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ORIGINAL ARTICLE

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A school-based self-regulation intervention for reducing digital game addiction symptoms and sleep deprivation in adolescents

BACKGROUND
This study evaluated the effectiveness of a school-based health education intervention grounded in self-regulation theory in reducing digital game addiction and sleep deprivation among middle school students.

PARTICIPANTS AND PROCEDURE
A pretest-posttest control group experimental design was used during the 2024-2025 academic year in Türkiye. A total of 102 high-risk students aged 10-14 (intervention: $n = 50$; control: $n = 52$) were selected from two public middle schools. The intervention consisted of four weekly classroom sessions targeting self-monitoring, goal-setting, time management, and sleep-related behaviors, supported by a seminar for parents and teachers. Data were collected using the Digital Game Addiction Scale for Children (DGAS-C) and the Sleep Deprivation Scale for Children and Adolescents (SDS-C/A).

RESULTS
Baseline comparisons showed no significant differences between groups. After the intervention, the intervention group demonstrated significant reductions in DGAS-C scores (85.05 to 72.18) and SDS-C/A scores (49.12 to 39.67) at post-test and three-month follow-up ($p < .001$). Large effect sizes were observed for both gaming addiction ($\eta^2 = .387$) and sleep deprivation ($\eta^2 = .245$), while no significant changes occurred in the control group.

CONCLUSIONS
A brief, theory-based school intervention effectively reduced digital game addiction severity measured by DGAS-C scores and improved sleep health in adolescents. Integrating structured self-regulation modules into routine school health curricula, supported by parent and teacher involvement, offers a feasible and scalable strategy for early prevention of problematic gaming behaviors and promotion of healthy sleep habits in adolescents.

KEY WORDS
adolescents; problematic gaming behavior; digital game addiction; sleep deprivation; self-regulation theory; health psychology

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BACKGROUND

With the rapid proliferation of digital technologies, online gaming has become one of the most common leisure activities among adolescents (Dağ et al., 2021; Peng et al., 2025a). Although digital games provide opportunities for entertainment and social interaction, excessive and uncontrolled use has led to the emergence of digital game addiction as a significant public health concern (Keskin & Aral, 2021; Peng et al., 2025b). The World Health Organization (WHO) has formally recognized this condition as gaming disorder in the ICD-11 and emphasized that adolescents are particularly vulnerable due to their developmental characteristics (Stevens et al., 2024; WHO, 2024). Ongoing cognitive development and limited self-regulation capacities increase adolescents' susceptibility to this form of behavioral addiction, with global prevalence estimates ranging between 2% and 10% (Kristensen et al., 2021; Stevens et al., 2024).

Particularly between the ages of 10 and 14, the prefrontal cortex is not yet fully matured, making adolescents more susceptible to the reward-based reinforcement mechanisms inherent in digital games and weakening impulse control (Arıcak, 2020; Panda, 2023). Deficiencies in executive functions – such as inhibitory control, working memory, and cognitive flexibility – have been shown to further compound these vulnerabilities, as they impair adolescents' ability to regulate goal-directed behavior and resist immediate rewards (Al-Qasem et al., 2026). Behavioral addiction theory suggests that excessive gaming behavior is maintained through these reward-based mechanisms, which gradually diminish individuals' self-regulation capacity (Griffiths, 2010). During this developmental period, excessive use of digital devices has been associated with multidimensional problems, including anxiety, depression, academic decline, and social isolation (Barańczuk et al., 2026; Mustafaoğlu & Yasacı, 2018; Peng et al., 2025a).

One of the most prevalent and physically harmful consequences of digital game addiction is sleep disturbance (Mustafaoğlu & Yasacı, 2018; Peng et al., 2025c). Prolonged screen exposure late at night disrupts circadian rhythm by suppressing melatonin secretion due to blue light emission (Kayhan Aygün et al., 2023; Nagare et al., 2019). Studies indicate that adolescents with problematic gaming behaviors experience longer sleep latency, frequent nighttime awakenings, reduced total sleep duration, and severe daytime sleepiness (Kawabe et al., 2019; Tereshchenko et al., 2021; Tuncay & Göger, 2022; Walker & Stickgold, 2006).

Grounded in self-regulation theory (SRT), this study is based on the principle that strengthening individuals' abilities to monitor, control, and regulate their own behaviors can reduce risky habits (Zimmerman, 2000). Digital game addiction is closely associated with impaired impulse control, while sleep behaviors are directly linked to general self-control mechanisms; therefore, the designed intervention aimed to enhance adolescents' capacity to manage these processes (Arıcak, 2020; Peng et al., 2025b). Schools provide the most suitable and effective settings for developing these theoretical skills due to their structured access to adolescents and opportunities for teacher and family involvement (Pakpour et al., 2022; Peng et al., 2025a). However, despite digital gaming being one of the most common online activities among youth in Türkiye, experimental school-based programs that simultaneously target digital game addiction and sleep problems remain scarce (Turkish Statistical Institute, 2024; Tuncay & Göger, 2022; Kayhan Aygün et al., 2023). To address this gap, the present study evaluated the effectiveness of a theory-based school health intervention designed to reduce digital game addiction and improve sleep health among middle school students.

