

PROBLEMATIC ONLINE GAMING: A LONGITUDINAL STUDY OF A MINDFULNESS- BASED INTERVENTION IN A PSYCHOEDUCATIONAL PREVENTION PROGRAM

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Abstract

The main objective of this study is to investigate the effects of a mindfulness-based psychoeducation program on adolescents' levels of mindfulness and problematic online gaming. The study implemented a 2x3 (experimental group/control group X pre-test/post-test/follow-up test) experimental design. Data was obtained through the Internet Gaming Disorder Scale Short Form (IGDS9-SF) and the Mindful Attention Awareness Scale (MAAS). Adolescents in the experimental group took part in a mindfulness-based psychoeducation program that included one session per week for a total of eight sessions, whereas no intervention was provided to the participants in the control group. The data was analysed using two-way repeated measures ANOVA to see if there were statistically significant differences between measurements and groups. In accordance with the outcomes, the interaction between intervention and assessment (pre-test, post-test, and follow-up test) for the study's dependent variables, problematic online gaming and mindfulness, was significant. This data suggests that the participants' pre-test, post-test, and follow-up test scores were influenced at varying levels by their psychoeducation program. A Bonferroni-adjusted multiple comparison test was employed to determine the cause of the variations. The findings indicate that the mindfulness-based psychoeducation program performed well in decreasing participants' problematic online gaming levels while increasing their mindfulness levels.

Keywords: adolescents, problematic online gaming, mindfulness, psychoeducational program.

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Introduction

Games can be said to have an important role in the development of children. Children find the opportunity to develop their emotional, social, and cognitive skills and self-expression through playing (Sezen, 2013). The imaginary worlds created during play allow children to reveal their creativity and develop problem-solving skills (Akgül, 2019). Regarding the sustainability of development, it can be said that games have an important place in adolescents' daily lives. Therefore, games contribute to the development of individuals at various periods of their lives. Nowadays, it can be stated that traditional games have been replaced by online or offline games played with technological devices. Internet-based technologies and online games have become an essential means of leisure, especially for adolescents, showing their effects at every stage of people's lives. The spread of the Internet in every field has enabled distances to be overcome and online games to reach a wider audience. This situation has led to the emergence of a serious competitive race between game groups, professional game clubs, and professional national teams competing on online gaming platforms. The usage rates of online games worldwide and in Türkiye are also noteworthy. According to data from the Turkish Statistical Institute (TÜİK) (2022), 94.7% of children aged 6–15 regularly play online games at least once a week. In the 2023 report published by the Entertainment Software Association (ESA) in the USA, it is stated that people play games for an average of 12.8 hours per week regardless of gender, and 12% of these games are played on smartphones. Yıldırım (2018) conducted a study with adolescents and found that 56.3% of individuals access online games via smartphones, 21.2% via computers, and 9.6% via tablets. It's clearly stated that if these games are played without control and time limits, they may cause negative behaviours such as problematic online gaming (Lermi & Afat, 2020). In this study, problematic online gaming will be defined as a condition where an individual's online gaming behaviour negatively impacts social, psychological, and academic aspects (Ng & Wiemer-Hastings, 2005). This problematic online game playing may cause adolescents to neglect their daily life activities (Kaya, 2013). Supporting this view, studies in the literature indicate that problematic online game playing shows significant positive relationships with depression (Wei et al., 2012), anxiety, aggression (Mehroof & Griffiths, 2010), low academic achievement (Jiang, 2014), and low self-esteem (Younes et al., 2016).

A variety of terms have been used in the literature to describe the negative behaviours that are associated with online gaming. These include gaming addiction, gaming disorder, and problematic online gaming (Kuss et al., 2018; Škařupová & Blinka, 2016). As is commonly known, despite the creation of diagnostic criteria under the name "gaming disorder" in the International Classification of Diseases

(ICD) in 2016 (Balhara et al., 2020), the Diagnostic and Statistical Manual of Mental Disorders (DSM) (APA, 2013) does not yet include formal diagnostic criteria for this condition. At this point, strong criticisms of the criteria published by the ICD and DSM have been raised by scholars working in the field of gaming (Aarseth et al., 2016). These criticisms focus on the weak research base, the reliance of the current definitions on substance use and gambling addiction, and the lack of consensus on symptoms. It is also noted that formalizing this disorder could have negative medical, social, and human rights consequences, particularly leading to false positive diagnoses in children and adolescents. In addition, there have been concerns that research could become overly confirmatory, negatively impacting healthy gamers and potentially stigmatizing millions of children. Supporting this view, it is observed that the term problematic online gaming is frequently used in scales developed under the name of "Internet Gaming Disorder" (Canale et al., 2019; Chang et al., 2022; Colder-Carras & Kardefelt-Winther, 2018; Cudo et al., 2024; Vadlin et al., 2016). In this article, the term problematic online gaming is used, considering both the relevant concerns and the fact that the sample group has not received a diagnosis, as well as the absence of a medical diagnosis covering the content.

