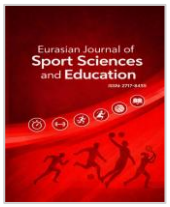
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Research Article

The Effect of the Level of Digital Addiction on University Students' Attitudes Toward Sports: The Mediating Role of Cognitive Flexibility

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Abstract

The present study aimed to examine the effect of university students' digital addiction levels on their attitudes toward sports and to determine the mediating role of cognitive flexibility in this relationship. The research was conducted using a quantitative, cross-sectional correlational design within a mediation framework. The sample consisted of 464 undergraduate students enrolled in different faculties at Dicle University and selected through convenience sampling. Data were collected using a Personal Information Form, the Digital Addiction Scale, the Cognitive Flexibility Inventory, and the Attitude Toward Sports Scale. The data were analyzed using SPSS. Descriptive statistics and Pearson correlation analyses were conducted, followed by multiple linear regression analysis to assess the simultaneous predictive effects of digital addiction and cognitive flexibility on attitudes toward sports. Mediation analysis was performed using Hayes' PROCESS macro (Model 4) with 5,000 bootstrap resamples to estimate indirect effects. The findings revealed a positive and statistically significant relationship between digital addiction and attitudes toward sports. Digital addiction was negatively associated with cognitive flexibility, whereas cognitive flexibility was positively related to attitudes toward sports. Bootstrap results indicated a statistically significant indirect effect of digital addiction on attitudes toward sports through cognitive flexibility. Overall, digital addiction was found to influence attitudes toward sports both directly and indirectly via cognitive flexibility. These findings highlight the importance of cognitive flexibility as a psychological mechanism in understanding sport-related attitudes within the context of increasing digital engagement.

Keywords: Digital addiction, attitudes toward sports, cognitive flexibility, university students.

INTRODUCTION

With the increasing prevalence of digitalization, individuals' daily life practices, communication patterns, and leisure activities have undergone a noticeable transformation. In particular, the widespread use of smartphones, social media platforms, online games, and easy access to digital content has led to a substantial increase in the amount of time individuals spend engaging with digital devices. This situation has brought the concept of digital addiction to the forefront, referring to conditions in which the use of digital tools becomes excessive and uncontrollable, thereby negatively affecting an individual's daily functioning (Young, 1998; Griffiths, 2005)Digital addiction is increasingly conceptualized within the broader rubric of behavioral addictions, insofar as it reflects a persistent pattern of dysregulated engagement with digital devices that is maintained despite negative consequences. This characterization can be grounded, first, in Griffiths' components model of addiction, which proposes core addiction features such as salience, mood modification, tolerance, withdrawal, conflict, and relapse—phenomena that can be mapped onto problematic digital use (Griffiths, 2005). Second, contemporary process-oriented accounts such as the I-PACE model frame problematic technology use as the outcome of interactions among person variables, affective and cognitive responses, and executive-control processes, which together foster impaired control and compulsive continuation (Brand et al., 2016; Brand et al., 2019). Accordingly, within these theoretical frameworks, digital addiction may be defined as a pattern of excessive and maladaptive digital device use that exceeds situationally appropriate limits, is accompanied by loss of control over frequency and duration, involves withdrawal-like negative affect (e.g., restlessness, irritability, or discomfort) when access is reduced, and persists despite clear adverse consequences in academic, occupational, social, or psychological functioning (Griffiths, 2005; Brand et al., 2016; Brand et al., 2019). As a result, individuals may encounter impairments in their academic performance, social relationships, and physical well-being (Griffiths, 2005). University students are considered a high-risk group for digital addiction due to their developmental characteristics, academic demands, and the

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fact that a substantial portion of their social interactions and educational activities are conducted through digital environments (Kuss & Griffiths, 2017).

Studies conducted in Türkiye similarly indicate that university students' levels of digital addiction have reached noteworthy levels and that this condition negatively affects their overall quality of life (Kesici & Tunç, 2018). One of the most significant consequences of digital addiction is the widespread adoption of a sedentary lifestyle, accompanied by a decline in physical activity levels. Prolonged screen time reduces the amount of time individuals allocate to sports and exercise, thereby increasing physical inactivity (Tremblay et al., 2011). However, participation in sports and regular physical activity plays a crucial role not only in improving cardiovascular health, musculoskeletal development, and body composition, but also in reducing stress, enhancing psychological well-being, and strengthening social integration (Biddle & Asare, 2011).