PARTICIPANTS AND PROCEDURE

STUDY DESIGN AND PARTICIPANTS

This study employed a cluster randomized, pretest-posttest controlled experimental design and was conducted during the 2024-2025 academic year in a city in central Türkiye. The study was reported in accordance with the CONSORT 2010 statement and its extension for cluster randomized trials. This study was registered at ClinicalTrials.gov (NCT07423689) on 14 February 2026. The trial was retrospectively registered.

Among the six public middle schools located in the city center with similar sociodemographic characteristics, two schools were selected using a lottery method. Schools were used as the unit of randomization (cluster level). Following the random selection, one school was randomly assigned to the intervention arm (total enrollment = 1,025 students) and the other to the control arm (total enrollment = 920 students). The allocation process was conducted using a sealed-envelope technique by an independent individual not involved in the study to ensure allocation concealment and minimize selection bias.

Although randomization was performed at the school (cluster) level, outcome assessments and statistical analyses were conducted at the individual level. Given that only two clusters were included in the study, multilevel modeling or estimation of intracluster correlation coefficients was not statistically feasible. Baseline analyses confirmed that the intervention and control groups were comparable across sociodemographic and behavioral variables, supporting the appropriateness of individual-level analyses.

The study sample was drawn from 5th, 6th, and 7th grade students enrolled in the selected schools.

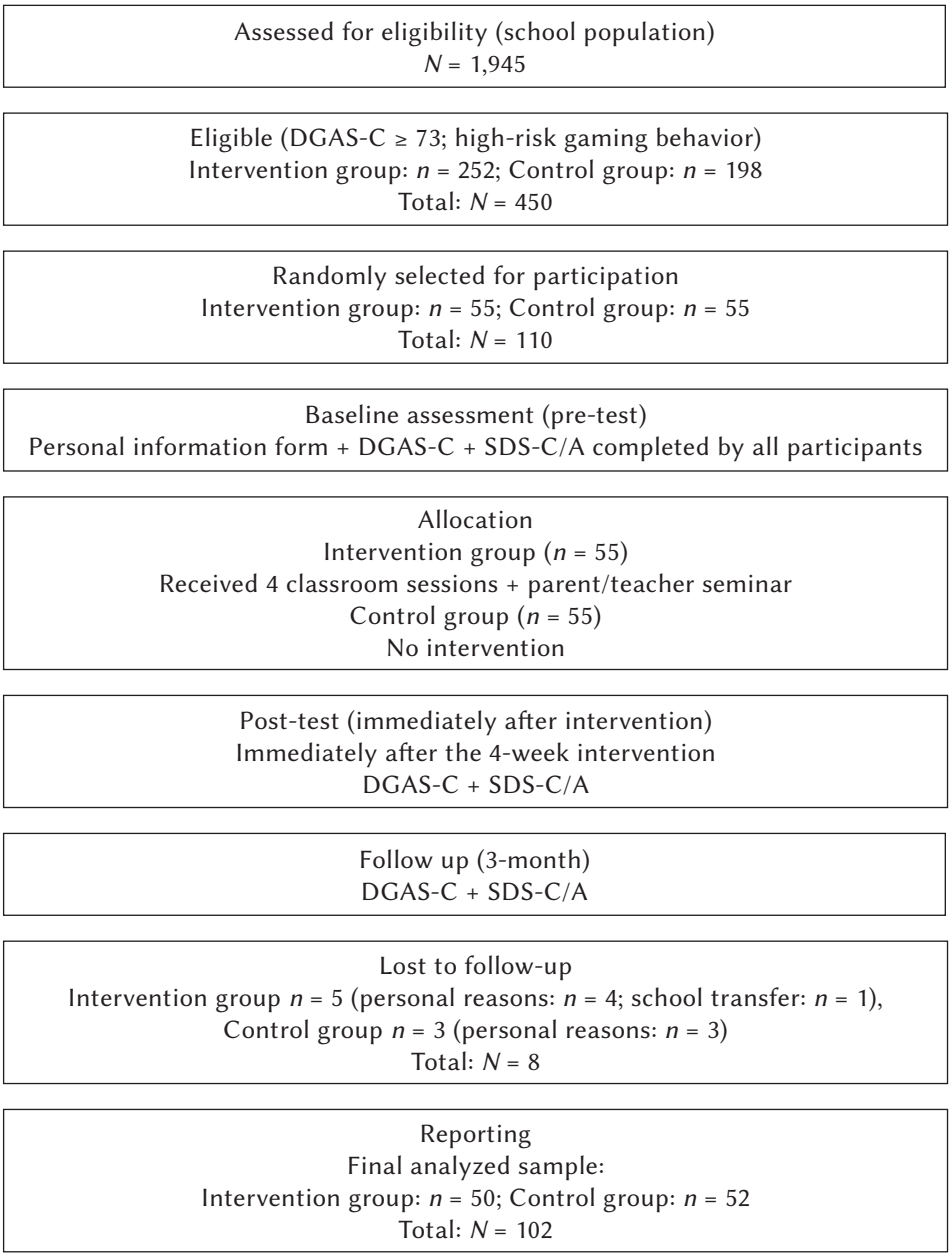
Eighth-grade students were excluded due to their national examination year and their decision not to participate. Students scoring in the high-risk category (≥ 73 points) on the Digital Game Addiction Scale for Children (DGAS-C) were considered eligible for inclusion. Among the 1,945 screened students, 252 from the intervention school and 198 from the control school met this criterion. From this pool, 55 students were randomly selected from each school using simple random sampling (lottery method), in which each eligible student was assigned a number and selections were made using a random number table, independently within each school to preserve the cluster structure. The detailed flow of participant selection, allocation, follow-up, and analysis is presented in the CONSORT diagram (Figure 1).