Problematic online gaming, which has become a global problem, affects a significant percentage of adolescents worldwide. In Norway, 1.4% of online gamers are identified as problem gamers in mental health, while 7.3% are considered problematic online gamers (Wittek et al., 2016). In Germany, 3% of online gamers are classified as problem gamers (Peukert et al., 2010). In the United States, 15% of young people who play online games are reported to be at risk of problematic online gaming (Tanner, 2007). In Türkiye, when examining the rates of problematic online gaming, it is revealed that adolescents show a high level of interest in this issue, with rates ranging from 3.7% (Arıçak et al., 2018) to 15.1% (Yiğit, 2017). It can be said that problematic online gaming has increased even more today. In a meta-analysis that included 18 scientific studies on problematic online gaming conducted in Asia, Han et al. (2022) compared the prevalence rates of problematic online gaming in the pre-pandemic and post-pandemic periods. The results show an increase from 2.3% to 29.4% in problematic online gaming following the pandemic. Moreover, while a study conducted in Indonesia in 2013 found that the prevalence rate of problematic online gaming was 10% (Jap et al., 2013), this rate increased to 27% by 2020 (Wiguna et al., 2020). When the results are evaluated, it appears that problematic online gaming may become a growing problem, and effective prevention programs are needed to address this issue.

The literature uses various therapies and interventions to prevent problematic gaming. These methods include behavioural therapy, cognitive behavioural therapy, mindfulness-based interventions, and cognitive behavioural therapy programmes developed specifically for problematic online gaming (Dong & Potenza, 2014; Torres-Rodrigues et al., 2018). A meta-analysis comparing 17 different

interventions for problematic online gaming shows that mindfulness-based interventions are more effective than cognitive behavioural therapy (Kim et al., 2022).

Mindfulness interventions, unlike other psychotherapy models, focus not on changing thoughts but on observing them without judgment (Kabat-Zinn, 2009). This approach helps individuals cope with their thoughts and emotions more healthily without resisting them. Since online games are frequently used as a form of entertainment (Hauge & Gentile, 2003), adolescents will likely resist quitting games. However, mindfulness, by its nature, is less likely to be rejected, potentially leading to more positive results compared to other therapy models. For instance, mindfulness-based interventions are commonly used to reduce stress (Brooks et al., 2021; Ma et al., 2022; Marciniak et al., 2020; Zhang et al., 2019). Another advantage of mindfulness is that it enables individuals to become aware of automatic thoughts generated by the body and mind, helping them avoid reactive behaviours. This can have a direct positive effect on habits performed automatically while gaming, such as drinking coffee or eating. Given the positive correlations between problematic online gaming behaviour and stress and anxiety (Canale et al., 2019; Che et al., 2017; Rajab et al., 2020), the experiential learning that adolescents gain through mindfulness may directly contribute to stress reduction, which in turn can decrease problematic online gaming levels.

Another theoretical model was presented by Scerri et al. (2019). This study consistently emphasizes the psychological needs for a better understanding of the underlying risk factors of problematic online gaming. According to this theory, while gaming offers a simple and accessible way to alleviate distress, relying on gaming to fulfil unmet psychological needs invites problematic use. Self-Determination Theory highlights the importance of three universal, intrinsic psychological needs: relatedness, competence, and autonomy. Supporting this theory, research indicates that in daily life, the need for competence, autonomy, and relatedness (Allen & Anderson, 2018; Bekir & Çelik, 2019; Mills et al., 2018), a sense of belonging (Saritepeci et al., 2023), and the need for compassion (Wong et al., 2024; Tang et al., 2023) are essential.

Considering the above studies and theoretical models, mindfulness-based interventions have been more effective (Lee & Cho, 2021) and more cost-effective (Bentley et al., 2022) than other interventions. In addition, in order to make mindfulness activities more effective, the inclusion of psychological needs that are highly related to online games in prevention sessions will make the study more effective. Considering that awareness-based interventions naturally increase individuals' awareness, these interventions may be more effective in reducing the levels of problematic online gaming. In this context, mindfulness-based interventions will be used in this study. The following hypotheses will be investigated within the scope of this research.

H1: Participants in the mindfulness-based psychoeducation group will demonstrate a greater decrease in problematic online gaming than the control group

at the post-test assessment, and this difference will persist at the three-month follow-up assessment.

H2: Participants in the mindfulness-based psychoeducation group will demonstrate a greater increase in mindfulness levels than the control group at the post-test assessment, and this difference will persist at the three-month follow-up assessment.

Method

This research aims to examine the effect of a mindfulness-based psychoeducation program on adolescents' mindfulness levels and problematic online gaming levels. A 2x3 (experimental/control groups x pre-test/post-test/follow-up test) experimental design was used in the study. This design includes a minimum of two factors to evaluate the effects on the dependent variable. One of these factors represents the different experimental treatment conditions that constitute the experimental and control groups, while the other represents the measurements (pre-test, post-test, and follow-up test) of adolescents taken at various time periods (Karasar, 2005).

Participants

The research was conducted in a high school in Türkiye during the 2023/24 academic year. Participants were selected at random from those who did not get psychological support or take any psychiatric medication and who played online games. A sample of 242 high school adolescents who volunteered to participate was selected for the study. In this study, 131 participants with a standard deviation above 1 were included to analyse the effect of the mindfulness-based programme on problematic online gaming, more specifically. Fischer and Milfont (2010) stated that individuals with a standard deviation above 1 could be selected to include those with higher scores on the applied psychological scale (i.e., high rates of problematic online gaming). In this study, the standard deviation of the participants was 1 or above. Of these, 46 agreed to participate in the psychoeducational study (male = 40, female = 6). Of these 46, only 26 were included in the study. To ensure equal gender representation, female participants were included directly, while only the first 20 male participants were included. Participants were placed in experimental and control groups based on IGDS9-SF score ranking. First, the males and then the females were distributed into groups. The male with the highest score was placed in Group 1, and the male with the second-highest score was placed in Group 2, and continued until each group had 13 participants. The groups were then randomly

assigned as experimental and control groups. Descriptive information on the 26 adolescents included in the study is provided in Table 1.

