



RESEARCH ARTICLE

The Mediating Role of Loneliness in the Relationship between Self-Control and Internet Addiction

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ARTICLE INFO	ABSTRACT
Received: Nov 13, 2024 Accepted: Jan 10, 2025	Nowadays the internet has become an integral part of society, all groups including adolescents are active internet users, used for various interests including learning and entertainment, however there are problems that appear related to the increasing prevalence of internet addiction among adolescents globally, in Indonesia itself there is also an increase in internet addiction among adolescents. Some of the important risk factors that have been identified are the problem of loneliness experienced by adolescents and low self-control factors, however research on the mediating role of loneliness related to self-control and internet addiction is still rarely done, therefore the current research aims to identify the role Loneliness mediates the relationship between self-control and internet addiction in adolescents. A total of 700 adolescents in Depok, Indonesia were involved in this research using a cross sectional study. The research collected demographic data, Internet Addiction Diagnostic Questionnaire (IADQ), Brief Self Control Scale (BSCS) and ULS short version (ULS-5) to assess loneliness in adolescents. Descriptive and mediational analyzes were used for statistical analysis. The results of the mediation test show that there is a partially mediating role of loneliness in the relationship between self-control and internet addiction in adolescents, low self-control affects loneliness which causes an increase in depression in adolescents, self-control is an important factor in various maladaptive behaviors..
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INTRODUCTION

The Internet continues to grow and has a major impact on all aspects of society's life. In October 2024, statistics estimate that there will be 5.52 billion internet users worldwide or 67.5% of the total world population. The internet is very useful for the community to access information, connect with friends and family, follow news and events, business, education, and there are many more benefits from the internet. The Internet has changed human behavior related to communicating, learning, working, managing finances, accessing entertainment, and shopping, all of which rely on Internet access.

The Internet has changed the way we live, work, and communicate. The Internet offers a wealth of information, entertainment, and social connections. However, excessive use of the internet can cause various problems, including internet addiction. The Internet has become an integral part of modern life, especially for adolescents. Despite offering many benefits, such as education, communication, and entertainment, excessive or unhealthy use of the internet can have negative consequences. Adolescence is a time of significant physical, emotional, and social change. Coupled with the increasing ease of accessing technology, this time can be a serious storm for the development of adolescents related to internet addiction. Internet addiction in adolescents is a growing problem that can have a significant negative impact on the mental health, social life, and academic performance of adolescents. The estimated global prevalence of internet addiction in adolescents is 14.22% (95% CI,

12.90–15.65) (Meng et al., 2022). Siste et al. (2021) reported that in Indonesia the prevalence of internet addiction is around 19.3% occurring in adolescents.

Internet addiction is a behavioral addiction characterized by excessive and compulsive use of the internet that interferes with daily life. A growing concern that can have a significant negative impact on the individual and the well-being of adolescents. Neglecting responsibility, preferring to use the internet instead of doing schoolwork, and engaging in face-to-face social activities (Abendan, 2021). There are symptoms of social withdrawal (Amendola et al., 2023). Adolescents also tend to be irritable, anxious, or depressed when they cannot access the internet (Zhao et al., 2022). In addition, adolescents who are addicted to the internet also lie about using the internet, activities using the internet will be hidden or minimize the amount of time spent online when asked about this (LaRose et al., 2003). There is a problem with sleep disorders, adolescents have difficulty sleeping because they use the internet all night (Ekinici et al., 2014). Physical symptoms found in adolescents with internet addiction are complaints of headaches, eyes that contract too much due to spending too much time in front of the mobile phone screen (Dev & Singh, 2023). Other symptoms were also found to be social isolation or withdrawing socially from friends and family preferring to interact online (O'Day & Heimberg, 2021).

