A Link Between Problematic Social Media Use and Mental Health in Greece: Sex and Generation Differences

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Article

A Link Between Problematic Social Media Use and Mental Health in Greece: Sex and Generation Differences

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Abstract

Our study aimed to evaluate the association between problematic social media use and mental health. We also examined sex and generation differences. We carried out a cross-sectional study in Greece using a convenience sample. Participants were divided into three generational cohorts: Generation Z (born 1997-2012), Millennials (born 1981-1996), and Generation X (born 1965-1980). To evaluate problematic social media use, we employed the Bergen Social Media Addiction Scale. Anxiety and depression were measured using the Patient Health Questionnaire-4, and sleep quality was assessed with the Sleep Quality Scale. We developed multivariable linear regression models to control for confounding variables. Our findings revealed a positive correlation between problematic social media use and anxiety, unaffected by sex or generation. Additionally, a positive link was found between problematic social media use and depression, with a stronger association observed in Generation Z and Millennials. Our multivariable models also indicated a negative relationship between problematic social media use and sleep quality, more pronounced among males and Millennials. In summary, our results underscore the link between problematic social media use and mental health issues. Policymakers, stakeholders, and healthcare professionals should devise and implement suitable interventions to mitigate the adverse effects of problematic social media use.

Keywords: social media; anxiety; depression; sleep quality; sex; generation

1. Introduction

It is quite evident from the past decade that the growth spurt of social networking sites has redefined social interaction. Billions of accounts are active, enabling people to use sites like Facebook, Instagram, and TikTok to communicate, access information, and make friends (Valkenburg et al., 2022). The widespread use of social media has raised increasing concerns about its psychological impact. In response, the term problematic social media use (PSMU) was introduced to describe patterns of excessive or compulsive engagement. This behavior is typically marked by preoccupation with social media (salience), attempts to regulate mood through its use, growing tolerance, withdrawal symptoms when not using it, and conflicts arising from its interference with daily life (Andreassen & Pallesen, 2014; Griffiths, 2005). Although it cannot be formally considered a mental disorder, PSMU has earned a behavioral addiction framework and is known to have a wider array of

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mental health outcomes, such as depression, anxiety, and sleep disturbances (Cataldo et al., 2021;Weinstein, 2023).

Meta-analyses and systematic reviews indicate that social media use and well-being somehow form a complex relationship. Most often, measurement of use by time or frequency checking shows small (r=0.10-0.17) and often non-significant correlation with the symptoms of depression (Vahedi & Zannella, 2021; Valkenburg et al., 2022). In contrast, studies focusing on PSMU show moderate positive association correlation of PSMU with depression and anxiety (Ahmed et al., 2024). A recent systematic review and meta-analysis investigating problematic TikTok use lend similar findings in presenting moderate positive associations with depression (b=0.32) and anxiety (b=0.41) (Galanis et al., 2025). Galanis et al. (2025) noted the existence of a positive linkage between TikTok use and concerns about body image, poorer sleeping patterns, aggressiveness, distress intolerance, narcissism, and stress. This proves that compulsive, addictive-like patterns of use, rather than how long an individual spends online, could be relevant to mental well-being.

Individual studies reveal both the dangers and prospects for benefits. Cross-sectional studies found that higher PSMU scores correlate with higher anxiety and depression and that a large emotional investment in social media significantly predicts higher chances of these symptoms than does time spent online (Alsunni & Latif, 2020). Fear of Missing Out (FOMO) drives clicking late at night, which predicts bedtimes, sleep-onset latencies, and sleep duration differences. Higher levels of TikTok addiction and use were linked to shorter nightly sleep duration and more sleepiness at work or in class in cross-sectional research of Greek adults (Katsiroumpa et al., 2025). In a similar vein, Bilali et al. (2025) discovered that among Greek adolescents, while problematic TikTok use was linked to higher sleepiness in both sexes, boys were more affected by the app in terms of anxiety and depression than girls.