Table 1. Descriptive information about the experimental and control groups

		Group-1 (Experiment)	Group-2 (Control)	Total
Gender	Male	10	10	20
	Female	3	3	6
	Total	13	13	26
Game Type	MOBA	4	3	7
	FPS	6	6	12
	RTS	3	4	7
	Total	13	13	26
Grade	Preparatory C.	2	1	3
	9	6	5	11
	10	3	5	8
	11	2	2	4
From whom did he/she learn to play games?	To Yourself	2	2	4
	Friend	6	8	14
	Family	5	3	8
	Total	13	13	26

Preparatory Class: The first year after moving from middle school to high school. *MOBA:* Multiplayer Online Battle Arena, *FPS:* First-Person Shooter, *RTS:* Real-Time Strategy.

It was observed that many participants who agreed to take part in the study were male. This predominance is consistent with findings in the literature (Bilgin, 2015; Johansson and Götestam, 2004; Tazawa and Okada, 2001). Veltri et al. (2014) stated in their study that it is common for online game playing to be more prevalent among males, attributing this to game producers not making sufficient efforts to ensure gender equality and creating content that is particularly appealing to a male audience. Therefore, it was considered acceptable to have a higher number of male participants in the study, resulting in groups that were predominantly composed of males.

Data Collection Tools

In this study, the personal information form and two scales by the author were used to collect data.

Personal Information Form: This form consists of questions designed to obtain information about the participants' gender, grade, game type, from whom they learned to play games, and weekly playing time.

The Internet Gaming Disorder Scale Short Form (IGDS9-SF): This scale, developed by Pontes and Griffiths (2015), is used to analyse levels of problematic online gaming by measuring addictive tendencies. It was adapted for the

Turkish culture by Arıcağ et al. (2018). The research involved adolescents aged 10–19, and the scale was tested using confirmatory factor analysis (CFA), with fit indices reported as $\chi^2/df = 4.79$, CFI = 0.90, and RMSEA = 0.09. Research into the validity and reliability of the IGDS9-SF was conducted, and the results showed that it is a valid and reliable tool (Cronbach's alpha = 0.82).

The Mindfulness Awareness Scale (MAAS): The MAAS was developed by Brown (2003) and adapted for Turkish culture by Özyeşil et al. (2019). The MAAS measures differences in mindfulness and attention skills in relation to experiences. Confirmatory factor analysis confirmed one factor ($\chi^2/df = 1.69$, RMSEA = 0.57, TLI = 0.88, CFI = 0.90), and the scale's Cronbach's alpha reliability value was calculated as 0.82. Test-retest reliability is 0.86. Research into the validity and reliability of the MAAS was conducted, and the results showed that it is a valid and reliable tool.

Mindfulness-Based Psychoeducation Programme Prepared to Reduce the Level of Problematic Online Gaming

Purpose and General Features of the Programme: The mindfulness-based psychoeducation programme, designed to reduce the level of problematic online gaming, was planned as 8 sessions, each lasting 60-90 minutes, with at least one session per week. The programme aims to inform adolescents about the harms of online games, help them recognize their emotions, focus on the present moment, learn about autopilot behaviour, understand the triad of emotion, thought, and behaviour, and establish the relationship between gaming and needs such as achievement, autonomy, relatedness, self-compassion, and belonging. It also emphasizes the importance of habits in life. The purpose of the psychoeducation sessions and their titles are provided in Table 2

Table 2. Purpose of psychoeducational sessions

Session Title	Purposes
Introduction	• Facilitating group leader and members to get to know each other, • Increasing their mindfulness, • Familiarizing them with the psycho-education program aimed at reducing problematic online gaming levels, • Normalizing of games, • Recognizing emotions.
Here and Now	• Focusing on the present moment and learning to apply the concept of "autopilot" in their lives, • Recognizing when they are on autopilot while playing online games, • Becoming aware of missed opportunities while gaming.
E-T-B	• Understanding the triad of emotion, thought, and behavior (E-T-B), • Identifying negative automatic thoughts, • Grasping the importance of mindful sitting.

Session Title	Purposes
Psychological Needs	• Recognizing the need for achievement, autonomy, and relatedness (Psychological Needs), • Understanding the relationship between these needs and online gaming, • Setting weekly activities and goals, • Realizing the importance of acting mindfully.
Psychological Needs	• Introducing self-compassion and the need for belonging to school and family (Psychological Needs), • Understanding the relationship between these needs and online gaming.
Habits-1	• Understanding the importance of habits in life, • Recognizing habits associated with online gaming, • Realizing the significance of mindful eating.
Habits-2	• Understanding the importance of habits in life • Recognizing habits associated with online gaming, • Realizing the significance of mindful colouring.
Last session	• Evaluating the group process and expressing feelings about the process, • Assessing the extent to which group members have achieved their goals and expectations.