PILOT STUDY AND INTERVENTION REFINEMENT

A pilot study was conducted with 15 students from another public school to test the clarity, feasibility, and timing of the intervention sessions. Based on pilot feedback, minor revisions were made to the session flow. Pilot data were also used for power analysis.

Figure 1

CONSORT flow diagram



Note. DGAS-C – Digital Game Addiction Scale for Children; SDS-C/A – Sleep Deprivation Scale for Children and Adolescents.

SAMPLE SIZE CALCULATION

An a priori power analysis (two-tailed, $\alpha = 0.05$) based on a medium effect size ($d = 0.50$) indicated that at least 50 participants per group would be required to achieve 80% power. Allowing for potential attrition (approximately 10%), 55 participants were recruited for each group at baseline (total $N = 110$). During follow-up, 5 students in the intervention group and 3 students in the control group withdrew for personal reasons. Consequently, the final analyses were conducted with 50 participants in the intervention group and 52 participants in the control group (total $N = 102$).

INCLUSION AND EXCLUSION CRITERIA

Students aged 10-14 years who volunteered to participate, provided parental consent, and scored in the "high-risk" category (≥ 73 points) on the Digital Game Addiction Scale for Children (DGAS-C), indicating problematic gaming behavior, were included in the study. Students with a history of technology or gaming addiction treatment, a chronic neurological or psychiatric disorder, or lack of continuity during the study were excluded.

DATA COLLECTION PROCESS

Data were collected at three time points: baseline (pre-test), immediately after completion of the four-week intervention (post-test 1), and three months later (post-test 2). At baseline, written informed consent was obtained from the parents, and students were informed about the study procedures and confidentiality principles prior to participation. Subsequently, participants in both the intervention and control groups completed the personal information form, the DGAS-C, and the Sleep Deprivation Scale for Children and Adolescents (SDS-C/A).

After the intervention was delivered to the relevant group, the same instruments were administered again at post-test 1 to evaluate changes over time. All assessments were conducted during classroom hours by the researcher in collaboration with classroom teachers, and each data collection session lasted approximately 15-20 minutes. Post-test 2 was administered to each group three months later.

DATA COLLECTION INSTRUMENTS

Personal information form. The personal information form was developed by the researcher based on a review of the relevant literature addressing sociodemographic characteristics and digital gaming behaviors among children and adolescents (Eyimaya et al., 2020; Marufoğlu & Kutlutürk, 2021; Tuncay & Göger, 2022). The form consisted of 13 structured items assessing participants' age, gender, parental age, parental education level, perceived economic status, daily gaming duration, gaming device, gaming partner, sleep duration, sleep quality, and family conflict related to gaming behaviors. The instrument was used to describe baseline characteristics and to evaluate group comparability prior to the intervention.

Digital Game Addiction Scale for Children (DGAS-C). The Digital Game Addiction Scale for Children (DGAS-C) was developed and psychometrically validated by Hazar and Hazar (2017) to assess the severity of digital game addiction among children aged 10-14 years. The scale consists of 24 items rated on a 5-point Likert scale from 1 (*strongly disagree*) to 5 (*strongly agree*), with total scores ranging from 24 to 120. Higher scores indicate greater levels of digital game addiction. The original validation study reported satisfactory internal consistency (Cronbach's $\alpha = .86$) and demonstrated construct validity through factor analysis. In the present study, the internal consistency coefficient was high (Cronbach's $\alpha = .91$), indicating strong reliability within the current sample. In accordance with the developers' recommendations, only the total score was used to represent overall addiction severity.