One of the primary variables determining university students' participation in sports is their attitude toward sports. Attitude is a multidimensional construct encompassing an individual's cognitive evaluations, affective responses, and behavioral tendencies toward a particular behavior (Ajzen, 2001). Attitudes toward sports specifically reflect individuals' perceptions of the physical, psychological, and social benefits of sport, as well as their willingness to engage in sporting activities. The literature clearly emphasizes that individuals with more positive attitudes toward sports are more likely to participate regularly in physical activity (Koçak, 2014). However, the increasing prevalence of digital addiction may contribute to the weakening of positive attitudes toward sports and reduce the priority given to sports in daily life. In examining the relationship between digital addiction and attitudes toward sports, individual psychological characteristics are thought to play a determining role. One such characteristic is cognitive flexibility, which is defined as an individual's capacity to adapt to changing conditions, generate alternative solutions, and restructure dysfunctional thought patterns (Martin & Rubin, 1995). Cognitive flexibility has been conceptualized as a key self-regulatory capacity that supports adaptive coping in the face of stressors and complex, changing demands, insofar as it entails shifting perspectives, generating alternative appraisals, and adjusting behavior when circumstances require it (Dennis & Vander Wal, 2010; Gabrys et al., 2018). This view is also consistent with process-oriented accounts of behavioral regulation, which emphasize that flexible updating of cognitive and behavioral strategies facilitates effective functioning under conditions of uncertainty and challenge (Tong et al., 2024). Accordingly, cognitive flexibility can be treated as a psychological resource that may help individuals respond more effectively to stressful and complex situations by enabling adaptive reappraisal and goal-directed adjustment (Dennis & Vander Wal, 2010; Gabrys et al., 2018).

Cognitive flexibility is defined as the ability to shift cognitive sets, consider alternative interpretations, and adapt thoughts and actions in response to changing situational demands (Dennis & Vander Wal, 2010). This capacity is theoretically relevant to self-regulation because it facilitates adaptive appraisal, problem solving, and behavioral adjustment under challenge. Within the proposed mediation model, cognitive flexibility is expected to operate as a psychological mechanism linking digital addiction to attitudes toward sports. Specifically, excessive and dysregulated digital use may be associated with reduced regulatory capacity and more rigid coping patterns, whereas higher cognitive flexibility may support goal-consistent choices, adaptive coping, and more favorable evaluations of health-promoting activities such as sport. Accordingly, cognitive flexibility is posited to partially account for how digital addiction is related to individuals' attitudes toward sports.

A review of the literature suggests that cognitive flexibility is inversely related to problematic forms of technology use, such that lower flexibility is associated with more rigid coping patterns and higher risk for problematic internet/smartphone engagement (Kaymaz & Şakiroğlu, 2020; Yılmaz, 2025). Conversely, higher cognitive flexibility—conceptualized as the capacity to generate alternative appraisals and adapt behavior to situational demands—has been linked to better self-regulatory functioning (Dennis & Vander Wal, 2010) and appears to operate alongside self-control/self-regulation processes in explaining lower levels of problematic smartphone/internet use (Kaymaz & Şakiroğlu, 2020). Building on this rationale, cognitive flexibility is plausibly positioned as a mediating mechanism through which digital addiction may relate to attitudes toward sports, insofar as reduced flexibility may undermine adaptive self-regulation and increase reliance on maladaptive digital engagement patterns, whereas greater flexibility may support more goal-consistent behavioral choices and more favorable orientations toward health-promoting activities.

Both national and international studies reveal that research simultaneously addressing digital addiction, cognitive flexibility, and attitudes toward sports remains limited. Existing studies have predominantly focused on the effects of digital addiction on academic achievement, psychological well-being, or social relationships, while insufficient attention has been given to attitudes toward sports and the mediating role of cognitive flexibility in this relationship. This gap underscores the necessity of examining these variables through a more comprehensive and integrative perspective.

The primary aim of the present study is to examine the direct effect of digital addiction on university students' attitudes toward sports and to investigate whether cognitive flexibility functions as a psychological mechanism that explains this relationship. Specifically, the study seeks to test a mediation model in which digital addiction predicts cognitive flexibility, which in turn predicts attitudes toward sports, thereby providing a theoretically grounded explanation of both direct and indirect pathways among these variables.

Based on the theoretical framework and empirical literature, the following hypotheses were formulated:

H_1: Digital addiction is positively related to attitudes toward sports.

H_2: Digital addiction is negatively related to cognitive flexibility.

H_3: Cognitive flexibility is positively related to attitudes toward sports.

H_4: Cognitive flexibility mediates the relationship between digital addiction and attitudes toward sports.

METHOD

Research model

This study was conducted within the framework of quantitative research methods, based on a cross-sectional and correlational survey design. The correlational survey model is a research design that aims to determine the degree and direction of co-variation between two or more variables (Karasar, 2012). In this model, variables are examined in their natural context without any experimental manipulation, and the relationships among them are tested through statistical techniques.