Disruption in sleep could be underlying some association between PSMU and mental health (Scott & Cleland Woods, 2018). Social comparison, urbanity, and cyberbullying have a role: being exposed to idealized content-will lower self-esteem levels and even lead to depressive symptoms while being bullied online increases anxiety. Rumination is the mediator between social networking addiction and depression, and this relationship is moderated by low self-esteem. There is convincing evidence that social media can assist in fulfilling psychological needs. Facebook usage metaphorically fulfilled belonging and self-actualization and hence resulted in predicting overall higher life satisfaction (Houghton et al., 2020) while a nine-year longitudinal study suggested that regular use of computers improved cognitive functioning, optimism, and social relationships among adults (Hartanto et al., 2020).

In fact, social media usage is normative among adolescents. Surveys conducted in several European countries found that more than three-quarters of 13- to 16-year-olds had an online social network profile and almost all older adolescents used at least one social media every day (Livingstone et al., 2011; Tsitsika et al., 2014). The most recent survey from Pew Research Center conducted in 2018, like that, found that 97 percent of teenagers in the United States used not less than one social network (Anderson & Jiang, 2018). People also turn to online social network to pursue developmentally appropriate needs for social engagement with peers but, equally, it can be seen as a sedentary behavior in which someone can access bad social comparisons and cyberbullying (Keresteš & Štulhofer, 2020). Displaced behavior theory proposes that time spent in sedentary online activities displaces face-to-face interaction and physical activity (Karim et al., 2020). Gender preferences differ for platforms; men dominate on Twitter, while women tend to use Snapchat (Karim et al., 2020). The systematic reviews and meta-analyses found that main effect sizes were typically small and that psychosocial context rather than gender per se would be the most important contributor (Vahedi & Zannella, 2021; Valkenburg et al., 2022).

Only a small percentage of users fit the criteria for PSMU, according to extensive surveys and umbrella reviews, and the effect sizes relating general social media use to mental health are small (Bányai et al., 2017; Cataldo et al., 2021; Keles et al., 2020). Further nuance is provided by longitudinal studies: a latent growth analysis of Croatian youth revealed gender-specific effects of social media

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use on life satisfaction (Keresteš & Štulhofer, 2020), and an eight-year cohort of U.S. adolescents found no evidence that time spent on social media increased depression or anxiety (Coyne et al., 2020). These mixed findings substantiate the importance of conducting research in a culturally sensitive way that takes differences between normal and problematic use into account, and investigates moderators like age, sex, and socioeconomic context.

It seems the international literature is on the increase but empirical studies on PSMU in Greece remain lacking. Past work has tended to focus on university students or some hypothetical specific platforms, and to the best of our knowledge there has been no large-scale examination of PSMU across different generations. Investigating generational differences will be informative because digital natives—members of generation Z and millennials—grew up in a media-saturated environment, while generation X began using these technologies later; developmental neuroscience proposes that this period is a sensitive period for social reward processing (Crone & Konijn, 2018). Potential sex differences would also be relevant: for instance, women tend to experience negative emotions to a greater extent during technology use, while men pursue exploration and entertainment to a greater degree (Sobieraj & Kraemer, 2020). However, this moderation has not been found to be consistent in meta-analysis (Vahedi & Zannella, 2021).

They are often given birth-year ranges. Generation Z might be described as those born from 1997 to 2012, whereas Millennials are generally described as born between 1981 and 1996, and Generation X includes those born from 1965 to 1980 (Cantrell, 2020; Dimock, 2019). These cohorts have been shaped by different socio-political climates and technologies: while the Millennials were coming of age during the internet explosion, Generation Z has essentially never known a world without smartphones or social media, and Generation X saw the birth of personal computers (Dimock, 2019). These facts may be instrumental in elucidating why social media use by digital natives may be distinguished from later life social media use by others.

The current study explored the associations between PSMU, anxiety, depression and sleep quality in a large Greek Generation Z, Millennial and Generation X sample. We hypothesized that PSMU demonstrate a positive association with anxious and depressive symptoms, and a negative association with the quality of sleep, these relationships possibly differing according to generation and gender. Our study aims to achieve a more nuanced understanding of the grave risks and congenial benefits accruing from social media use within the Greek settings by employing validated measures and positioning its findings among the greater literature.