Sleep Deprivation Scale for Children and Adolescents (SDS-C/A). The Sleep Deprivation Scale for Children and Adolescents (SDS-C/A) was developed and validated by Kandemir et al. (2021) to measure daytime sleep deprivation risk among school-aged children and adolescents. The scale is unidimensional and consists of 15 items rated on a 4-point Likert scale from 1 (*strongly agree*) to 4 (*strongly disagree*), with total scores ranging from 15 to 60. Higher scores indicate a greater risk of sleep deprivation. The original validation study demonstrated excellent internal consistency (Cronbach's $\alpha = .94$) and confirmed the scale's psychometric robustness. In the present study, the Cronbach's alpha coefficient was .91, indicating high internal reliability.

Both scales were previously developed and validated in Turkish populations, making them culturally appropriate for use in the present study.

INTERVENTION

The intervention was conducted in six classrooms at the intervention school, including two 5th-grade, two 6th-grade, and two 7th-grade classes. Eighth-grade students were not included due to their national examination year and their decision not to participate. All sessions were delivered face-to-face by the same researcher, a PhD-qualified Public Health Nursing specialist with expertise in addiction prevention, to ensure consistency.

The intervention was theoretically grounded in SRT. The program was designed to enhance adolescents' self-monitoring, self-control, goal-setting, and behavioral adjustment skills while increasing awareness of reward-based mechanisms underlying problematic gaming behavior.

The program consisted of two components:

- Four weekly classroom-based sessions (35-40 minutes each): These sessions addressed digital game addiction awareness, healthy technology use, time management, sleep-related behaviors, emotional regulation, and safe digital practices. Interactive behavioral techniques were used, including visual presentations, case scenarios, role-playing activities, guided imagery, and problem-solving exercises.
- A one-hour seminar for parents and teachers: Conducted prior to the intervention, this seminar aimed to increase awareness, provide guidance on monitoring gaming duration and sleep patterns, and reinforce supportive behaviors in both school and home environments.

The content of each session was systematically structured in accordance with the components of SRT. Each session progressively targeted specific self-regulation skills while increasing adolescents' awareness of the behavioral mechanisms underlying problematic gaming. The theoretical mapping of the session content is presented in Table 1.

Table 1 presents how each session was structured to develop specific self-regulation skills and targeted behavioral outcomes.

To ensure intervention fidelity, all sessions were delivered by the same researcher using standardized educational materials and a structured session plan. The duration and content of each session were strictly maintained across all classrooms. A checklist was used to monitor the implementation of each session, and adherence to the planned activities was verified immediately after each session. This procedure was applied to guarantee consistency of the intervention across different classes.

STATISTICAL ANALYSIS

Data were analyzed using IBM SPSS Statistics 25. Descriptive statistics (mean, standard deviation, frequency, and percentage) were calculated for all variables. Normality of the data distribution was assessed using skewness and kurtosis values, which were within the acceptable range (–2 to +2) (George & Mallery, 2010). Baseline differences between the intervention and control groups were examined using independent samples *t*-tests and chi-square tests where appropriate. Independent samples *t*-tests were used to compare mean scores between groups at each measurement point (pre-test, post-test, and follow-up). Within-group changes across time were evaluated using repeated measures ANOVA. Partial eta squared (η^2) was reported as an indicator of effect size (Cohen, 2013). Statistical significance was set at $p < .05$.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethical approval for this study was obtained from the Zonguldak Bulent Ecevit University Human Research Ethics Committee (Approval No. 565585; Date: 18 February 2024). Institutional permission was received from the Provincial Directorate of National Education. All procedures were conducted in accordance with the 1964 Declaration of Helsinki and its later amendments. Written informed consent was obtained from parents prior to participation, and all data were anonymised.

Table 1

Structure of the intervention sessions based on self-regulation theory

Session	Main topic	Self-regulation component	Methods used	Targeted behavioral outcome
Session 1	Awareness of digital game addiction and its consequences	Self-monitoring	Visual presentation, case examples, group discussion	Increasing awareness of problematic gaming behavior
Session 2	Time management and healthy technology use	Self-control, goal setting	Role-playing, problem-solving activities	Reducing daily gaming duration
Session 3	Sleep-related behaviors and evening routines	Behavioral adjustment	Guided imagery, scenario analysis	Establishing healthier nighttime routines and reducing bedtime gaming
Session 4	Emotional regulation and safe digital behaviors	Self-evaluation, behavioral adjustment	Group discussion, reflection exercises	Developing coping strategies and sustaining behavior change

RESULTS

Table 2 shows that there were no statistically significant differences between the intervention and control groups in terms of children's age, parents' age, gender distribution, parental education level, and perceived economic status ($p > .05$ for all variables). These findings indicate that the groups were sociodemographically comparable at baseline, supporting the internal validity of the study and reducing the likelihood that post-intervention differences were influenced by pre-existing characteristics.

