PROBLEMATIC SOCIAL MEDIA USE, SLEEP QUALITY, AND PHYSICAL ACTIVITY AS PREDICTORS OF LIFE SATISFACTION AMONG ADOLESCENTS IN NORTH MACEDONIA

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Abstract

The aim of this study is to examine the predictive power of problematic social media use, sleep quality, and physical activity in relation to life satisfaction among adolescents in North Macedonia. The study was based on cross-sectional data from 5,144 adolescents aged 11, 13, and 15 years who participated in the 2022 Health Behaviour in School-aged Children (HBSC) study in North Macedonia. The sample consisted of 48.4% boys and 51.6% girls.

Hierarchical linear regression analysis was conducted to examine the relationships between problematic social media use, sleep quality, physical activity, and life satisfaction, while controlling for gender, language of instruction at school, and age.

The results of the regression model were statistically significant and explained 9.0% of the variance in life satisfaction. Problematic social media use was negatively associated with life satisfaction. Furthermore, participants with sleep difficulties reported lower life satisfaction than those who did not experience these difficulties, whereas engagement in physical activity on more days of the week was associated with higher life satisfaction.

In conclusion, problematic social media use and sleep difficulties are associated with lower life satisfaction among adolescents, whereas engagement in physical activity on several days of the week is associated with higher life satisfaction.

Keywords: Life satisfaction, Problematic social media use, Sleep difficulties, Physical activity

1. Introduction

In the era of technological development, the problematic use of social media, which is now symbolically perceived as a shadow that follows people, particularly adolescents, once again highlights the importance of concerns regarding their health and well-being. Considering adolescence as a highly critical and important period in the formation of habits and lifestyle patterns that may also influence later life, problematic social media use may negatively affect sleep routines, reduce physical activity, and decrease life satisfaction.

In this regard, numerous studies have examined the relationship between these factors, sometimes linking problematic social media use with sleep quality and mental health, and at other times exploring the interaction between physical activity, social media use, and life satisfaction or the psychological well-being of adolescents.

The problematic use of social media has reached unprecedented proportions in recent years (Datareportal, 2023). This communication revolution has changed the course and nature of human interactions, particularly among adolescents, who are increasingly spending more time using their social media networks, while gradually withdrawing from family interactions, meetings with friends, and participation in various everyday activities (Twenge et al., 2019). According to the behavioral addiction theory, adolescents' problematic use of social media is considered a form of addiction, as its use provides them with gratification, leading them to repeat this behavior even despite the negative effects it may have (Griffiths, 2005).

Research conducted in Malaysia has also found that problematic social media use leads not only to a deterioration in mental health but also to a decline in academic success (Sahimi et

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al., 2022; Rathakrishnan et al., 2021). A study conducted by Tian (2026), which analyzed data from the Health Behaviour in School-aged Children (HBSC) study involving a total of 187,090 adolescents, showed that all dimensions of problematic social media use are negatively associated with life satisfaction among adolescents. Furthermore, a study involving 446 Chinese adolescents reported that the intensity of problematic social media use serves as a risk factor for adolescents' subjective perception of life satisfaction (Yang, 2024).

Sleep Recovery Theory emphasizes that sleep is highly important not only for hormonal regulation, immune system functioning, and the recovery of cognitive functions, but also for physical functioning (Oswald, 1974). Nowadays, this theory is supported more than ever before, as numerous studies have concluded that problematic social media use through smartphones by adolescents until late hours plays a negative role in sleep quality, which may subsequently be reflected in mental health and other aspects of functioning throughout life (Abdullah et al., 2022; Kee et al., 2024). Some studies indicate the mediating role of sleep in the relationship between problematic social media use and mental and physical well-being (Kolhar et al., 2021). Relationships involving poor sleep quality clearly emerge as important factors in various health problems in general, and in mental and physical health in particular, while interventions aimed at reducing problematic social media use and promoting healthy sleep habits have consistently demonstrated positive effects on young people's well-being (Busch & McCarthy, 2021).