Process of Developing the Psychoeducation Program

This study was developed in response to the pressing need to address the problematic online gaming that has become increasingly widespread. To this end, a mindfulness-based psychoeducation programme was formulated as a means of intervention. It is widely accepted that mindfulness-based interventions are third-wave therapies, an extension of cognitive behavioral therapies (Hayes, 2004). They also exhibit significant variations in terms of their content, including acceptance, cognitive diffusion, and dialectical behaviour, among others (Hayes et al., 2004). In the field of mental health, the application of mindfulness techniques has been demonstrated in various programmes, including the Mindfulness-Based Stress Reduction Program (Kabat-Zinn, 1990), Mindfulness-Based Cognitive Therapy (Segal et al., 2002), and Dialectical Behavior Therapy (Linehan et al., 1999). Acceptance and Commitment Therapy (Hayes et al., 1999) is another example of this approach. Although cognitive behavioural therapies form the basis of this research, innovative and mindful interventions will also be included. Moreover, the research content comprised an in-depth examination of the philosophy, intervention techniques, exercises, applications, psychoeducation, and intervention programmes that form the foundation of mindfulness. Moreover, a review of the academic literature on problematic online gaming, which was the dependent variable of the study, was conducted. Recent research findings suggest that mindfulness-based group studies are frequently conducted in closed groups (Brown et al., 2020). In accordance with the information provided, it was determined that a closed group format would be the optimal study design. An examination of intervention programmes for the 12-17 age range revealed that 8-session programmes are commonly used for this age group (Johnson & Wade, 2019; Sun et al., 2021; Warnecke et al., 2011). The initial session began with the implementation of

normalising games and the recognition of emotions (Kököneyi et al., 2019; Park et al., 2016; Santos et al., 2016; Sakuma et al., 2017). The second session focused on automatic thoughts and moment-to-moment awareness, reflecting the fundamental stages of mindfulness (Kuyken et al., 2008; Li et al., 2017; Yao et al., 2017; Williams et al., 2006). The third session focused on the relationship between emotions, thoughts, behaviours, and games, and the identification of negative automatic thoughts (Chen & Jordan, 2020; Kuss et al., 2018). The fourth and fifth sessions focused on psychological needs, including achievement, autonomy, relatedness, self-compassion, and belonging. The sixth and seventh sessions focused on mindfulness-based interventions and changing frequently used habits to prevent problematic behaviours. The final session focused on the skills necessary for receiving feedback and saying goodbye (DeLucia-Waack, 2006; Trotzer, 2004).

Data Collection and Analysing

Before administering the measurement tools, the aims of the scientific study were explained, and the participants were informed about how to complete the measurement tools. The pre-test application of the scale was conducted online, while the other applications were carried out face-to-face. To determine which tests should be used in analysing the data, the data obtained from the IGDS9-SF and MAAS were considered. Multiple conditions must be met to determine whether the data obtained from the study show a normal distribution. The first of these is that the kurtosis and skewness values should be between +3 and -3, as stated by Tabachnick and Fidell (2007). To test the conformity of the data to the normal distribution, the skewness and kurtosis values of the experimental and control groups were calculated and are presented in Table 3.

Table 3. Standard deviation, arithmetic mean, kurtosis, kurtosis standard error, skewness, skewness standard error table

Scale	Group	Measuring	N	$\bar{x}$	SD	Kurt.	K. SE	Skew.	S.SE
IGDS9-SF	Experiment	Pre-Test	13	27.9	6.46	.51	1.19	-.48	.61
		Post-Test	13	21.4	4.57	-.32	1.19	-.89	.61
		Follow-up T.	13	24.0	4.88	1.94	1.19	-1.40	.61
	Control	Pre-Test	13	26.2	7.07	-.14	1.19	-.93	.61
		Post-Test	13	26.6	6.73	.14	1.19	-.90	.61
		Follow-up T.	13	27.5	5.91	.22	1.19	-.80	.61
MAAS	Experiment	Pre-Test	13	53.4	14.7	-.77	1.19	.40	.61
		Post-Test	13	64.7	8.28	-.53	1.19	.30	.61
		Follow-up T.	13	57.2	9.97	-.98	1.19	-.11	.61
	Control	Pre-Test	13	53.6	10.4	2.02	1.19	-.46	.61
		Post-Test	13	27.9	6.46	.51	1.19	-.48	.61
		Follow-up T.	13	21.4	4.57	-.32	1.19	-.89	.61

SD: Standard Deviation. N: Participants. $\bar{x}$: Arithmetic Mean. Kurt: Kurtosis. K. SE: Standard Error of Kurtosis. Skew: Skewness. S.SE: Skewness Standard Error.