2. Materials and Methods

2.1. Study Design

We conducted a web-based cross-sectional study in Greece, utilizing an online questionnaire created via Google Forms and distributed through social media platforms. Specifically, we posted an invitation to join our study on Facebook, Instagram, and LinkedIn. Interested participants accepted the invitation and completed the questionnaire. Additionally, we produced a TikTok video to inform users about our study, and the Google forms link was sent to interested TikTok users via inbox messages. Participants had to be adults over 18 years old. Before beginning the online questionnaire, participants were presented with an introductory page containing essential information. This page outlined the study's purpose and design, provided a brief overview of the questions, estimated the time needed to complete the questionnaire, emphasized the voluntary nature of participation, and informed participants of their ability to exit the survey by closing their web browser. Our contact information was also provided. To ensure data integrity, we asked participants if they had previously completed the survey, and any affirmative responses were excluded from the dataset, resulting in a convenience sample. Data collection took place from January to March 2025. We adhered to the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for our study (Vandenbroucke et al., 2007).

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We used G*Power v.3.1.9.2 to calculate our sample size. Considering a small effect size between problematic social media use, and anxiety, depression and sleep quality ($f^2 = 0.02$), the number of independent variables (one predictor and six confounders), a confidence level of 95%, and a margin error of 5%, sample size was estimated at 652 participants.

2.2. Measurements

To assess problematic social media use, we employed the Bergen Social Media Addiction Scale (BSMAS) (Andreassen et al., 2016). This scale comprises six items that reflect essential addiction components: salience, mood modification, tolerance, withdrawal symptoms, conflict, and relapse. The BSMAS measures behaviors related to problematic social media use over a year, with each of the six items rated on a 5-point Likert scale from 1 (very rarely) to 5 (very often). The BSMAS is structured as a unifactorial model, allowing total scores to range from 6 to 30, where higher scores signify more severe problematic social media use (Andreassen et al., 2016; Monacis et al., 2017). Sample items include statements like ""You spend a lot of time thinking about social media or planning how to use it" and "You feel an urge to use social media more and more". We utilized the validated Greek version of the BSMAS (Dadiotis et al., 2021; Katsiroumpa et al., in press), which demonstrated excellent internal reliability in our study (Cronbach's $\alpha = 0.867$).

We assessed anxiety and depression using the Patient Health Questionnaire-4 (PHQ-4), which consists of four questions: two for anxiety and two for depression (Kroenke et al., 2009). Responses are recorded on a four-point Likert scale ranging from 0 (not at all) to 3 (nearly every day). The scores for both factors can vary from 0 to 6, with higher scores indicating more severe anxiety and depressive symptoms. A score of 3 or above signifies elevated levels of anxiety and depression. We used the Greek version of the PHQ-4 (Karekla et al., 2012). In our study, the Cronbach's alpha for the PHQ-4 was 0.849, with 0.790 for anxiety and 0.782 for depression.

Sleep quality was assessed using the Sleep Quality Scale (SQS) (Snyder et al., 2018). Participants rated their overall sleep quality over the past week on a visual analogue scale, selecting an integer from 0 (terrible sleep quality) to 10 (excellent sleep quality). The SQS developers suggested the following cut-off points: 0 = terrible, 1–3 = poor, 4–6 = fair, 7–9 = good, and 10 = excellent sleep quality (Snyder et al., 2018). When evaluating their sleep quality, participants considered factors such as the number of hours slept, ease of falling asleep, frequency of waking during the night (excluding bathroom trips), instances of waking earlier than necessary, and how refreshing their sleep felt.

We consider six potential confounding variables, including sex (female or male), age (as a continuous variable), educational level (ranging from elementary school to PhD), socioeconomic status, daily social media usage (continuous variable), and the total number of social media accounts (continuous variable). Socioeconomic status was measured with a straightforward question: "How do you consider your socioeconomic status?" Responses were on a scale from 0 to 10, where 0 indicated the lowest socioeconomic status and 10 the highest.