Since the present study aims to examine the effect of university students' levels of digital addiction on their attitudes toward sports and to determine the mediating role of cognitive flexibility in this relationship, a mediation model structured within the correlational survey framework was employed. A mediation model enables researchers to examine whether and to what extent the effect of an independent variable on a dependent variable is transmitted through a mediator variable. Although the causal steps approach proposed by Baron and Kenny (1986) represents an early framework for testing mediation, this approach has been criticized for its limited statistical power and its indirect assessment of the mediation effect. Contemporary mediation analysis primarily relies on regression-based path modeling combined with bootstrapping procedures to directly estimate indirect effects and construct bias-corrected confidence intervals (Hayes, 2018). Accordingly, the present study employed a bootstrap-based mediation analysis to provide a more robust and statistically reliable test of indirect effects. Accordingly, the study adopts a cross-sectional correlational research design of an explanatory and predictive nature, in which both the direct and indirect effects among the variables are tested.

Research groups / Sampling

The population of the study consists of undergraduate students actively enrolled in higher education institutions. In line with the research objectives, the population was restricted to undergraduate-level students.

The sample comprised 464 undergraduate students enrolled in different faculties and departments at Dicle University. Participants were selected using a convenience sampling method among students who voluntarily agreed to participate. This approach was preferred to ensure feasibility and access to diverse academic units within the institution.

To ensure the adequacy of the sample size, an a priori power analysis was conducted using G*Power software. Based on a medium effect size (f^2 = .15), an alpha level of .05, and a desired statistical power of .95 for multiple regression analysis with two predictors, the minimum required sample size was calculated as 107 participants. Accordingly, the final sample size of 464 exceeds the minimum requirement and provides sufficient statistical power to detect meaningful effects.

The findings of this study should be interpreted in light of certain limitations. First, the sample was limited to undergraduate students from a single institution (Dicle University), which may restrict the generalizability of the results to students from other universities or cultural contexts. Future studies may benefit from including multi-site samples to enhance external validity.

Collection of data

The data for the study were collected using an online survey method. Prior to the implementation, participants were informed about the purpose of the research, and it was clearly stated that participation was based on voluntary consent. In accordance with ethical principles, participants' identity information was kept confidential, and it was assured that the data obtained would be used solely for scientific purposes.

Data collection tools

Personal information form

The Personal Information Form, developed to determine the demographic characteristics of the participants, includes questions regarding age, gender, department of study, and grade level.

Digital Addiction Scale (DAS)

University students' digital addiction levels were measured using the Digital Addiction Scale (DAS) developed by Kesici and Fidan Tunç (2018). The scale consists of 19 items distributed across five sub-dimensions: Excessive Use, Lack of Control, Interference with Daily Life, Emotional State, and Dependence. It is structured on a five-point Likert-type format, with higher scores indicating higher levels of digital addiction. In the original scale development study, exploratory factor analysis revealed that the five-factor structure explained 59.51% of the total variance, and the overall internal consistency coefficient (Cronbach's alpha) was reported as .87. Furthermore, confirmatory factor analysis supported the factorial validity of the instrument by demonstrating acceptable model fit indices (Kesici & Fidan Tunç, 2018). For the present study, the internal consistency of the DAS was re-evaluated using data obtained from the current sample (N = 464). The Cronbach's alpha coefficient was calculated as .936, indicating excellent internal consistency. This finding provides strong evidence for the reliability of the scale within the current research context.

Cognitive Flexibility Inventory (CFI)

Participants' cognitive flexibility levels were assessed using the Cognitive Flexibility Inventory (CFI), originally developed by Dennis and Vander Wal (2010) and subsequently adapted into Turkish by Sapmaz and Doğan (2013). The instrument is designed to evaluate individuals' ability to generate alternative solutions in challenging situations, adapt to changing circumstances, and maintain a sense of control. The CFI consists of 20 items organized into two sub-dimensions: *Alternatives* and *Control*. The scale is administered using a five-point Likert-type format, and several items are reverse-coded. Higher total scores reflect greater cognitive flexibility. In the Turkish adaptation study, both exploratory and confirmatory factor analyses supported the preservation of the original two-factor structure. The two factors accounted for 49.67% of the total variance, and model fit indices were reported to be within acceptable ranges. Regarding reliability, the Cronbach's alpha coefficient was .90 for the total scale, .90 for the *Alternatives* subscale, and .84 for the *Control* subscale. The test–retest reliability coefficient for the overall scale was .75 (Sapmaz & Doğan, 2013). For the present study, the internal consistency of the CFI was recalculated using data from the current sample (N = 464). The Cronbach's alpha coefficient for the total scale was found to be .933, indicating excellent internal consistency. This result confirms that the scale demonstrates strong reliability within the context of the present research.

