3–5 hour	1.83	23.35	0.07	0.93	0.027
3–5 – >5 hour	20.52	21.18	0.96	0.33	0.298
Parent marital status:					
Complete - Divorced	-17.97	14.34	-1.25	0.21	-0.261
Parent income	8.53	7.08	1.20	0.23	0.118
Having a boyfriend/girlfiend					
1 = yes – 0 = no	15.272	12.76	1.19	0.23	0.221

Note. (*) significant at $p<0.05$, (**) significant at $p<0.001$

most prominent influence, with a standardized estimate value of -0.260 ($p < 0.05$) and a negative association, implying that the higher a person's EF, the lower their PIU. Attachment to peers had the second greatest influence after EF, with a beta value of -0.189 ($p < 0.05$), indicating that higher attachment to peers was associated with lower PIU. Conversely, attachment with parents showed no significant effect on PIU, with a standardized estimate value of 0.043 ($p > 0.05$), suggesting that attachment to parents did not significantly influence PIU behavior. There was no significant effect of demographic variables on individual PIU, which could imply that other unexamined variables might be influencing PIU behavior (Table 2).

Hypothesis Test II: Mediation Regression. In Hypothesis Test II, a mediation analysis was conducted to assess whether executive function acts as a mediator in the influence of parent attachment and peer attachment on problematic internet use (PIU).

Mediation analysis result (i).

Table 3 shows that the direct influence of parent attachment on PIU was not significant ($b = 0.025$; $p > .05$). However, the influence of parent attachment on executive function was found to be significant ($b = 0.03$; $p < .05$). The influence of executive function on PIU was also significant ($b = -8.99$; $p < 0.05$). The mediation estimates model indicated that there was an indirect significant effect of parent attachment on PIU ($a \times b$; $b = -0.0275$; $p < 0.05$). The direct effect of parent attachment on PIU (c; $b = -0.25$; $p > 0.05$) was not significant, nor was the total effect ($a \times b + c$; $b = -0.0526$; $p > 0.05$). Thus, executive function can be considered a mediator in the relationship between parent attachment and PIU.

Table 3 The result of the influence of attachment to parents on PIU, tested and mediated by executive function variables (n=127)

Path Estimates			Label	Estimate	SE	Z	p
Attachment with parent	→	EF	a	0.030	0.011	2.648	0.008**
EF	→	PIU	b	-8.990	2.285	-3.935	< .001**
Attachment with parent	→	PIU	c	-0.2517	0.305	-0.825	0.409
Indirect			a × b	-0.275	0.125	-2.197	0.028*
Direct			c	-0.252	0.305	-0.825	0.409
Total			c + a × b	-0.526	0.315	-1.673	0.094

Note. (*) significant at $p<0.05$, (**) significant at $p<0.001$

Table 4 The result of the influence of attachment to peers on PIU, mediated by executive function variables (n=127)

Path Estimates			Label	Estimate	SE	Z	p
Attachment with peer	→	EF	a	0.033	0.020	1.6	0.110
EF	→	PIU	b	-8.791	2.217	-3.97	<0.001**
Attachment with peer	→	PIU	c	-1.048	0.517	-2.03	0.043*
Indirect			a × b	-0.288	0.194	-1.48	0.138
Direct			c	-1.048	0.518	-2.03	0.043*
Total			c + a × b	-1.337	0.543	-2.46	0.014*

Note. (*) significant at $p<0.05$, (**) significant at $p<0.001$

Mediation analysis result (ii)

Table 4 shows a significant direct influence of peer attachment on PIU (b = -1.048; p < .05). However, the effect of peer attachment on executive function was not significant (b = 0.033; p > .05). The influence of executive function on PIU remained significant (b = -8.791; p < .05). The direct effect of peer attachment on PIU was significant (b = -1.048; p < .05), but the indirect effect of peer attachment on PIU through executive function was not significant (a x b; b = -0.288; p > .05). The total effect of peer attachment on PIU (a x b + c; b = -1.337; p < .05) indicated a significant influence. Therefore, executive function does not play a mediating role in the influence of peer attachment on PIU, with peer attachment directly influencing PIU.