When Table 3 is evaluated, it is seen that all test results obtained from the IGDS9-SF and MAAS meet the normality assumption. Since the number of participants was less than 50. The Shapiro-Wilk test was used (Elliot & Woodward, 2007). and the results are presented in Table 4

Table 4. Results of the Shapiro-Wilk normality test

Scale	Group	Measuring	<i>W</i>	N	<i>p</i>
IGDS9-SF	Experiment	Pre-Test	.964	13	.814
		Post-Test	.867	13	.057
		Follow-up T.	.858	13	.037
	Control	Pre-Test	.894	13	.109
		Post-Test	.889	13	.094
		Follow-up T.	.940	13	.460
MAAS	Experiment	Pre-Test	.944	13	.511
		Post-Test	.971	13	.908
		Follow-up T.	.968	13	.865
	Control	Pre-Test	.945	13	.526
		Post-Test	.917	13	.226
		Follow-up T.	.961	13	.767

Considering Table 4, it can be concluded that the pre-test, post-test, and follow-up test scores of the experimental and control groups' IGDS9-SF and MAAS pre-test, post-test, and follow-up test scores were normally distributed. To use parametric tests in the analysis of the data obtained from the measurements in the study, the kurtosis, skewness, and Shapiro-Wilk results must show homogeneity of variances (Levene's Test) (Pasin et al., 2016), covariances of groups must be equal for binary combinations of measurement sets (Box's M Test), and the sphericity condition (Mauchly's Test) must be tested (Leech et al., 2005). The results are presented in Table 5.

Table 5. Levene, Box's M and sphericity test results

Groups	Variables	Levene				Box's M			Test of Sphericity	
		F	<i>sd1</i>	<i>sd2</i>	<i>p</i>	Statistic	<i>F</i>	<i>p</i>	Mauchly's W	<i>p</i>
IGDS9-SF	Pre-Test	.68	1	24	.41	13.32	1.91	.078	.85	.15
	Post-Test	.34	1	24	.45					
	Follow-up T.	.42	1	24	.52					
MAAS	Pre-Test	1.12	1	18	.30	15.97	2.38	.057	.76	.05
	Post-Test	3.37	1	18	.08					
	Follow-up T.	.003	1	18	.95					

The Levene's test result ($p > .05$) in Table 5 shows that the variances of the experimental and control groups are equal in terms of IGDS9-SF and MAAS. Additionally, the Box's M test result ($p > .05$) indicates that the covariances of the

groups are equal for the binary combinations of the measurement sets. When the Mauchly test result ($p > .05$) is analysed, it is seen that the assumption of sphericity among the assumptions of ANOVA for Repeated Measures is met. As a result, in line with the hypotheses of the study, the repeated measures ANOVA test was used to test the effectiveness of the mindfulness-based psychoeducation programme prepared to reduce the level of problematic online game playing on the dependent variables (problematic online game playing level and mindfulness).

Findings

Preliminary Analyses: The independent samples t-test was used to compare the pre-test scores obtained from the IGDS9-SF and MAAS by participants in the experimental and control groups. The results of the analysis are presented in Table 6.

Table 6. Table of results for the pre-test mean scores of the IGDS9-SF and MAAS for the experimental and control groups.

Scales	Variables	N	$\bar{x}$	SS	t	p
IGDS9-SF Pre-Test	Experimental Group	13	27.9	6.46	.63	.53
	Control Group	13	26.2	7.07		
MAAS Pre-Test	Experimental Group	13	53.46	14.75	-.04	.76
	Control Group	13	53.69	10.45		

As seen in Table 6, there is no significant difference between the IGDS9-SF and MAAS mean scores of participants in the experimental and control groups ($p > .05$).

Findings Related to the Effect of the Mindfulness-Based Psycho-Education Programme on Adolescents' Problematic Online Gaming: In the study, the first hypothesis, "Participants in the mindfulness-based psychoeducation group will demonstrate a greater decrease in problematic online gaming than the control group at the post-test assessment, and this difference will persist at the three-month follow-up assessment," was tested using a 2x3 repeated measures analysis of variance. The results of the repeated measures analysis of variance (ANOVA) test for the average scores of the experimental and control groups on the IGDS9-SF are presented in Table 7.

Table 7: Analysis of variance (ANOVA) test for repeated measures

Source of Variance	Sums of Square	Df	Mean Square	F	p	η^2
Between Groups						
Experimental and Control Groups	100.16	1	100.16	16.05	.00	.24
Error	156.00	25	8.66			
Within Groups						
Measurement (Pre-test, Post-test, and Follow-up)	121.10	2	60.55	14.09	.00	.32
Group * Measurement T. Interaction	165.30	2	94.99	19.23	.00	.34
Error	206.25	48	4.93			

As seen in Table 7, when only the groups are considered independently of the measurements. A significant difference is found in the mean scores of the IGDS9-SF ($F_{1,24} = 16.051$; $p < 0.05$, $\eta^2 = 0.24$). When only the order of measurements is considered independently of the group variable. the IGDS9-SF scores of all participants change depending on the change in measurements ($F_{1,24} = 14.091$; $p < 0.05$, $\eta^2 = 0.32$). The group * measurement interaction results show that the mean IGDS9-SF scores differ between the experimental and control groups as the measurements (Pre-test, Post-test, Follow-up) change ($F_{1,24} = 19.235$; $p < 0.05$, $\eta^2 = 0.34$). 34% of the change in IGDS9-SF scores observed across the measurements between the groups is explained by the experimental procedure. A η^2 value greater than 0.14 indicates that the effect of the independent variable (the psycho-education program applied to the participants) is strong. To determine from which groups the difference in the intervention * measurement interaction originated, and in which direction this difference was. the Bonferroni test was applied. The findings are presented in Table 8.