Attitude Toward Sports Scale (ATSS)

University students' attitudes toward sports were assessed using the Attitude Toward Sports Scale (ATSS), developed by Koçak (2014). The scale was designed to evaluate the perceptions and attitudes of university students enrolled in non-sport-related fields toward sports within a multidimensional framework. It consists of 22 items organized under three dimensions: psychosocial development, physical development, and mental development. The instrument uses a five-point Likert-type response format ranging from "Strongly disagree (1)" to "Strongly agree (5)," with higher scores indicating more positive attitudes toward sports. During the scale development process, exploratory factor analysis supported a three-factor structure explaining 50.35% of the total variance. Confirmatory factor analysis demonstrated acceptable to good model fit indices. In terms of reliability, the overall Cronbach's alpha coefficient was reported as .89, while the subscale alpha coefficients ranged between .77 and .87. Additionally, the Spearman–Brown split-half reliability coefficient was calculated as .83, indicating satisfactory internal consistency (Koçak, 2014). In the present study, the internal consistency of the ATSS was reassessed using data from the current sample (N = 464). The Cronbach's alpha coefficient for the total scale was calculated as .970, indicating excellent internal consistency. This finding provides strong evidence for the reliability of the instrument within the current research context.

Ethical approval

Prior to the commencement of data collection, ethical approval for this study was obtained from the Social and Human Sciences Ethics Committee of Dicle University. The research titled "Dijital Bağımlılık Düzeyinin Üniversite Öğrencilerinin Spora Yönelik Tutumu Üzerindeki Etkisi: Bilişsel Esnekliğin Aracılık Rolü" was evaluated in accordance with the Directive on Scientific Research and Publication Ethics of Higher Education Institutions and was deemed ethically appropriate. The approval was granted by the Rectorate of Dicle University following the decision of the Social and Human Sciences Ethics Committee dated 19.12.2025 and numbered 562 (Protocol No: 19/12/2025-562).

Data / Statistical analysis

All statistical analyses were conducted using SPSS. Prior to the main analyses, the distributional properties of the total scores obtained from the Digital Addiction, Cognitive Flexibility, and Attitude Toward Sports scales were examined. Skewness values ranged between −0.60 and 0.23, and kurtosis values ranged between 0.26 and 0.76. Since these values fell within the acceptable limits of ±1.5 (Tabachnick & Fidell, 2013), the distributions were considered sufficiently close to normal. Given the sample size (N=464), parametric statistical procedures were deemed appropriate. Before conducting regression analyses, the underlying assumptions were evaluated. Multicollinearity was assessed using Variance Inflation Factor (VIF) and tolerance statistics; VIF values were below 5 and tolerance values were above .20, indicating no multicollinearity problem. The Durbin–Watson statistic was 1.077, suggesting no violation of the independence of errors assumption. Linearity and homoscedasticity were examined through visual inspection of scatterplots and standardized residual plots, which showed no systematic pattern. Standardized residual values were also reviewed, and no cases exceeded ±3, indicating the absence of influential outliers. Descriptive statistics were computed to summarize the central tendencies and variability of the study variables. Pearson product–moment correlation analysis was then conducted to examine the relationships among digital addiction, cognitive flexibility, and attitudes toward sports. Multiple linear regression analysis was performed to determine the simultaneous predictive effects of digital addiction and cognitive flexibility on attitudes toward sports. To test the mediating role of cognitive flexibility, mediation analysis was conducted using Hayes' PROCESS macro (Model 4). Indirect effects were estimated using a bootstrapping procedure with 5,000 resamples, and 95% bias-corrected confidence intervals were calculated. An indirect effect was considered statistically significant if the confidence interval did not include zero. The significance level was set at .05.

Table 1. Normality findings of the variables included in the study

Variable	Mean	SD	Skewness	Kurtosis
Cognitive Flexibility (Total)	3.11	0.32	−0.11	0.74
Attitude Toward Sports (Total)	3.85	0.81	−0.60	0.76
Digital Addiction (Total)	3.09	0.78	0.23	0.26

The skewness and kurtosis values presented in Table 1 indicate that although the variables of digital addiction, cognitive flexibility, and attitudes toward sports do not fully meet the assumption of normal distribution, they fall within acceptable limits for conducting parametric analyses (Tabachnick & Fidell, 2013).