DISCUSSION

The objective of this study is to elaborate on the effect of attachment on PIU, mediated by executive function (EF) abilities in university students. Participants in this study had an average age of 21 years, which is considered early adulthood. Females accounted for 79% of the research participants. In contrast to previous research, this study found that age and gender had no significant effect on PIU. This could be because, in early adulthood, all types of internet activities are not gender-specific, with women using online games to relieve stress and men using social media to impress the opposite sex (Liu et al., 2023). According to data from APJII (2022), people of all ages, from children to the elderly in Indonesia, now use the internet. Sixty-seven percent of the participants in this study reported using the internet for more than five hours per day. However, the analysis results show that the duration of internet use has no significant effect on PIU. This finding contradicts the concept of behavioral addiction proposed by Young (2011), which includes PIU as a type of addiction, as also discovered by Schimmenti et al. In this study, PIU is defined not only by the amount of time people spend on the internet but also by the presence of cognitive preoccupation and emotional factors that are thought to shape maladaptive internet behavior. Meanwhile, duration refers only to the amount of time people spend online. However, Reiner et al. (2017) proposed that humans should be aware of how the internet today changes behavior by influencing various forms of internet-related activities. This suggests that the long duration of internet use is now adaptive and was later found to have no significant effect on PIU.

PIU is a maladaptive use of the internet by individuals that disrupts daily functioning and is associated with the emergence of cognitive, emotional, and behavioral problems. Various factors can contribute to an individual's behavior when using the internet. The aim of this study is to identify the factors that influence problematic internet use. The results show no significant direct effect of attachment to parents on individuals' PIU behavior. This could be because the average research participant is in early adulthood, a stage during which individuals may regard parental figures as insignificant and unreliable (Romano et al., 2020). This transition stage between adolescence and adulthood, known as early adulthood, allows individuals to expand their environment in accordance with their age (Cassidy & Shaver, 2016; Berk, 2014), affecting their social sphere and developmental tasks such as pursuing education, finding a job, or seeking a partner. Furthermore, parents often believe that their young adult children are self-regulated (Lan & Wang, 2020). As a result, parents have minimal direct impact on their children's internet use. This is consistent with attachment behavior theory, which explains the concept of "functional equivalence" in attachment behavior. Functional equivalence means that attachment behavior may vary across different ages but still represents the individual's need to seek comfort from their parents. Despite no longer crying in response to stress, grown-up individuals may still seek comfort through deep conversations with their parents. This reflects that parents no longer regulate their behavior directly through actions like patting or soothing, but instead remain

responsive and sensitive by being present when needed. The study sample of university students supports this explanation, as these early adults often live far from their parents and are preoccupied with their studies and university activities. Consequently, regardless of the emotional closeness between parents and their young adult children, parents do not have a significant influence on their internet use behavior (Asyriati, 2020), which contradicts previous research by Niu et al. (2023).

This study supports Odaci & Çikrikçi's (2014) finding that secure attachment to parents has no significant direct effect on PIU in university students. Instead, their study found a significant effect of insecure attachment, specifically dismissive and preoccupied attachment, on PIU. The explanation was that individuals with insecure attachment seek emotional support and care in interpersonal relationships, using the internet as a form of compensation. Zakiyyah & Latifah (2022) also found that attachment to parents had no direct influence on PIU. Although they conducted their research on high school adolescents, Zakiyyah & Latifah's findings are consistent with this study, which similarly examines and measures the quality of attachment. Attachment is measured using a continuous scale that represents individuals' levels of secure and insecure attachment (Armsden & Greenberg, 1987). As a result, there are no apparent differences between avoidant attachment, ambivalent attachment, and insecure attachment. In fact, cognitive differences between avoidant and ambivalent attachments can influence behavioral regulation (Rahmawati, 2018; Mukti & Hendrawan, 2018). Meanwhile, other studies that measured attachment category types have found that attachment affects PIU, including avoidant attachment (Schimmenti et al., 2021) and anxious attachment (Jia & Jia, 2016). However, this study did not elaborate on the insecure attachment category due to limitations in the measurement tools. Future research should consider exploring each attachment type in adulthood to gain a more comprehensive understanding.