Kecanduan internet pada remaja merupakan masalah yang terus berkembang yang dapat berdampak negatif signifikan pada kesehatan mental, kehidupan sosial, dan prestasi akademis remaja. Beberapa faktor penting yang berkontribusi terhadap adiksi internet pada remaja adalah masalah pengendalian diri yang buruk pada remaja. Pengendalian diri, kemampuan untuk mengatur pikiran, emosi, dan perilaku seseorang, merupakan faktor penting dalam mencegah dan mengelola kecanduan internet di kalangan remaja. Ketika remaja kurang memiliki pengendalian diri, mereka mungkin kesulitan untuk menolak daya tarik dunia digital, yang berujung pada penggunaan internet yang berlebihan dan kompulsif.

Higher self-control scores correlate with higher school grades, better adjustment (fewer reports of psychopathology, higher self-esteem), less binge eating and alcohol abuse, better relationships and interpersonal skills, secure attachment, and a more optimal emotional response, low self-control is a significant risk factor for various personal and interpersonal problems (Tangney et al., 2004). Tangney et al. (2004) view self-control as the ability to override or change one's internal responses, as well as stop unwanted behavioral tendencies and refrain from acting on them. Li et al. (2021) viewed at the dynamics of the internet from the factor of adolescent self-control based on the impulsivity theory developed by Ainslie (1975), that some adolescents are more restrained than others and less impulsive so they are more likely to sacrifice short-term entertainment to invest efforts in achieving long-term goals. Adolescent with low self-control tend to avoid studying for the next day's test by watching videos on the Internet. Adolescents who lack self-control tend to make decisions based on short-term gains rather than investments for long-term gains, such as studying for tests. Adolescents who are less able to control themselves have no other way to satisfy their emotional needs, and the internet can be a means for adolescents to satisfy their emotional needs. Therefore, the repeated decision of adolescents to enjoy using the Internet can foster Internet addiction.

In fact, self-control is a protective factor that can protect adolescents from internet addiction. Wang et al. (2023) found that a high level of self-control functions as a protective factor against internet addiction in adolescents. Adolescents with greater self-control are proven to be able to regulate their internet use effectively, resist the temptation of stimulating elements in the virtual online world, and adolescents tend to show rational control over their online activities and are not too immersed in the pleasure aspects offered by the online environment. On the other hand, individuals with a low level of self-control are more susceptible to being absorbed in the online world. They are often less effective in managing and managing negative emotions, thus making internet addiction an escape from real life problems. In addition, individuals with low levels of self-control are more likely to rely on the internet to meet their emotional needs. The love of using the internet for personal satisfaction has the potential to worsen the development of internet addiction.

Tangney et al. (2004) developed a self-control scale (SCS), to assess individual differences in self-control. These measurements are designed based on an extensive review of self-control processes and failures. Alpha for the Total Self-Control Scale was 0.89 on two different samples of

undergraduate students. Test-retest reliability over three weeks was 0.89 for the Total SCS score. Regarding validity, higher self-control scores correlate with better adjustment (fewer reports of psychopathology, higher self-esteem), less binge eating and alcohol abuse, better relationships and interpersonal skills, secure attachment (Basic Data PsycTests APA, 2021).

Self-control and loneliness

Self-Control is the ability to regulate one's thoughts, emotions, and behavior. Previous research has revealed that lower self-control is associated with higher loneliness at both the trait and situational levels. Low self-control contributes to loneliness, failure of self-control negatively affects others leading to a higher risk of being ostracized by others, which predicts increased feelings of loneliness over time. Low self-control, associated with negative intrapersonal outcomes, can have important interpersonal consequences by causing isolation, and the consequence is loneliness (Stavrova et al., 2022). Self-control refers to inhibition or control, which is the ability to regulate emotions, thoughts, and behavior in the face of temptations and urges; on the other hand, it is also realized as an executive function, which is the cognitive process required to regulate a person's behavior in order to achieve a certain goal (Carnevale & Fujita, 2016). Adolescents who lack self-control tend to experience difficulties in controlling emotions and behavior, adolescents with strong self-control are often considered more socially competent, which in turn can improve relationships with peers and create a sense of security and having (Huang et al., 2023).