RESULTS

This section presents the findings regarding the relationships between university students' levels of digital addiction and their attitudes toward sports, as well as the mediating role of cognitive flexibility in this relationship. The results indicate that digital addiction demonstrates significant associations with attitudes toward sports and that cognitive flexibility partially explains this relationship.

Table 2. Demographic characteristics of the participants

Variable	Category	n	%
Gender	Male	119	25.6
	Female	345	74.4
Age Range	18–21	216	46.6
	22–25	196	42.2
	26 and above	52	11.2
Faculty / Department	School of Physical Education and Sports (SPES)	34	7.3
	State Conservatory / Fine Arts-Design	85	18.3
	Faculty of Arts and Sciences	124	26.7
	Faculty of Theology	11	2.4
	Other	210	45.3
Grade Level	1st Year	44	9.5
	2nd Year	114	24.6
	3rd Year	203	43.8
	4th Year	103	22,1
Participation in Sports	Yes	205	44.2
	No	259	55.8
	Total	464	100

Table 2 presents the sociodemographic characteristics of the participants (N = 464). Female students constituted 74.4% of the sample (n = 345), while male students represented 25.6% (n = 119). Regarding age distribution, 46.6% of participants were between 18–21 years (n = 216), 42.2% were between 22–25 years (n = 196), and 11.2% were aged 26 and above (n = 52). For descriptive purposes, age was categorized into three groups; however, age was treated as a continuous variable in inferential analyses. In terms of faculty/department, 7.3% of participants were enrolled in the School of Physical Education and Sports (SPES) (n = 34), 18.3% in the State Conservatory/Fine Arts-Design (n = 85), 26.7% in the Faculty of Arts and Sciences (n = 124), 2.4% in the Faculty of Theology (n = 11), and 45.3% in other faculties (n = 210). Although the Attitude Toward Sports Scale was originally developed for students in non-sport-related fields, students from the School of Physical Education and Sports were not excluded from the present study. Their inclusion was based on the aim of examining attitudes toward sports across different academic contexts. This should be considered when interpreting the findings in terms of construct comparability. With respect to grade level, 9.5% of participants were first-year students (n = 44), 24.6% were second-year students (n = 114), 43.8% were third-year students (n = 203), and 22.1% were fourth-year students (n = 103). Regarding participation in sports, 44.2% of students (n = 205) reported engaging in sports activities, whereas 55.8% (n = 259) reported not engaging in sports.

Table 3 presents the descriptive statistics for the Digital Addiction Scale, the Attitude Toward Sports Scale, and the Cognitive Flexibility Inventory, together with their respective sub-dimensions. For the Digital Addiction Scale, the highest mean score was observed in the Inability to Quit sub-dimension ($\bar{X}$ = 3.48; SD = 0.91), whereas the lowest mean score was found in the Interference with Daily Life sub-dimension ($\bar{X}$ = 2.92; SD = 0.96). The Emotional State sub-dimension yielded a mean of 2.94 (SD = 0.92), and the Relapse sub-dimension had a mean of 3.01 (SD = 1.01). The total mean score for digital addiction was 3.09 (SD = 0.78). Regarding the Attitude Toward Sports Scale, the Physical Development sub-dimension showed the highest mean score ($\bar{X}$ = 3.91; SD = 0.89), followed by the Psychosocial Development sub-dimension ($\bar{X}$ = 3.86; SD = 0.81). The Mental Development sub-dimension yielded a mean of 3.75 (SD = 0.95). The overall mean score of the scale was 3.85 (SD = 0.81). For the Cognitive Flexibility Inventory, the Alternatives sub-dimension had a mean of 3.39 (SD = 0.72), while the Control sub-dimension had a mean of 2.61 (SD = 0.63). The total mean score for cognitive flexibility was 3.11 (SD = 0.32). These values are reported descriptively within the observed score range of each scale.

Table 3. Descriptive statistics for the scales and sub-dimensions used in the study

Variable / Scale	Sub-Dimension	N	Min	Max	Mean ($\bar{X}$)	SD
Digital Addiction Scale	Excessive Use	464	1.00	5.00	3.14	0.89
	Relapse	464	1.00	5.00	3.01	1.01
	Interference with Daily Life	464	1.00	5.00	2.92	0.96
	Emotional State	464	1.00	5.00	2.94	0.92
	Inability to Quit	464	1.00	5.00	3.48	0.91
	Total Score	464	1.00	5.00	3.09	0.78
Attitude Toward Sports Scale	Psychosocial Development	464	1.00	5.00	3.86	0.81
	Physical Development	464	1.00	5.00	3.91	0.89
	Mental Development	464	1.00	5.00	3.75	0.95
	Total Score	464	1.00	5.00	3.85	0.81
Cognitive Flexibility Inventory	Alternatives	464	1.00	5.00	3.39	0.72
	Control	464	1.29	4.43	2.61	0.63
	Total Score	464	2.00	3.90	3.11	0.32