As presented in Table 3, no statistically significant differences were observed between the groups regarding baseline sleep duration, sleep quality, daily gaming time, gaming partner, gaming device, or family conflict related to gaming ($p > .05$ for all variables). This homogeneity indicates that both groups had similar sleep and gaming behavior profiles prior to the intervention.

Baseline DGAS-C and SDS-C/A scores were similar between groups ($p > .05$). After the intervention, the intervention group showed significant and sustained reductions in both outcomes at post-test and follow-up, while the control group showed no change. Within-group analyses indicated large effect sizes for the intervention (DGAS-C $\eta^2 = .387$; SDS-C/A $\eta^2 = .245$). Between-group differences became significant after the intervention and increased at follow-up ($p < .001$), confirming the effectiveness of the program (Table 4).

DISCUSSION

This study aimed to evaluate the effect of a school-based health education program developed in accordance with SRT on digital game addiction and sleep deprivation among middle school students. The findings revealed that, following the four-week intervention and the three-month follow-up period, students in the intervention group demonstrated a statistically significant and progressive reduction in both digital game addiction scores and sleep deprivation scores.

Table 2

Baseline sociodemographic characteristics of participants

Variable	Intervention (n = 50)	Control (n = 52)	p
Age of children ($M \pm SD$)	12.45 ± 0.70	12.25 ± 0.50	.479
Age of parents ($M \pm SD$)	35.76 ± 1.15	33.07 ± 0.95	.368
Child gender, n (%)			.457
Male	35 (70.0)	38 (73.1)	
Female	15 (30.0)	14 (26.9)	
Parent gender, n (%)			.356
Female	45 (88.9)	42 (80.7)	
Male	5 (11.1)	10 (19.3)	
Mother's education, n (%)			.268
Primary/middle school	25 (50.0)	25 (48.1)	
High school	15 (30.0)	19 (36.5)	
University	10 (20.0)	8 (15.4)	
Father's education, n (%)			.796
Primary/middle school	45 (90.0)	42 (80.8)	
High school	3 (6.0)	8 (15.4)	
University	2 (4.0)	2 (3.8)	
Economic status, n (%)			.102
Good	10 (20.0)	8 (15.4)	
Middle	30 (60.0)	35 (67.3)	
Bad	10 (20.0)	10 (19.2)	

Note. Continuous variables were compared using independent samples t-tests, and categorical variables were compared using chi-square tests.

Table 3

Baseline sleep and digital gaming characteristics

Variable	Intervention (n = 50)	Control (n = 52)	p
Sleep duration, *n* (%)			.124
< 5 hours	18 (36.0)	16 (30.8)	
5-7 hours	22 (44.0)	25 (48.0)	
8-10 hours	10 (20.0)	11 (21.2)	
Sleep quality, *n* (%)			.274
Good	13 (26.0)	12 (23.1)	
Moderate	22 (44.0)	22 (42.3)	
Poor	15 (30.0)	18 (34.6)	
Daily gaming time, *n* (%)			.846
0-2 hours	10 (20.0)	12 (23.1)	
3-4 hours	25 (50.0)	28 (53.8)	
> 5 hours	15 (30.0)	12 (23.1)	
Gaming partner, *n* (%)			.694
Alone	8 (16.0)	10 (19.2)	
Real friends	26 (52.0)	28 (53.8)	
Online friends	16 (32.0)	14 (26.9)	
Gaming device, *n* (%)			.348
Computer/tablet	32 (64.0)	34 (65.4)	
Smartphone	10 (20.0)	12 (23.1)	
Game console	8 (16.0)	6 (11.5)	
Family conflict due to gaming, *n* (%)			.278
Yes	40 (80.0)	41 (78.8)	
No	10 (20.0)	11 (21.2)	

Note. Group differences were examined using chi-square tests.

The absence of significant changes in these parameters within the control group further confirms the effectiveness of the designed intervention program and supports the primary hypotheses of the study.

SELF-REGULATION AND COGNITIVE DEVELOPMENT IN DIGITAL GAME ADDICTION

The marked decline in digital game addiction scores observed in the intervention group from baseline to the three-month follow-up reflects the effectiveness of a theory-driven approach in facilitating behavioral change among adolescents. Given that the prefrontal cortex is not yet fully matured in individuals aged 10-14 years, adolescents are particularly vulnerable to the immediate reward mechanisms offered by digital games, which in turn complicates impulse control (Arıcak, 2020; Panda, 2023). Strengthening executive functions through structured training has been shown to reduce cognitive vulnerabilities such as anxiety and impaired self-control in adolescents (Al-Qasem et al., 2026). According to SRT, strengthening individuals' capacity to monitor, control, and regulate their own behaviors can lead to the reduction of risky habits (Zimmerman, 2000). The time-management and goal-setting techniques implemented in this study enabled adolescents to activate their cognitive control mechanisms and optimize the duration of their gaming activities.