Recent data highlight that adolescents are increasingly engaging less in physical activities, often filling their time instead with problematic social media use. This trend is also reflected in cultural influences and the educational approach within schools, where very little emphasis is placed on physical development specifically regarding the subject of physical education (Knowles, 2023). A substantial body of research evidence suggests that promoting physical activity enhances mental health resilience, not only during adolescence but also throughout adulthood (Bogdanski, 2026). Physical activity has been viewed by many researchers as a form of beneficial distraction and a mechanism for preventing social media addiction, as well as improving the mental health of adolescents experiencing various emotional difficulties, for whom the digital world may represent the only refuge and a means of self-expression. Physical activity interrupts this vicious cycle by reducing the motivation to engage in the virtual world and contributing to greater life satisfaction (Belanger et al., 2019; Wong et al., 2025).

There is limited scientific evidence examining the relationship between life satisfaction and physical activity; however, the available evidence has shown that the higher the level of dissatisfaction with life, the lower the participation of adolescents in sports activities (Graupensperger et al., 2021). According to the perspective of the top-down theory, the perception of life satisfaction depends on the individual's personal characteristics and the way in which they interpret their experiences (Diener, 1984). However, taking into consideration the period of adolescence and the extended time spent using platforms associated with problematic social media use, their sedentary lifestyle directs them towards physical inactivity, sleep difficulties, decreased life satisfaction, as well as exposure to various health conditions (Melkevik et al., 2015; Zou et al., 2019; Hu et al., 2001).

Since previous studies have examined problematic social media use, sleep quality, engagement in physical activities, and adolescent well-being, but as separate constructs, the need for a more integrated examination of these constructs in predicting life satisfaction served as the guiding objective of this study. The aim was to expand the existing literature by examining the additional contribution of problematic social media use, sleep quality, and physical activity to the predictive power of life satisfaction.

The theoretical contribution of this study lies in providing data on the relationships between psychological constructs specifically life satisfaction, problematic social media use, sleep difficulties, and physical activity among adolescents within a specific context: North

Macedonia. Regarding its practical implications, these findings provide valuable information for educational institutions, parents, and health professionals to better understand the factors associated with adolescents' life satisfaction and to further guide initiatives aimed at promoting their well-being.
Therefore, this study aims to examine the predictive power of problematic social media use, sleep quality, and physical activity in relation to life satisfaction among adolescents in North Macedonia.

2. Methodology

2.1 Sample

The data presented in this paper are part of the HBSC study, which is a collaborative cross-national survey conducted every four years in more than 50 countries. It includes a representative sample of young people aged 11, 13, and 15. The number of participants is 5,144 in 2022.
By gender, among the total number of adolescents in the study, boys made up 48.4% of the sample, while girls accounted for 51.6%.
As part of the HBSC study protocol, for each survey year, the sample is selected using a systematic random sampling method. The units of analysis are primary and secondary schools in the Republic of North Macedonia. During the subject selection process, stratification is also applied based on the language of instruction - Albanian and Macedonian - which reflects the demographic composition of the population in North Macedonia.

2.2 Instruments

Problematic social media use was measured using the Social Media Disorder Scale (Eijnden et al., 2016). The scale consists of 9 items related to symptoms of social media addiction. *Problematic social media use* includes difficulties in controlling usage and negative consequences associated with its use. Participants were asked to think about the past year and, for example, consider the question: “Has it happened that you could not think of anything else except the moment when you would be able to use social media again?” They were required to respond with “yes” or “no” to each item. To be classified as problematic social media users, participants had to answer “yes” to six or more items. The internal consistency of the scale for this sample was satisfactory (Cronbach’s alpha = .76).
Physical activity was measured using one item, in which participants were asked to indicate how many days during the previous week they had been physically active for at least one hour. For the analyses in this study, responses were categorized into three levels: 0–2 days, 3–4 days, 5–6 days, and every day.
Life satisfaction was measured using one item, through which participants rated their level of life satisfaction on a scale ranging from 0 to 10, where 0 indicated that they were not at all satisfied with life, while 10 indicated that they were completely satisfied with life.
Sleep difficulties were measured using one item. Participants were asked how often they had experienced difficulties falling asleep during the past six months. They selected one of the five response options provided: every day, more than once a week, almost every week, almost every month, and rarely or never. The five options regarding sleep difficulties have been categorized into two groups: "Yes" includes the responses "Every day" and "More than once a week," while the other three options are categorized as "No."