Table 8. Bonferroni Test Results for IGDS9-SF Mean Scores

		Experiment Group			Control Group		
		Pre-Test Mean Difference (I-J)	Post-Test Mean Difference (I-J)	Follow-Up Test Mean Difference (I-J)	Pre-Test Mean Difference (I-J)	Post-Test Mean Difference (I-J)	Follow-Up Test Mean Difference (I-J)
Experiment Group	Pre-Test				1.69		
	Post-Test	-6.46*				-5.15*	
	Follow-up T.	-3.84*	2.61*				-3.46*
Control Group	Pre-Test						
	Post-Test				-.384		
	Follow-up T.				-1.30	-.923	

*p < .05

As seen in Table 8, the difference between the experimental group's IGDS9-SF pre-test mean score ($\bar{x} = 27.90$) and post-test mean score ($\bar{x} = 21.4$) was found to

be statistically significant ($-6.461^* p < .05$). The difference between the experimental group's post-test means score ($\bar{x} = 21.4$) and follow-up test mean score ($\bar{x} = 24.0$) was also significant ($2.615^* p < .05$). Another finding indicates that the difference between the experimental group's pre-test mean score ($\bar{x} = 27.90$) and follow-up test mean score ($\bar{x} = 24$) was significant as well ($-3.846^* p < .05$).

The findings related to the first hypothesis of the study show that the mindfulness-based psychoeducation program resulted in a statistically significant decrease in the IGDS9-SF mean scores of participants in the experimental group compared to those in the control group after the experimental intervention. Despite some increase, the effect of these decreases continued. Based on these findings, the first hypothesis of the research is confirmed. To support the first hypothesis of the study, an independent samples t-test was conducted to determine whether there was a statistically significant difference between the experimental and control groups in terms of online gaming durations (pre-test, post-test, and follow-up test). The results of the analysis are presented in Table 9.

Table 9. Mean Online Gaming Duration of Participants

		<i>N</i>	$\bar{x}$	<i>SD</i>	<i>t</i>	<i>p</i>
Pre-Test Online Gaming Duration	Experiment Group	13	13.0	3.02	-.19	.85
	Control Group	13	13.2	3.17		
Post-Test Online Gaming Duration	Experiment Group	13	7.77	2.16	-3.35	.00
	Control Group	13	11.3	3.22		
Follow-Up Test Online Gaming Duration	Experiment Group	13	8.85	2.34	-3.30	.00
	Control Group	13	12.2	2.86		

* $p < 0.05$

As seen in Table 9, there is no significant difference between the pre-test mean scores of the experimental and control groups in terms of online gaming duration ($p > .05$). However, significant differences are observed in the post-test and follow-up test scores. These findings support the results obtained from the IGDS9-SF mean scores.

Findings on the Effect of the Mindfulness-Based Psycho-Education Program on Adolescents' Mindfulness Levels: In the study, a 2x3 repeated measures analysis of variance (ANOVA) was conducted to test the second hypothesis, which states: " *H2: Participants in the mindfulness-based psychoeducation group will demonstrate a greater increase in mindfulness levels than the control group at the post-test assessment, and this difference will persist at the three-month follow-up assessment.*" The results of the repeated measures ANOVA test for the mean MAAS scores of the experimental and control groups are presented in Table 10.

Table 10. Analysis of variance (ANOVA) test for repeated measures

Source of Variance	Sums of Squares	<i>Df</i>	Mean Square	<i>F</i>	<i>p</i>	η ²
Between Groups						
Experimental and Control Groups	614.77	1	614.88	2.03	.04	.18
Error	7269.43	24	302.78			
Within Groups						
Measurement Times (Pre-test, Post-test, and Follow-up)	272.10	2	136.05	8.41	.00	.26
Group * Measurement T. Interaction	628.92	2	388.50	19.46	.00	.28
Error	775.64	48	16.15			

As seen in Table 10, when only the groups are considered independently of the measurements. a significant difference is found in the mean MAAS scores ($F_{1,24} = 2.030$; $p < 0.05$, $\eta^2 = 0.18$). When only the order of measurements is considered independently of the group variable. the MAAS scores of all participants change depending on the change in measurements ($F_{1,24} = 8.419$; $p < 0.05$, $\eta^2 = 0.26$). The group* measurement interaction results show that the mean MAAS scores differ between the experimental and control groups as the measurements (Pre-test, Post-test, Follow-up) change ($F_{1,24} = 19.460$; $p < 0.05$, $\eta^2 = 0.28$). 28% of the change in MAAS scores observed across the measurements between the groups is explained by the experimental procedure. A η^2 value greater than 0.14 indicates that the effect of the independent variable (the psycho-education program applied to the participants) is strong. To determine from which groups the difference in the intervention * measurement interaction originated and in which direction this difference was. the Bonferroni test was applied. The findings are presented in Table 11.