IMPROVEMENT OF SLEEP DEPRIVATION AND UNDERLYING PHYSIOLOGICAL MECHANISMS

Another critical finding of the study was the significant reduction in sleep deprivation scores observed in

Table 4

Comparison of DGAS-C and SDS-C/A mean scores within and between groups

Outcome	Group	Pre-test *M* ± *SD*	Post-test *M* ± *SD*	Follow-up *M* ± *SD*	Within-group difference	η^2
DGAS-C score	Intervention	85.05 ± 8.25	78.45 ± 6.17	72.18 ± 6.54	$F = 30.93$, $p < .001$	.387
	Control	84.76 ± 9.10	84.28 ± 10.05	82.12 ± 5.56	$F = 1.04$, $p = .357$	.020
	Between groups	$t = 0.17$, $p = .866$	$t = -3.55$, $p < .001$	$t = -8.25$, $p < .001$		
SDS-C/A score	Intervention	49.12 ± 2.45	41.85 ± 7.56	39.67 ± 5.74	$F = 15.90$, $p < .001$	.245
	Control	48.57 ± 9.78	48.12 ± 8.85	47.68 ± 7.55	$F = 0.62$, $p = .541$	.012
	Between groups	$t = 0.39$, $p = .696$	$t = -3.85$, $p < .001$	$t = -6.05$, $p < .001$		

Note. DGAS-C – Digital Game Addiction Scale for Children; SDS-C/A – Sleep Deprivation Scale for Children and Adolescents. Independent samples *t*-tests were used for between-group comparisons at each time point. Within-group changes across time were evaluated using repeated measures ANOVA. Effect sizes are reported as partial eta squared (η^2).

the intervention group. Previous research has demonstrated a statistically significant positive association between digital game addiction and poor sleep quality, indicating that as addiction severity increases, sleep-related problems also intensify (Tuncay & Göger, 2022; Yılmaz & Hazar, 2025). Exposure to blue light emitted from screens during late evening hours is known to suppress melatonin secretion, which regulates circadian rhythm, thereby prolonging sleep onset latency (Kayhan Aygün et al., 2023; Nagare et al., 2019). Through the program, adolescents learned to limit technology use during evening hours, which may have contributed to the normalization of melatonin cycles and, consequently, improvements in sleep quality.

THE IMPORTANCE OF SOCIAL SUPPORT AND PARENTAL INVOLVEMENT

The sustained and progressively increasing effect observed at the three-month follow-up indicates that the program facilitated a lasting behavioral transformation. A critical component of this success was the inclusion of parents in the intervention process, enabling them to monitor their children's gaming duration and to create a supportive home environment that promotes healthy sleep hygiene. Previous studies emphasize that social support and psychological capital serve as significant protective factors for adolescent mental health and wellbeing, particularly in the face of stressful or adverse circumstances (Barańczuk et al., 2026). Similarly, the time spent with parents in play and educational activities constitutes one of the strongest protective factors against the risk of computer game addiction (Kayhan Aygün et al., 2023).

CONCLUSIONS AND RECOMMENDATIONS

In this study, which implemented a health education intervention grounded in SRT, adolescents in the intervention group demonstrated a statistically significant, progressively strengthening, and sustained improvement with large effect sizes in both digital game addiction severity (DGAS-C scores) and sleep deprivation levels over time, in contrast to the control group.

To prevent digital game addiction and promote sleep health among adolescents, theory-based school health interventions should be integrated into national policies. The sustainability of behavioral change can be enhanced by actively involving parents and teachers in monitoring processes, providing structured awareness training for families, and strengthening school–family collaboration. Considering global practices, legal regulations aimed at monitoring children's screen time should be planned, while simultaneously encouraging physical activities and group-based engagements that redirect digital energy toward healthier domains.

STRENGTHS AND LIMITATIONS

This study has several notable strengths. First, the intervention was explicitly grounded in self-regulation

theory, providing a strong theoretical framework that enhances the scientific rigor and interpretability of the findings beyond a simple educational program. Second, the school-based implementation within regular classroom hours ensured high ecological validity and demonstrated the feasibility of integrating such interventions into routine school health practices. Third, the use of a pretest–posttest control group design with a three-month follow-up strengthened the capacity for causal inference and allowed the evaluation of sustained effects over time. The objective selection and allocation of schools through a lottery and sealed-envelope method minimized selection bias. Additionally, the inclusion of only high-risk students (DGAS-C ≥ 73) allowed the intervention to be tested in a group with elevated digital game addiction scores. The incorporation of parents and teachers into the process further reinforced environmental support for behavior change, while the delivery of all sessions by the same researcher with fidelity monitoring ensured intervention consistency. Finally, the use of validated, reliable measurement tools and the observation of large effect sizes enhanced both the reliability and the practical significance of the results.