3. Results

3.1 Descriptive statistics of the variables

Table 1 presents the descriptive statistics of the variables included in the study. Regarding physical activity, the highest percentage of participants reported engaging in physical activity on 5–6 days per week (30.7%, *n* = 1,582), whereas the lowest percentage of participants reported engaging in physical activity on 0–2 days (18.2%, *n* = 938). Problematic social media use was identified among 13.2% of participants (*n* = 680), while sleep difficulties were reported by 22.7% (*n* = 1,169). The mean life satisfaction score was 7.89 (*SD* = 2.31), on a scale ranging from 0 to 10.

Table 1. Descriptive statistics of the variables

	N (in %)
Gender	
Boys	2488 (48.4)
Girls	2656 (51.6)
Language of instruction	
Macedonian	3427 (66.6)
Albanian	1720 (33.4)
Physic activity	
0-2 days	938 (18.2)
3-4 days	1413 (27.5)
5-6 days	1582 (30.7)
Daily	1204 (23.4)
Age	
11	1744 (33.9)
13	1741 (33.2)
15	1687(32.8)
Problematic social media use	
NO	4297 (83.5)
YES	680 (13.2)
Sleeping difficulties	
NO	3949 (76.7)
YES	1169 (22.7)
	Mean (standard deviation)
Life satisfaction	7.89 (2.31)

3.2 Hierarchical Linear Regression

Hierarchical linear regression was conducted with life satisfaction as the criterion variable (Tables 2 & 3). Gender, age, and ethnicity were included as control variables in the first block, while problematic social media use, sleep difficulties, and physical activity were added as predictor variables in the second block.

Table 2. Hierarchical Linear Regression Model for Life Satisfaction

Model	R^2	R^2 adjusted	ΔR^2	F	df
1	.033	.032	.033	55.65	3
2	.090	.089	.057	81.11	6

Table 3. Hierarchical Linear Regression Model for Life Satisfaction

Model 1	B	SEB	β	t	p
Constant	8.701	0.160	-	54.39	.000
Sex	-0.128	0.064	-.028	-2.00	.046
Language in school	0.257	0.068	.053	3.75	.000
Age	-0.477	0.039	-.170	-12.11	.000
Model 2					
Constant	8.070	0.175	-	46.24	.000
Sex	0.032	0.063	.007	0.50	.615
Language in school	0,258	0.066	.053	3.89	.000
Age	-0.367	0.039	-.131	-9.44	.000
Sleeping difficulties	-0.909	0.075	.167	-12.05	.000
Physic activities	0.278	0.031	.125	8.90	.000
Problematic social media use	-0.510	0.092	-0.76	-5.55	.000

Hierarchical linear regression was used to examine whether problematic social media use, sleep difficulties, and physical activity predict life satisfaction after controlling for gender, language of instruction at school, and age categories. In the first block, the demographic variables explained 3.3% of the variance in life satisfaction, $R^2 = .033$, adjusted $R^2 = .032$. The model was statistically significant, $F(3, 4933) = 55.65$, $p < .001$.

The addition of problematic social media use, sleep difficulties, and physical activity in the second block explained an additional 5.7% of the variance, $\Delta R^2 = .057$. This additional contribution was statistically significant, $\Delta F(3, 4930) = 103.11$, $p < .001$. The final model explained 9.0% of the variance in life satisfaction, $R^2 = .090$, adjusted $R^2 = .089$, $F(6, 4930) = 81.11$, $p < .001$.

In the final model, after controlling for the other predictors, problematic social media use was associated with lower life satisfaction, $B = -0.510$, $SE = 0.092$, $\beta = -.076$, 95% CI [−0.690, −0.330], $p < .001$. Furthermore, participants with sleep difficulties reported lower life satisfaction than those who did not experience these difficulties, $B = -0.909$, $SE = 0.075$, $\beta = -.167$, 95% CI [−1.057, −0.761], $p < .001$. Physical activity was positively associated with life satisfaction, $B = 0.278$, $SE = 0.031$, $\beta = .125$, 95% CI [0.216, 0.339], $p < .001$. Engagement in physical activity on more days of the week was associated with an average increase of 0.278 in life satisfaction, after controlling for gender, language of instruction at school, and age group. Among the control variables, age and ethnicity were significant predictors of life satisfaction, whereas gender was not. Specifically, increasing age was associated with lower life satisfaction, $B = -0.367$, $SE = 0.039$, $\beta = -.131$, $p < .001$. Students who received instruction in Albanian reported higher life satisfaction than those who received instruction in Macedonian, $B = 0.258$, $SE = 0.066$, $\beta = .053$, $p < .001$.