Table 11. Bonferroni Test Results for MAAS Mean Scores

MAAS - Bonferroni		Experiment Group			Control Group		
		Pre-Test Mean	Post-Test Mean	Follow-Up Test Mean	Pre-Test Mean	Post-Test Mean	Follow-Up Test Mean
		Difference (I-J)	Difference (I-J)	Difference (I-J)	Difference (I-J)	Difference (I-J)	Difference (I-J)
Experiment Group	Pre-Test				-.23		
	Post-Test	11.30*				13.30*	
	Follow-up T.	-3.76*	-7.53*				3.97*
Control Group	Pre-Test						
	Post-Test			-2.22			
	Follow-up T.			.230	2.00		

As seen in Table 11. the difference between the experimental group's MAAS pre-test means score ($\bar{x} = 53.46$) and post-test mean score ($\bar{x} = 64.76$) is significant ($11.307^* p < .05$). The difference between the experimental group's post-test means score ($\bar{x} = 64.76$) and follow-up test mean score ($\bar{x} = 57.23$) is also

significant ($-7.615^* p < .05$). Another finding indicates that the difference between the experimental group's pre-test mean score ($\bar{x} = 53.46$) and follow-up test mean score ($\bar{x} = 57.23$) is significant as well ($-3.979^* p < .05$).

The findings related to the second hypothesis of the study show that the mindfulness-based psychoeducation program resulted in a statistically significant increase in the MAAS mean scores of participants in the experimental group compared to those in the control group after the experimental intervention. Despite a slight decrease, the effect of this increase continued. Based on these findings, the second hypothesis of the research is confirmed.

Discussion

Discussion of Findings on the Effect of the Mindfulness-Based Psychoeducation Program on Adolescents' Problematic Online Gaming Levels:

An examination of the pre-test, post-test, and follow-up test scores of adolescents who participated in the mindfulness-based psychoeducation program revealed a decrease in problematic online gaming levels; however, an increase was observed during the three months following the completion of the experimental processes. When these follow-up test results are compared with the pre-test results, it is evident that the effect persisted. These findings support the hypothesis that "*Participants in the mindfulness-based psychoeducation group will demonstrate a greater decrease in problematic online gaming than the control group at the post-test assessment, and this difference will persist at the three-month follow-up assessment.*" The results of this study are consistent with findings from another research in the field (Li et al., 2017; Li et al., 2018; Yao et al., 2017).

The results of the present study indicate that, by the end of the psychoeducation process, the level of problematic online gaming among adolescents in the experimental group had decreased. These findings are believed to have been achieved by emphasizing the recognition of emotions (Kököneyi et al., 2019; Park et al., 2016; Santos et al., 2016), awareness of being on autopilot while playing online games (Kuyken et al., 2008; Williams et al., 2006; Wright et al., 2019), and the relationship between psychological needs and online gaming (Torres-Rodriguez et al., 2018) during the sessions of the current study.

The dynamics of online games encompass various emotional responses, such as attachment, coping with stress, loneliness in real life, compassion, and emotional avoidance (Boran & Sürücü, 2022; Oğuz & Şenel, 2022). These emotional responses create a foundation for adolescents to form attachments with in-game characters and to escape from real-life stressors (Gökmen, 2019). The multiplayer nature of online games inherently triggers a sense of competition among players (Yükçü & Kaplanoğlu, 2018). Over time, this sense of competition may intensify,

leading adolescents to participate in another online gaming community where they can find compassion and support, ultimately fostering a sense of belonging to that group (Bekir, 2018). As a result, adolescents may fulfill their needs for communication, belonging, compassion, and achievement through online games, thereby reducing the importance of these needs in real life (Özarslan & Perdahçı, 2023). In the present study, addressing the automatic thoughts that may arise from problematic online gaming and highlighting the differences between real-life successes and failures and those in games may have contributed to the reduction in adolescents' levels of problematic online gaming.

A significant finding of the present study is that problematic online gaming increased in the follow-up test after the post-test measurements in both the experimental and control groups. In the case of Turkey, the high school entrance exam (HSEE) system is implemented as a compulsory requirement for students to transition from middle school to high school. The examination system used to assess students employs a grading scale that categorizes students as high achievers or low achievers, with the highest score being 500 points. The lowest exam score attained by participants in this study was 375. Consequently, it can be stated that the participants exhibited characteristics of successful students to a certain extent. Although the literature often shows a negative relationship between academic achievement and online gaming (Anand, 2007; Drummond & Sauer, 2014; Şahin, 2016), it has also been suggested that online gaming has little impact on adolescents' academic success. Dağ et al. (2021) found that participants with high levels of problematic online gaming could also have high levels of academic achievement. The literature also shows strong negative relationships between academic achievement and academic procrastination (e.g., delaying studying for exams, not completing assignments on time, missing important academic tasks) (Çetin & Ceyhan, 2018). Given that the adolescents in this study were admitted to high school based on their scores, their academic success was likely high, leading to low levels of academic procrastination, and consequently, they may have waited until the completion of academic tasks before engaging in online gaming.

Supporting this view, the use of self-regulation strategies is positively associated with academic achievement (Paterson, 1996; Pintrich & DeGroot, 1990), suggesting that during periods of intense academic demands, adolescents may have focused on academic success and adjusted their online gaming time accordingly during leisure periods. Additionally, the preference for online gaming as a primary leisure activity among adolescents (Hazar et al., 2017), the perception of vacation as a time for online gaming (Biricik & Atik, 2021), and special events with record discounts organized by the world's largest gaming platform, STEAM, during the "Great Seasonal Sale" in June (STEAM, 2023) may have contributed to the increase in problematic online gaming levels.