The study was conducted in only two public middle schools within a single city, which may limit the generalizability of the findings to different socio-cultural contexts. Furthermore, as the study employed a two-cluster design, it was not statistically feasible to estimate the intracluster correlation coefficient (ICC) or to apply multilevel modeling. Analyses were therefore conducted at the individual level, which may increase the risk of a Type I error by underestimating the clustering effect and potentially overestimating the significance of between-group differences. Future studies should include a larger number of school clusters to enable more rigorous multilevel analyses and to strengthen the generalizability of findings. Additionally, all study outcomes were measured using self-report scales, which may introduce response bias. The fact that the same researcher both delivered the intervention and collected the data may have increased the risk of expectancy bias, social desirability bias, and the Hawthorne effect. Future studies should consider blinded assessors, independent data collection, and objective measures to mitigate these potential sources of bias.

IMPLICATIONS FOR PRACTICE

The findings of this study provide important practical guidance for school health professionals, nurses, educators, and policy makers aiming to address digital game addiction and sleep problems among adolescents through feasible and theory-driven strategies.

First, the results demonstrate that self-regulation skills can be effectively taught within regular classroom settings without requiring complex infrastructure or extended program durations. A brief, four-session intervention integrated into the school timetable was sufficient to produce significant and sustained behavioral improvements. This indicates that similar programs can be readily incorporated into existing school health education curricula by school nurses, counselors, and teachers.

Second, the study highlights the critical role of schools as primary settings for early intervention for at-risk adolescents. Because adolescents spend a large portion of their day in school environments, school-based interventions offer a unique opportunity for systematic monitoring, guidance, and reinforcement of healthy digital habits. Implementing structured self-regulation–based modules within school health programs may serve as an effective preventive strategy before problematic gaming behaviors escalate into more severe levels of gaming-related problems.

Third, the inclusion of parents and teachers in the intervention process underscores the importance of a school–family partnership in sustaining behavioral change. Practical seminars for parents and teachers can enhance awareness, improve monitoring of gaming duration and sleep routines at home, and create a consistent supportive environment across settings.

Fourth, the improvement observed in sleep deprivation scores indicates that digital addiction interventions should not be limited to behavioral control alone but should also address sleep hygiene and circadian health. School health professionals can integrate sleep education into digital addiction prevention programs to maximize outcomes.

Finally, the structured, theory-based nature of this intervention provides a replicable model for national school health policies. Educational authorities and public health planners can adapt this program as a standardized module within adolescent health promotion frameworks, contributing to the prevention of problematic gaming behaviors and reduction of gaming-related risk factors at a population level.

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Disclosures

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The author declares no conflict of interest.

References

Al-Qasem, M. M., & Hamdan-Mansour, A. M. (2026). The effect of a training program in executive functions based on Anderson's model in reducing cognitive test anxiety. *Health Psychology Report, 14*, 133–140. https://doi.org/10.5114/hpr/191089

Arıcak, O. T. (2020, October 1). *What does game addiction lead to?* Yeşilay. Retrieved from https://yesilay.org.tr [accessed March 10, 2025]

Barańczuk, U., Goncikowska, K., Pisula, E., & Pisula, W. (2026). Adolescent wellbeing during the pandemic: The role of socioeconomic position, gender, psychological capital, and social support. *Health Psychology Report, 14*, 195–201. https://doi.org/10.5114/hpr/210092

Cohen, J. (2013). *Statistical power analysis for the behavioral sciences* (2nd ed.). Routledge.

Dağ, Y. S., Yayan, Y. Ö., & Yayan, E. H. (2021). The effect of children's game addiction levels on sleep and academic achievement during the COVID-19 process. *Journal of Dependence, 22*, 447–454. https://doi.org/10.51982/bagimli.930996

Eyimaya, A. O., Irmak, A. Y., & Erdoğan, S. (2020). Development and validation of the Digital Game Playing Evaluation Scale for adolescents. *Current Psychology, 39*, 2181–2192. https://doi.org/10.1007/s12144-018-9871-y

George, D., & Mallery, M. (2010). *SPSS for Windows step by step: a simple guide and reference* (17.0 update). Pearson.

Griffiths, M. D. (2010). The role of context in online gaming excess and addiction: Some case study evidence. *International Journal of Mental Health and Addiction, 8*, 119–125. https://doi.org/10.1007/s11469-009-9229-x

Hazar, Z., & Hazar, M. (2017). Çocuklar için dijital oyun bağımlılığı ölçeği [Digital Game Addiction Scale for Children]. *Journal of Human Sciences, 14*, 203–216. https://doi.org/10.14687/jhs.v14i1.4387

Kandemir, M., Bozdemir, E., Hayran, Y., & Tonga, Z. (2021). Sleep Deprivation Scale for Children and Adolescents. *Journal of Interdisciplinary Education: Theory and Practice, 3*, 48–61. https://doi.org/10.47157/jietp.875187

Kawabe, K., Horiuchi, F., Oka, Y., & Ueno, S. I. (2019). Association between sleep habits and problems and internet addiction in adolescents. *Psychiatry Investigation, 16*, 581–587. https://doi.org/10.30773/pi.2019.03.21.2