4. Conclusions

This study examines the predictive power of problematic social media use, sleep quality, and physical activity in relation to life satisfaction among adolescents in North Macedonia, using nationally representative data from the 2022 Health Behaviour in School-aged Children (HBSC) study.

The results confirm that problematic social media use, sleep quality, and engagement in physical activities are significant predictors of life satisfaction among adolescents.

The analytical model revealed a statistically significant predictive effect of problematic social media use on life satisfaction, indicating that adolescents with a higher level of problematic social media use tend to report lower levels of life satisfaction. Similar findings regarding this predictive relationship were reported in a longitudinal study conducted among adolescents in Switzerland by Mader et al. (2025), in which lower life satisfaction was associated with higher levels of problematic social media use. Another study, conducted by Orben et al. (2019), which examined the relationship between problematic social media use and life satisfaction, reported a generally moderate association between these two variables. Meanwhile, Boer et al. (2021), in their study, found a strong, negative, and statistically significant association between problematic social media use and lower life satisfaction.

In our study, although regression analysis does not establish a direct causal relationship between the variables, what can be concluded is that dependence on problematic social media use may compromise adolescents' well-being, such as their life satisfaction. Furthermore, a deeper analytical perspective may suggest that lower levels of life satisfaction may also be associated with problematic social media use.

Adolescents' engagement in physical activities showed a significant predictive effect on life satisfaction. This finding itself encompasses the idea that the more adolescents engage in various physical activities, the higher their well-being, the more positive their emotional experiences, and the better their social relationships will be. Similar findings indicating that physical activity is positively associated with life satisfaction have also been reported by Nie et al. (2025). In contrast to this finding, other similar studies have specified the type of physical activity in greater detail by distinguishing between team sports and individual sports. In this regard, team sports have shown a more pronounced reduction in anxiety, depression, and stress, as well as an increase in life satisfaction, compared with individual sports or physical inactivity among adolescents (Gutiérrez-Rivas, 2025). Although our study did not examine the type of physical activity, which may remain a recommendation for future studies, these relevant findings will nevertheless serve as a complementary perspective to our study, highlighting that different types of physical activity engagement may also be predictors of life satisfaction.

Model 2 also provided the finding that sleep difficulties were a significant predictor of life satisfaction. The negative values indicate that as sleep difficulties increase, life satisfaction decreases. Similar studies conducted among Norwegian adolescents by Grasaas, Ostojic, and Jahre (2024), as well as among Swedish adolescents by Thorsén (2020), provide evidence that longer and higher-quality sleep, with a duration of eight hours, is associated with higher levels of life satisfaction, as well as reduced exposure to phone screens. Similar evidence indicating that better sleep quality is associated with higher life satisfaction has also been reported by Cao et al. (2022). From a psychological perspective, insufficient sleep is often associated with adolescents' less favourable perception of life, the way they cope with everyday demands, and the way they evaluate their own lives.

The results also showed that demographic factors were significant predictors of life satisfaction. Regarding age, it was observed that life satisfaction tended to decrease as age increased. These changes in life satisfaction across different periods of adolescence were also reported in the study by Orben et al. (2022). Gender was found to be statistically significant in Model 1; however, after the inclusion of additional variables in Model 2, no significant predictive contribution of gender to life satisfaction was observed. Language of instruction remained significant in Model 2, indicating that students receiving instruction in Albanian reported higher life satisfaction than those receiving instruction in Macedonian. Nevertheless,

these results should not automatically be interpreted as cultural differences, since this finding may also be related to other social contexts.

In conclusion, we can emphasize that the findings of this study are also consistent with previous evidence, suggesting that adolescents' life satisfaction is associated with a combination of factors, including physical activity, sleep quality, and problematic social media use. The increase in the explained variance from 3.3% based on demographic characteristics in Model 1 to 9.0% following the inclusion of physical activity, sleep quality, and problematic social media use in Model 2 highlights the importance of an integrated approach to adolescents' life satisfaction, taking into account both the behaviours that may support it and the difficulties that may undermine it. However, given that the model explains 9% of the variance in life satisfaction, further research is needed to include other individual, family, and social factors, as well as to examine the direction of these relationships.

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