In conclusion, although there was an increase in the follow-up test IGDS9-SF mean scores, significant differences in online gaming time between the

experimental and control groups were observed in the post-test and follow-up tests. These results suggest that the control group had higher online gaming times compared to the experimental group, supporting the first hypothesis.

Discussion of Findings on the Effect of the Mindfulness-Based Psychoeducation Program on Adolescents' Mindfulness Levels: An examination of the pre-test, post-test, and follow-up test scores of adolescents who participated in the mindfulness-based psychoeducation program designed to reduce problematic online gaming levels revealed an increase in mindfulness levels; however, a decrease was observed during the three months following the completion of the experimental processes. When these follow-up test results are compared with the pre-test results, it is evident that the effect persisted. These findings support the hypothesis that *"Participants in the mindfulness-based psychoeducation group will demonstrate a greater increase in mindfulness levels than the control group at the post-test assessment, and this difference will persist at the three-month follow-up assessment."* The results of this study are consistent with findings from other research in the field (Li et al., 2017; Li et al., 2018; Özçakmak-Altınay, 2023; Serap-Keçeli, 2017; Sharma et al., 2021).

The results of the present study indicate that the mindfulness levels of participants in the experimental group increased by the end of the psychoeducation process. These findings are believed to have been achieved through the mindfulness-based interventions applied during the psychoeducation sessions, which emphasized focusing on the present moment, learning and applying the concept of 'autopilot' in daily life (Kircaburun et al., 2019; Li et al., 2017; Mettler et al., 2020; Yao et al., 2017; Yu et al., 2018; Zajac et al., 2020; Zhang et al., 2019), mindful sitting, movement (Semple & Lee, 2008; Semple & Lee, 2014; Williams & Penman, 2011; Wright et al., 2019), mindful eating (Monroe, 2015; Kristeller & Epel, 2014), and the importance of mindful coloring (Carsley et al., 2015; Carsley & Heath, 2020).

In mindfulness-based interventions, topics such as body awareness (Surawy et al., 2015), the mind-body relationship (Kabat-Zinn, 1982), cognitive distortions (Güldal, 2019), and automatic thoughts are frequently addressed, using exercises like body scanning, sitting meditation, and focusing on bodily sensations (Carsley et al., 2015; Carsley & Heath, 2020; Kristeller & Epel, 2014; Monroe, 2015; Semple & Lee, 2008; Semple & Lee, 2014; Williams & Penman, 2011). These exercises form the foundation of mindfulness-based interventions (Hayes et al., 2004; Linehan et al., 1999; Segal et al., 2002). In the present study, the use of these activities may have contributed to participants' increased mindfulness by bringing automatic thoughts to the surface.

Another finding of the present study is that the mindfulness levels of both the experimental and control groups decreased in the follow-up test after the post-test measurements. There could be multiple reasons for the decrease in mindfulness scores observed in the follow-up tests. Mindfulness activities require personal introspection, deep reflection, and a focus on the present moment (Kabat-Zinn,

1990). Given that online games are filled with external rewards and entertainment-seeking elements, it might have been challenging for adolescents to maintain their focus on mindfulness-based activities. Another reason for the decrease could be that the psychoeducation intervention program primarily focused on online gaming, making it difficult to generalize the mindfulness gained to other areas of life. This situation might have led to an increase in mindfulness levels in the post-test, but a limitation and decrease in the follow-up tests.

Conclusion

The findings of this study demonstrate that the mindfulness-based psychoeducation program effectively increased mindfulness levels and reduced problematic online gaming behaviors among adolescents in the experimental group. By focusing on present-moment awareness, autopilot, and the integration of mindfulness practices such as mindful sitting, movement, eating, and colouring, the program helped participants enhance their mindfulness and decrease their engagement in problematic online gaming.

However, the follow-up tests revealed a decline in mindfulness levels after the program ended, suggesting that sustaining mindfulness practices over time may be challenging, particularly in the face of external distractions like online gaming. The decrease in mindfulness observed during the follow-up period highlights the need for continued support and reinforcement of mindfulness practices beyond the duration of the intervention.

Moreover, the study's focus on online gaming may have limited the generalization of mindfulness skills to other areas of the participants' lives, indicating that future programs should consider a broader application of mindfulness to enhance its long-term effectiveness. Despite these challenges, the overall results support the effectiveness of mindfulness-based interventions in promoting healthier behaviours among adolescents. Future research could explore strategies to maintain and reinforce mindfulness practices over time, ensuring that the benefits of such interventions are sustained in the long term.

Limitations

This study has several limitations that should be considered. Firstly, it was conducted exclusively with Turkish high school students, within a specific sample group and at selected schools. Additionally, the majority of participants were male, which is another limitation. Moreover, given Türkiye's cultural diversity, conducting the study within a single region presents a limitation. The researcher leading the

study holds a PhD and has a European-accredited cognitive behavioural therapy certification (EACBT) as well as a mindfulness-based cognitive therapy (MBCT) certification. This might raise questions about the program's applicability. It would be valuable to compare these findings with those obtained when the program is implemented by a trained professional.

Authors' Notes

This study is based on the author's doctoral thesis, completed under the supervision of Assoc. Prof. Dr. Filiz Gültekin.

Author's contribution: Conception: S.B., Design: S.B. Data collection: S.B., Analysis: S.B., Writing: S.B.,

Conflict of interest: The authors declare no conflict of interest.

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