Loneliness is a subjective feeling of isolation and disconnection from other people. Previous research has shown the role of loneliness in mediating the relationship between physical exercise and internet addiction in college students (Xu & Tang, 2024). Yue et al. (2022) also found a mediating role of loneliness in the relationship between social exclusion and smartphone addiction. Loneliness can drive individuals to seek social connections online, which leads to excessive internet use and potential addiction. Individuals with low self-control may have difficulty forming and maintaining meaningful relationships, thus increasing feelings of loneliness. The relationship between self-control, loneliness, and internet addiction is a complex interaction of various psychological factors. In recent years, research has increasingly explored the role of loneliness as a mediator in this relationship. Several previous studies found that loneliness can mediate the relationship between depressive symptoms and cognitive impairment (Hou et al., 2022), loneliness partially mediates peer criticizing behavior and mobile social media addiction in adolescents (Xu et al., 2022), loneliness plays an important mediating role in the relationship between personality traits and depression in adolescents (Fu et al., 2024), Loneliness mediates the relationship between maternal depressive symptoms and adolescent suicidal tendencies (Psychogiou et al., 2022), loneliness mediates the relationship between anxiety and depression (Moeller & Seehuus, 2019), full mediation effect of loneliness in the relationship between social support and life satisfaction (Kong & You, 2013), loneliness mediates the relationship between shyness and social anxiety and depression in adolescents (Brunetti et al., 2024), loneliness can mediate the relationship between childhood trauma and adolescent intellectual intelligence (Dong et al., 2023).

The role of low self-control (as a trait or as a condition) can cause loneliness, the risk of being ostracized may be one of the mechanisms that link low self-control with higher loneliness (Stavrova et al., 2022). Although, by definition, high self-control is primarily associated with positive outcomes for oneself (eg, success in achieving goals), self-control has been shown to have several beneficial side effects for others. High self-control makes it easier to overcome selfish or antisocial impulses for the benefit of the group, self-control can function as a way to manage conflicts between selfish desires and cultural norms (for example, norms of prosocial behavior). In addition, self-control facilitates behaviors that strengthen social bonds, such as adherence to norms, cooperative behavior, self-sacrifice in romantic relationships, and reduced likelihood of aggressive responses.

Self-control and internet addiction

Adolescents with low self-control may have difficulty regulating their internet use, which leads to excessive and problematic behavior, self-control is negatively related to increased internet use (Li et al., 2021). Ainslie (1975) considering that adolescents with higher self-control compared to other students are less impulsive, less likely to engage in short-term behavior that can cause internet addiction and more likely to engage in short-term behavior that can cause internet addiction. Adolescents with high self-control sacrifice short-term interests for long-term goals.

Loneliness and internet addiction

Lonely adolescents use the internet excessively as a coping mechanism to find emotional support and social interaction (Morahan-Martin & Schumacher, 2003). Wang & Zeng (2024) proposed the view that loneliness and internet addiction interact in a cycle of amplification, lonely individuals are more likely to exhibit internet addiction behaviors, which in turn worsen their loneliness, and excessive internet use can intensify feelings of loneliness. The relationship between loneliness and internet addiction can be seen as bidirectional, using the internet to replace offline social interaction can increase loneliness. Dong et al. (2024) explains the relationship between loneliness and internet addiction based on the social compensation hypothesis, lonely individuals use the internet to compensate for social deficits in the real world, which leads to excessive internet use.

Present study

Previous research has focused more on the direct influence of self-control and loneliness on internet addiction in adolescents, but unfortunately research on the role of loneliness in mediating the relationship between self-control and internet addiction has not been widely studied or is still very limited. As previously known, poor self-control also contributes to the level of loneliness felt in adolescents. Loneliness can motivate individuals to turn to the internet as a source of social connection and escape, leading to increased internet use and potential addiction. Therefore, the purpose of this research is to identify the role of loneliness in mediating the relationship between self-control and internet addiction in adolescents. By understanding the complex interplay between self-control, loneliness, and internet addiction, we can develop more effective strategies to prevent and treat this growing problem.