Table 4. Pearson correlation coefficients between digital addiction, cognitive flexibility, and attitude toward sports

Variables	1	2	3
1. Cognitive Flexibility (CFI Total)	—	.200**	−.129**
2. Attitude Toward Sports (ATSS Total)		—	.153**
3. Digital Addiction (DAS Total)			—

p < .01. N = 464

An examination of Table 4 shows that the bivariate relationships among digital addiction, cognitive flexibility, and attitudes toward sports were assessed using Pearson correlation analysis. The findings indicate a positive and statistically significant relationship between digital addiction and attitudes toward sports ($r = .153$, $p < .01$). In contrast, a negative and significant relationship was identified between digital addiction and cognitive flexibility ($r = -.129$, $p < .01$). Furthermore, a positive and statistically significant association was found between cognitive flexibility and attitudes toward sports ($r = .200$, $p < .01$). When these results are considered collectively, it is evident that digital addiction demonstrates significant relationships with both attitudes toward sports and cognitive flexibility. Moreover, the association between cognitive flexibility and attitudes toward sports appears to be relatively stronger. In other words, an increase in digital addiction levels tends to be associated with a decrease in cognitive flexibility, whereas higher levels of cognitive flexibility are linked to more positive attitudes toward sports. In order to further examine the direction and predictive effect of these relationships identified through correlation analysis, a simple linear regression analysis was conducted to determine the predictive effect of digital addiction on attitudes toward sports, and the results are presented in Table 5.

Table 5. Multiple regression analysis predicting attitudes toward sports

Variables	B	SE	β	t	p
Constant	1.502	.406	—	3.700	< .001
Digital Addiction (DAS Total)	.187	.047	.181	4.006	< .001
Cognitive Flexibility (CFI Total)	.569	.116	.223	4.929	< .001

Model Summary: $R = .269$ $R^2 = .072$ Adjusted $R^2 = .068$ $F(2, 461) = 17.93$, $p < .001$ Durbin–Watson = 1.077

Table 5 presents the results of the multiple regression analysis conducted to examine the simultaneous predictive effects of digital addiction and cognitive flexibility on attitudes toward sports. The overall model was statistically significant, $F(2, 461) = 17.93$, $p < .001$, explaining 7.2% of the variance in attitudes toward sports ($R^2 = .072$). When both predictors were included in the same model, digital addiction ($B = .187$, $SE = .047$, $\beta = .181$, $t = 4.006$, $p < .001$) and cognitive flexibility ($B = .569$, $SE = .116$, $\beta = .223$, $t = 4.929$, $p < .001$) were found to be significant predictors. These findings indicate that each variable contributes uniquely to the prediction of attitudes toward sports when their effects are estimated simultaneously within a unified model. A mediation analysis was conducted using PROCESS macro (Model 4) with 5,000 bootstrap samples to examine whether cognitive flexibility transmitted the effect of digital addiction on attitudes toward sports. The indirect effect was statistically significant, as the 95% bootstrap confidence interval did not include zero. This indicates that digital addiction exerts an indirect effect on attitudes toward sports through cognitive flexibility. The magnitude and statistical significance of the indirect effect support the presence of a mediating mechanism, as estimated through bootstrap-based confidence intervals. A mediation analysis was conducted using PROCESS macro (Model 4) with 5,000 bootstrap samples to examine whether cognitive flexibility transmitted the effect of digital addiction on attitudes toward sports. The indirect effect was statistically significant, as the 95% bootstrap confidence interval did not include zero. This indicates that digital addiction exerts an indirect effect on attitudes toward sports through cognitive flexibility. The magnitude and statistical significance of the indirect effect support the presence of a mediating mechanism, as estimated through bootstrap-based confidence intervals.

Table 6. Mediation analysis between digital addiction, cognitive flexibility, and attitude toward sports (Bootstrap = 5000)

Effect Type	B (Unstandardized)	SE	t	p	95% CI (LL–UL)	Standardized β
X → M (a)	−0.052	0.019	−2.79	0.006	−0.089 – −0.015	−0.129
M → Y (b)	0.569	0.116	4.93	< 0.001	0.342 – 0.796	0.223
X → Y (c', direct)	0.187	0.047	4.01	< 0.001	0.096 – 0.279	0.181
X → Y (indirect via M)	−0.030	0.014	—	—	−0.057 – −0.002	−0.029

Note: *X = Digital Addiction, M = Cognitive Flexibility, Y = Attitude Toward Sports. Bootstrap sample size = 5000, 95% confidence interval.*