Kayhan Aygün, S., Başpınar, M. M., Güleç, S. G., & Basat, O. (2023). What is the role of computer game addiction in the sleep disturbance risk among children during the COVID-19 lockdown? A cross-sectional study. *Journal of Turkish Sleep Medicine, 10*, 91–97. https://doi.org/10.4274/jtsm.galenos.2022.60251

Keskin, G., & Aral, N. (2021). Digital game addiction in adolescents: Risk factors and protective roles of family. *Journal of Child and Adolescent Psychiatric Nursing, 34*, 240–248. https://doi.org/10.1111/jcap.12325

Kristensen, J., Larsen, S., & Getz, J. G. (2021). Problematic gaming and sleep: a systematic review and meta-analysis. *Frontiers in Psychiatry, 12*, 675237. https://doi.org/10.3389/fpsyt.2021.675237

Marufoğlu, S., & Kutlutürk, S. (2021). The effect of digital game addiction on physical activity and sleep habits in secondary school students. *Journal of Dependence, 22*, 114–122. https://doi.org/10.51982/bagimli.817756

Mustafaoğlu, R., & Yasacı, Z. (2018). The negative effects of digital game playing on children's mental and physical health. *Journal of Dependence, 19*, 51–58.

Nagare, R., Plitnick, B., & Figueiro, M. G. (2019). Effect of exposure duration and light spectra on nighttime melatonin suppression in adolescents and adults. *Lighting Research & Technology, 51*, 530–543. https://doi.org/10.1177/1477153517744243

Pakpour, A. H., Chen, C. Y., & Lin, C. Y. (2022). Effects of a transtheoretical model-based intervention on gaming addiction among adolescents: a randomized controlled trial. *Addictive Behaviors, 126*, 107146. https://doi.org/10.1016/j.addbeh.2021.107146

Panda, S. (2023). *The circadian code: Lose weight, supercharge your energy, and transform your health from morning to midnight*. The Kitap Publications.

Peng, P., Chen, Z. M., Ren, S. L., He, Y., Li, J. G., Liao, A. J., & Tang, J. S. (2025a). Internet gaming disorder and depression mediated by impaired resilience and sleep distress: a three-wave longitudinal study among Chinese adolescents. *Epidemiology and Psychiatric Sciences, 34*, e11. https://doi.org/10.1017/S2045796025000046

Peng, P., Chen, Z., Ren, S., He, Y., Li, J., Liao, A., & Liao, Y. (2025b). Trajectory of internet gaming disorder among Chinese adolescents: Course, predictors, and long-term mental health outcomes. *Journal of Behavioral Addictions, 14*, 846–860. https://doi.org/10.1556/2006.2025.00054

Peng, P., Jin, J., Chen, Z., Ren, S., He, Y., Li, J., & Liao, Y. (2025c). Impaired sleep quality mediates the relationship between internet gaming disorder and conduct problems among adolescents: a three-wave longitudinal study. *Child and Adolescent Psychiatry and Mental Health, 19*, 26. https://doi.org/10.1186/s13034-025-00889-2

Stevens, M. W. R., King, D. L., & Delfabbro, P. H. (2024). Clinical descriptions and diagnostic requirements for gaming disorder in ICD-11: Updated guidelines. *World Psychiatry, 23*, 78–86. https://doi.org/10.1002/wps.21162

Tereshchenko, S., Kasparov, E., Smolnikova, M., Shubina, M., Gorbacheva, N., & Moskalenko, O. (2021). Internet addiction and sleep problems among

Russian adolescents: a field school-based study. *International Journal of Environmental Research and Public Health, 18*, 10397. https://doi.org/10.3390/ijerph181910397

Tuncay, Y., & Göger, S. (2022). Investigating the relationship between digital game addiction and sleep quality in adolescents. *Journal of Turkish Sleep Medicine, 9*, 79–85. https://doi.org/10.4274/jtsm.galenos.2021.52207

Turkish Statistical Institute (2024). *Information and communication technology (ICT) usage survey on children 2024*. Retrieved from https://data.tuik.gov.tr [accessed February 20, 2025]

Walker, M. P., & Stickgold, R. (2006). Sleep, memory, and plasticity. *Annual Review of Psychology, 57*, 139–166. https://doi.org/10.1146/annurev.psych.56.091103.070307

World Health Organization (2024). *ICD-11: Gaming disorder*. Retrieved from https://icd.who.int [accessed January 15, 2025]

Yılmaz, H. İ., & Hazar, Z. (2025). Investigation of the relationship between digital game addiction and nutrition, exercise, and sleep deprivation in secondary school students. *Journal of Physical Education and Sport Sciences, 23*, 93–106. https://doi.org/10.33689/spormetre.1662636

Zimmerman, B. J. (2000). Attaining self-regulation: a social cognitive perspective. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 13–39). Academic Press.