MATERIALS AND METHODS

The population in this research is 700 adolescents who are aged 14 to 19 years old and are still in high school education in the Depok district of West Java, Indonesia. The current study is a study that uses a cross-sectional study design, data collection is done at a certain point in time by using an online form. Mediation analysis will be used to answer questions in this research related to whether there is a mediating role of loneliness in the relationship between self-control and internet addiction in adolescents. JASP (JASP Team, 2024) will be used to analyze mediation. To measure self-control in adolescents, the Self-Control scale developed by Tangney, Baumeister, dan Boone (2004) with 36 items, and a simplified version was created by De Ridder et al. (2012) into 10 items. The self-control scale has also been adapted in the Indonesian version by Arifin dan Milla (2020) with RMSEA value = 0,04, CFI = 0,97, and SRMR = 0,05, alpha Cronbach currently is $\alpha=0.739$. To measure loneliness, used UCLA Loneliness Scale 20 items developed by Russel (1996), and adapted into a short version of 8 items by Hays dan DiMatteo (1987), and adapted in Indonesian by Hudiyana et al. (2022), CFI = 0.98, SRMR = 0.05, TLI = 0.97, and RMSEA = 0.07, α Cronbach =0.759. Internet addiction was measured with the internet addiction scale developed by Young (1998) and adapted into Indonesian by Siste et al. (2021), psychometric test on 18 IADQ items produced values RMSEA= 0.066, CFI= 0.96, TLI= 0.96, alpha cronbach is currently generating value $\alpha=0.874$.

RESULTS

Descriptive analysis shows that the majority of respondents are male (n=59.7%), and the rest are female adolescents (n=40.3%). It was found that 17-year-olds were the most respondents in this research (n=33.4%), 16-year-olds n=31.3%, and 15-year-olds n=27.9%. The total number of hours using the internet was found to be 3 to 6 hours with the most respondents (n=35%), 7 to 9 hours with the total number of respondents n=20.4%, and more than 16 hours with the total number of respondents 13.2%.

Tabel 1: Demographic

Gender	Frequency	Percent
male	282	40.3
female	418	59.7
14	23	3.3
15	195	27.9

16	219	31.3
17	234	33.4
18	27	3.9
19	2	0.3
internet usage		
< 3 hour	63	9
3 - 6 hour	245	35
7 - 9 hour	143	20.4
13 - 15 hour	26	3.8
>16 hour	92	13.2

The normality test shows that the internet addiction data is not normally distributed, Kolmogorov-Smirnov significance was found $p < 0.001$ $df=700$, therefore test the correlation using Spearman's Rho. The results of the correlation test found that loneliness is significantly correlated with internet addiction ($r=.423^{**}$), self-control also has a very significant negative correlation with internet addiction ($r=-.530^{**}$), and loneliness is also significantly negatively correlated with self-control ($r=-.383^{**}$). Gender was also found to be significantly correlated with the of loneliness ($r=.121^{*}$), the amount of time spent using the internet is also highly correlated with age ($r=.204^{**}$), Gender is also significantly correlated with internet addiction ($r=.162^{**}$), has a very significant negative correlation with self-control ($r=-.104^{**}$).

Tabel 2: Spearman's rho correlations

	Gender	Age	Internet usage	IADQ	ULS	BSCS
Gender	1	0.019	0.03	0.064	.121**	0.007
Age	0.019	1	.204**	0.012	-0.007	0.014
Internet usage	0.03	.204**	1	.162**	0.042	-.104**
IADQ	0.064	0.012	.162**	1	.423**	-.530**
ULS	.121**	-0.007	0.042	.423**	1	-.383**
BSCS	0.007	0.014	-.104**	-.530**	-.383**	1