According to the mediation analysis results presented in Table 6, digital addiction has a negative and statistically significant effect on cognitive flexibility (path a: B = −0.052, p = .006), while cognitive flexibility positively and significantly predicts attitudes toward sports (path b: B = 0.569, p < .001). The direct effect of digital addiction on attitudes toward sports (path c′) remains statistically significant even after cognitive flexibility is included in the model (B = 0.187, p < .001). In addition, the indirect effect of digital addiction on attitudes toward sports through cognitive flexibility was found to be statistically significant (B = −0.030; 95% CI [−0.057, −0.002]). The fact that the confidence interval does not include zero indicates that cognitive flexibility plays a partial mediating role in this relationship. In other words, while digital addiction directly influences attitudes toward sports, it also exerts an indirect effect by decreasing cognitive flexibility, which in turn affects attitudes toward sports. This finding suggests that cognitive flexibility may be considered a critical psychological mechanism in understanding the attitudinal outcomes associated with digital addiction. Overall, when the findings presented in this section are evaluated collectively, it can be concluded that digital addiction has both direct and indirect effects —through cognitive flexibility— on university students' attitudes toward sports. While correlation and regression analyses reveal the direction and strength of the relationships among the variables, the mediation analysis demonstrates that cognitive flexibility assumes a partial mediating role in this association. These results indicate that the relationships among digital addiction, cognitive flexibility, and attitudes toward sports exhibit a multidimensional structure.

DISCUSSION AND CONCLUSION

In the present study, the relationship between university students' levels of digital addiction and their attitudes toward sports was examined, along with the mediating role of cognitive flexibility in this relationship. When the findings are considered as a whole, it becomes evident that the association between digital behavioral patterns and attitudes toward sports cannot be explained through a single-directional or single-mechanism perspective. Digital technologies appear to influence cognitive and affective processes related to sports through both risk pathways (e.g., problematic use, attentional fragmentation, and increased sedentariness) and opportunity pathways (e.g., access to exercise information and planning tools, social support, and motivational content) (Tremblay et al., 2017; Owen et al., 2010; Angosto et al., 2023).

The positive and significant relationship identified between digital addiction and attitudes toward sports may initially seem inconsistent with the widely reported link between problematic digital use and increased sedentary behavior. Indeed, prolonged screen time and sedentary behavior have been strongly associated with adverse health outcomes, including increased mortality risk, and are considered independent health risk factors (Katzmarzyk et al., 2009; Owen et al., 2010). However, recent evidence suggests that digital environments can also generate motivational and social mechanisms that promote sport participation among young adults. Research on fitness application adoption and usage intention indicates that perceived usefulness and app features may enhance engagement, while fitness-related social media use may positively influence exercise behavior through psychological mediators (Angosto et al., 2023). Similarly, exposure to fitness-related content and social comparison processes has been shown to shape users' beliefs and attitudes toward physical activity (Kim, 2022). Therefore, the positive association observed in this study may be explained by the possibility that, for some students, digital platforms strengthen sport-related attitudes through content access, community engagement, and self-monitoring opportunities. Importantly, this interpretation does not imply causality but rather suggests that digital use can also be embedded within sport-related ecosystems.

Another key finding of the study is the negative association between digital addiction and cognitive flexibility. This result aligns with theoretical and empirical evidence suggesting that problematic digital or internet use may strain self-regulation and cognitive control processes (Beard & Wolf, 2001). Cognitive flexibility is conceptualized as a capacity associated with executive functions, including the ability to perceive alternative solutions, adapt to changing conditions, and maintain cognitive set shifting (Martin & Rubin, 1995; Dennis & Vander Wal, 2010). Studies conducted in Turkish samples have similarly reported that problematic internet use negatively predicts cognitive flexibility and that coping strategies may play a role in this relationship (Erdem, 2022). More recent findings also support the inverse association between problematic internet use and cognitive flexibility (Yazıcı Çelebi, 2025). Within this framework, uncontrolled digital use may weaken flexible thinking through mechanisms such as constant exposure to stimuli, attentional fragmentation, and increased task-switching costs.

The positive relationship identified between cognitive flexibility and attitudes toward sports is also theoretically meaningful. Participation and persistence in sports require not only motivation but also executive and cognitive processes such as planning, overcoming barriers, generating alternative strategies, and sustaining goal-directed behavior. Therefore, cognitive flexibility can be conceptualized as a psychological resource that supports positive attitudes toward sports (Dennis & Vander Wal, 2010;

Martin & Rubin, 1995). Furthermore, research indicating that problematic digital use increases sedentary behavior, that increased sedentary time negatively affects physical activity behaviors, and that smartphone addiction is negatively associated with quality of life and activity indicators in university samples indirectly supports this line of reasoning (Katzmarzyk et al., 2009).