On the other hand, this study found a significant direct effect of peer attachment on PIU. The effect was determined to be negative, meaning that the stronger an individual's attachment to their friends, the less likely they are to develop PIU. Individuals with strong peer attachments use the internet in an adaptive manner based on their needs because their interpersonal needs are met through direct communication and trust in their friends. On the other hand, individuals without friends tend to use the internet to fulfill their need to socialize. Those who lack friends may feel uncomfortable with direct interactions and may experience loneliness, leading them to overuse the internet. Peers greatly influence an individual's self-concept from adolescence to adulthood (Berk, 2014). Peers can influence how individuals perceive and even judge things, as group acceptance becomes an important aspect of socialization at this age. As a result, peers can influence individual behavior, including internet use. Individuals with reliable peers, who share two-way communication and a sense of belonging to a group, are less likely to develop PIU. This happens because they can meet their social needs directly through real-life interpersonal relationships. An individual's need for emotional attachment, such as attention-seeking and appreciation from others—a developmental task of early adulthood—is fulfilled by the presence of peers. In contrast, individuals without peer relationships may turn to the internet to seek virtual social connections to fulfill their needs for attention, existence, and acceptance. This finding aligns with attachment theory, which proposes that, in later years, there are multiple attachment relationships that can fulfill an individual's need for safety and comfort during stressors, and help or influence behavior indirectly (Cassidy & Shaver, 2016).

However, the findings of this study support the researcher's hypothesis that executive function mediates the effect of attachment to parents on PIU. This finding was significant and supported the hypothesis that individuals with poor attachment quality can be buffered by cognitive abilities, specifically executive function, preventing them from engaging in maladaptive internet use. Since executive function has a significant mediating effect, only if college students have good executive function does their attachment to parents contribute to their PIU. This means that the quality of attachment formed through early interactions with parents establishes a developmental trajectory that influences their executive function abilities. Active, sensitive, and responsive parents who recognize and react to children's needs foster reciprocal interactions that optimize the child's exploration system, allowing their executive function to develop optimally. The positive relationship between secure attachment and high executive function is evident, as is the reverse. As individuals mature, their executive function helps them plan actions, make decisions, and evaluate behaviors that regulate their behavior. The results from well-developed executive functions help early adults regulate

their internet use, preventing them from developing PIU.

According to research by Stackert and Bursik (2003), individuals with secure attachment are less likely to engage in irrational thinking. This explains how individuals with secure attachment are supported by their cognitive ability to identify needs, including the need for interpersonal relationships. As a result, they do not fall into thinking errors related to the sense of comfort presented in online interactions or the desire to always be online, demonstrating the cognitive flexibility they possess. Instead, they can form healthy relationships with others (Sagone et al., 2023; Yuniar, 2021; Verissimo et al., 2014) and manage stress without using the internet as an escape. This explanation is consistent with the findings of Aydın et al. (2020), who stated that internet-addicted individuals have difficulty maintaining attention and controlling cognition, often making thinking errors when processing information.

Furthermore, executive function (EF) helps individuals with secure attachment maintain adaptive emotion regulation (Tammilehto et al., 2022). This allows them to consider the negative consequences of using the internet to control themselves (Zakiyyah & Latifah, 2022) and avoid exacerbating the situation. Romero-López et al. (2021) found similar evidence to support this explanation. They discovered that EF contributes to PIU in a negative relationship direction, with students who have low cognitive flexibility and emotional control preferring to interact online rather than in person because it feels safer, more comfortable, and more effective, as well as less stressful. However, they eventually develop a tendency to use the internet as a platform to regulate their emotions and behaviors, which increases obsessive thoughts and leads to maladaptive internet use.

However, future research should consider several aspects that are limitations in this study, so that later research will provide a more detailed and comprehensive explanation. It could consider adapting the Adult Attachment Interview (AAI) or fMRI to capture brain responses to attachment relationship vignettes, as opposed to using the IPPA-R. Later research could also consider measuring EF using techniques other than self-report, as suggested by Gao et al. (2019), such as eye blinks, heart rate, and so on, to avoid overgeneralizing the results of the EF test.

CONCLUSION AND SUGGESTION

This study concludes that attachment to peers has a significant direct effect on problematic internet use (PIU). Mediation analysis revealed a significant indirect effect of attachment to parents on PIU, mediated by executive function (EF) ability. However, the indirect effect of peer attachment on PIU, as mediated by EF, was found to be insignificant. These findings highlight that peer attachment directly influences problematic internet use.

Based on this study, it is recommended that young people carefully choose their peers and friends, as their influence profoundly impacts behavior and long-term development. Additionally, parents are encouraged to guide their young adult children, particularly during their university years, in selecting suitable peers and friends. This guidance is crucial, as parents may have limited ability to directly regulate their children's behavior at this stage. The study also emphasizes the importance of optimizing cognitive abilities, specifically executive function, from an early age. Developing strong EF skills enables children to better regulate their behavior as they grow older, making them more adaptive and resilient, especially when separated from their parents, such as during internet use.

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