Table 3 contains information about the path coefficient, the direct influence of self-control on internet addiction was found to have an estimated value of -0.814, LLCI=-0.932 ULCI=-0.697, $p < 0.001$. In table 4, it was found that the indirect influence of self-control through the mediation of loneliness was found to have an estimated value of -0.150 LLCI=-0.201 ULCI=-0.098 $p < 0.001$. In table 5, the total effect of self-control and loneliness is found with an estimate of -0.964, LLCI=-1.077 ULCI=-0.851. Table 6 can be seen the coefficient of the path, found self-control with an estimated value of -0.814 against internet addiction, and the estimated value of self-control against loneliness with an estimated value of -0.264. The sobel test also found a z value of -5.743 > 1.96 with one-tailed probability $p < 0.001$ which can be concluded that there is a partial mediation effect of loneliness in the relationship between self-control and internet addiction in adolescents.

Table 3: Parameter estimates (Direct effects)

							95% Confidence Interval	
			Estimate	Std. Error	z-value	p	Lower	Upper
NEW_BSC	→	NEW_IAT	-0.814	0.060	-13.591	0.000	-0.932	-0.697
<i>Note.</i> Delta method standard errors, normal theory confidence intervals, ML estimator.								

Table 4: Parameter estimates (Indirect effects)

								95% Confidence Interval		
				Estimate	Std. Error	z-value	p	Lower	Upper	
NEW_BSC	→	NEW_ULS	→	NEW_IAT	-0.150	0.026	-5.711	<0.001	-0.201	-0.098
Note. Delta method standard errors, normal theory confidence intervals, ML estimator.										

Table 5: Parameter estimates (Total effects)

							95% Confidence Interval	
			Estimate	Std. Error	z-value	p	Lower	Upper
NEW_BSC	→	NEW_IAT	-0.964	0.058	-16.751	<0.001	-1.077	-0.851
<i>Note.</i> Delta method standard errors, normal theory confidence intervals, ML estimator.								

Table 6: Parameter estimates (Path coefficients)

							95% Confidence Interval	
			Estimate	Std. Error	z-value	p	Lower	Upper
NEW_ULS	→	NEW_IAT	0.568	0.083	6.825	0.000	0.405	0.731
NEW_BSC	→	NEW_IAT	-0.814	0.060	-13.591	0.000	-0.932	-0.697
NEW_BSC	→	NEW_ULS	-0.264	0.025	-10.429	0.000	-0.314	-0.214

DISCUSSION

The results of the mediation test show that loneliness can partially mediate the relationship between self-control and internet addiction in adolescents. Self-control also influences loneliness and internet addiction, and the influence of self-control on both is negative which can be interpreted as the lower the self-control the higher the level of loneliness and the higher the level of internet addiction in adolescents. This finding is in line with the results of Wang et al. (2023) who found that self-control in adolescents has an effect on internet addiction. Cultivating self-control and growing a sense of meaning in life among adolescents can be an effective prevention and intervention strategy to overcome the problem of internet addiction in adolescents. This finding is also in line with the findings of Li et al. (2021) that there is a negative relationship between self-control and internet addiction. Self-control is the ability to control or delay impulses in order to achieve more meaningful and long-term goals, lack of self-control is one of the main aspects of addiction, self-control is an intrinsic factor that has a strong impact on internet addiction, adolescents can experience behavioral changes if they improve self-control by setting goals, making plans for themselves (Yang, 2020).

The correlation test also shows that there is a very significant correlation with internet addiction and loneliness. This finding is in line with the opinion of Saadati et al. (2021) that lonely individuals prefer to improve their communication through social networks to meet their emotional needs, the reason why adolescents who feel lonely prefer to use the internet excessively may be because those people find a way to overcome loneliness by interacting with other people in the environment. In addition, adolescents use the internet as an easy way to relieve stress, when they feel that they cannot solve a situation on their own or when they are in an uncontrollable environment, but even though these ways help them temporarily forget the difficulties in reality and serve as comfort and emotional protection, these things ultimately worsen the psychological suffering of adolescents by getting stuck in internet addiction.