One of the central findings of the present study is that cognitive flexibility transmits the effect of digital addiction on attitudes toward sports through a statistically significant indirect pathway. Contemporary mediation research emphasizes interpreting mediation effects based on the magnitude and significance of indirect effects rather than categorical labels (Hayes, 2018). In this context, the findings suggest that increased digital addiction is associated with lower levels of cognitive flexibility, which in turn relates to less favorable attitudes toward sports.

This pattern can be interpreted within the framework of self-regulation theory, which posits that excessive engagement in immediately rewarding digital activities may deplete executive control resources and impair adaptive cognitive functioning (Baumeister & Vohs, 2007). Empirical studies conducted in recent years have shown that problematic digital use is associated with diminished executive functioning, attentional control difficulties, and reduced cognitive flexibility among young adults (Dong, Wang, Du, & Potenza, 2019; Zhou, Li, & Zhu, 2021). These findings support the notion that digital overuse may undermine higher-order cognitive processes necessary for adaptive behavioral regulation.

Furthermore, the association between cognitive flexibility and attitudes toward sports can be interpreted through Cognitive Appraisal Theory (Lazarus, 1991), which emphasizes that individuals' evaluations of activities depend on how they cognitively interpret situational demands. Individuals with higher cognitive flexibility may be more likely to appraise sports participation as an opportunity for growth, social interaction, and well-being, whereas reduced flexibility may constrain such adaptive interpretations. Recent research has demonstrated that cognitive flexibility is positively related to health-promoting behaviors and adaptive lifestyle choices among university students (Martin & Rubin, 1995).

In addition, the indirect pathway observed in this study extends beyond the traditional displacement hypothesis, which argues that time spent in digital environments may replace engagement in offline activities such as sports (Putnam, 2000). While behavioral displacement remains relevant, the present findings indicate that cognitive-psychological mechanisms may also play a role. That is, digital addiction may influence attitudes toward sports not only by reallocating time but also by altering cognitive resources necessary for adaptive evaluation and engagement.

Taken together, these findings suggest that the relationship between digital addiction and attitudes toward sports cannot be reduced to a purely behavioral explanation. Rather, it appears to involve an interplay between behavioral patterns and cognitive-regulatory processes, highlighting the importance of addressing cognitive flexibility in interventions aimed at promoting positive attitudes toward sports among university students.

As a result of this study, interventions targeting the digital lives of university students should not remain limited to reducing screen time alone; rather, they should incorporate components that strengthen cognitive flexibility alongside digital self-regulation skills, including alternative planning, cognitive reappraisal, and goal–obstacle management. Furthermore, although digital environments may generate risks, they can also provide a supportive ecosystem that fosters positive attitudes toward sports when designed and utilized appropriately. In this regard, evidence indicating that fitness applications and sport-oriented social media content are associated with motivational processes is particularly noteworthy.

Several limitations of the present study should be acknowledged to ensure a transparent interpretation of the findings. The sample reflects a notable gender imbalance, with female students constituting the majority of participants (74.4%). This disproportionate distribution may have influenced the observed relationships among digital addiction, cognitive flexibility, and attitudes toward sports, particularly given that previous research indicates potential gender differences in digital behavior patterns and sport-related attitudes. A more balanced gender distribution in future studies would enhance the representativeness and robustness of the findings. The data were collected exclusively from undergraduate students at Dicle University. Although participants represented different faculties and departments, limiting the study to a single institution constrains the generalizability of the results to other university populations. Research conducted across multiple institutions and educational contexts would provide stronger external validity and allow for broader comparisons. Cultural and contextual dynamics may also shape the associations identified in this study. Digital technology use patterns, norms surrounding sport participation, and cognitive–behavioral tendencies can vary across sociocultural environments. The findings should therefore be interpreted within the specific cultural context in which the research was conducted, and replication studies in diverse cultural and educational settings are warranted.

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Authors' Contribution:

Conceptualization – E.O, H.K.**; Data curation –** M.A., F.K.**; Formal analysis –** M.A., E.O.**; Funding acquisition –** H.K., F.K.**; Investigation –** E.O., M.A.**; Methodology –** H.K., M.A.**; Resources –** HK, FK**; Software –** MA, EO**; Validation –** E.O., M.A.**; Visualization –** M.A., F.K.**; Writing – original draft –** M.A., E.O.**; Writing –Review & editing –** H.K., F.K**.** All authors read and approved the final manuscript.

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