The findings of this study found that there is a mediating role of loneliness in the relationship between self-control and internet addiction in adolescents, this finding is in line with the study of Fan et al. (2022). The finding of the mediating role of loneliness is also in line with the study of Dong et al. (2024) that loneliness can be a mediating factor between social anxiety and adolescent internet addiction. Dong et al. (2024) explained the relationship between loneliness and internet addiction referring to the decompensation hypothesis, when adolescents are stunted in their development, adolescents choose to use the Internet to relieve stress and get compensation, lonely adolescents prefer online social interaction to face-to-face communication,

which causes an increase in Internet use or compulsive Internet use in adolescents, thus increasing the incidence of Internet addiction in adolescents.

As previously known, loneliness is a risk factor for internet addiction, Matiz et al. (2024) argue that feelings of loneliness can significantly worsen adolescent internet addiction, there is a possibility that when internet addiction develops, it starts from loneliness that already exists before, resulting in a vicious circle in maintaining the symptoms of internet addiction. Loneliness is a negative affective state caused by the difference between the social needs desired by individuals and the actual level of interpersonal relationships (Van de Velde et al., 2023).

Various maladaptive and problematic behaviors are related to a person's low level of self-control and failure to control themselves, self-control is an important cause of addictive behavior, including internet addiction, adolescents with low self-control are most likely to fail to resist the temptation of the Internet and cannot control Internet use and maintain from potential addiction (Li et al. 2014). Self-control is the ability to control or regulate one's emotions, cognition, and behavior and is the core of an important function in competence, which is characterized as a person who is impulsive, insensitive, daring to take risks, short-term minded, in other words, they pursue satisfaction quick, prefers shortcuts, easy to take risks. Fan et al. (2022) argued that self-control can adjust cognition and emotion through cognitive evaluation strategies. With a high level of self-control, individuals can suppress cognition and emotions caused by rejection, conduct interpersonal communication rationally, and reduce feelings of loneliness, thus reducing their dependence on the Internet, when individuals with low self-control experience social rejection, the individual experiences dissatisfaction with their interpersonal relationships, this dissatisfaction makes them feel more lonely, and then they rely on the internet to meet unmet social needs. Stavrova et al. (2022) also convey that high self-control makes it easier to overcome selfish or antisocial impulses for the benefit of the group. Self-control facilitates behaviors that strengthen social bonds, such as adherence to norms, cooperative behavior, self-sacrifice in romantic relationships, and reduces the likelihood of aggressive responses.

CONCLUSION

Self-control affects the level of loneliness in adolescents which further affects internet addiction. High self-control makes it easier to overcome selfish or antisocial impulses for the benefit of the group. Self-control facilitates behavior that strengthens social bonds. The ability of good self-control in adolescents can help adolescents in suppressing negative cognition and emotions caused by social rejection, thus encouraging adolescents to conduct interpersonal communication rationally, and will reduce the feeling of loneliness, thus reducing their dependence on the Internet. Adolescents with low self-control who experience isolation from their social environment will experience dissatisfaction with their interpersonal relationships, this dissatisfaction makes them feel more lonely, and then they rely on the Internet to fulfill their unfulfilled social needs. The results of the current research provide an understanding of the importance of self-control in adolescents. Adolescents with high self-control will limit the duration of internet use. This research also opens up ideas related to measures to limit the duration of internet use as a way to prevent internet addiction and to strengthen the self-control of adolescents who are undergoing education in high school.

Ethics statement

Every research involving humans must obtain approval from the Research Ethics Committee at the Universiti Kebangsaan Malaysia (JEP-2023-271). The current study has been carried out in accordance with the rules and institutional requirements. Written consent to participate in this research was given by the participant's legal guardian through the School.

Authors' contribution

All authors have contributed, participated and are responsible in the concept, design, data analysis and the process of interpretation of analysis results, as well as in the preparation of the manuscript in the research process, including the process of editing the manuscript until completion. Each researcher gave suggestions for improvement in order to achieve this article.

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