2.3. Ethical Issues

Participants were briefed on the study's framework and asked to give their consent to join. Specifically, before they could access the online survey, social media users were queried through Google forms about their willingness to participate. Those who agreed were permitted to fill out the questionnaire, thus providing informed consent. Additionally, no personal information was gathered from participants, ensuring that their involvement was both voluntary and anonymous. Our study was conducted in accordance with the Declaration of Helsinki guidelines (World Medical Association, 2013). The study protocol received approval from the Ethics Committee of the Faculty of Nursing, National and Kapodistrian University of Athens (approval number; 05, October 10; 2024).

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2.4. Statistical Analysis

We present categorical variables as counts (n) and percentages (%), while continuous variables are shown with mean, standard deviation (SD), median, interquartile range, as well as skewness and kurtosis. The Kolmogorov-Smirnov test and Q-Q plots were employed to evaluate the distribution of continuous variables. Problematic social media use was treated as the independent variable. Our dependent variables included scores for anxiety, depression and sleep quality. Variables such as gender, age, education level, socioeconomic status, daily social media usage, and the total number of social media accounts were considered as potential confounders. Since the dependent variables were continuous and normally distributed, we used linear regression analysis, reporting both unadjusted and adjusted beta coefficients, 95% confidence intervals (CI), and p-values. All multivariable models were adjusted to account for the aforementioned confounders. To check for multicollinearity in the multivariable models, we used variance inflation factors (VIFs), with values over 4 indicating multicollinearity (Kim, 2019). The VIFs for the final models ranged from 1.071 to 1.535, indicating no multicollinearity issues. Additionally, we performed a stratification analysis to explore differences by sex and generation. Participants were categorized into three generational groups (Dimock, 2019): Generation Z (born 1997–2012), Millennials (born 1981–1996), and Generation X (born 1965–1980). We also conducted independent samples t-tests to examine differences in social media usage and study scales between genders and across the three generations. For generational analysis, we first conducted an analysis of variance, followed by independent samples t-tests between two groups with Bonferroni correction. Pearson's correlation coefficient was calculated to evaluate relationships between continuous variables. P-values less than 0.05 were considered statistically significant. We used the IBM SPSS 28.0 (IBM Corp. Released 2021. IBM SPSS Statistics for Windows, Version 28.0. Armonk, NY: IBM Corp) for the analysis.

3. Results

3.1. Demographic Characteristics

Our sample consisted of 1033 individuals. In our sample, 75.4% were females, and 24.6% were males. The average age was 31.1 years (SD; 12.4), with a median age of 26.0 years. Most participants were from Generation Z (53.6%), followed by Millennials at 28.6%, and Generation X at 17.8%. Among the participants, 60.4% had a university degree, while 39.6% had completed high school. The mean score on the socioeconomic status scale indicated a moderate level. Table 1 shows the demographic data of our participants.

Table 1. Study population (N=1033).

Characteristics	N	%
Sex		
Females	779	75.4
Males	254	24.6
Age[a]	31.1	12.4
Age categories		
Generation Z	554	53.6
Millennials	295	28.6
Generation X	184	17.8
Educational level		
High school	409	39.6
University degree	373	36.1

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MSc diploma	229	22.2
PhD diploma	22	2.1
Socioeconomic status[a]	6.2	1.5

[a] mean, standard deviation.

3.2. Social Media Characteristics

On average, participants dedicated 3.3 hours each day to social media (SD; 1.9), with a median of 3.0 hours, a minimum of 30 minutes, and a maximum of 8.0 hours. Females spent an average of 3.4 hours daily, while males averaged 3.3 hours (p-value = 0.356). Generation Z averaged 4.0 hours, Millennials 2.9 hours, and Generation X 2.1 hours on social media each day (p-value < 0.001 for differences among all groups).

Most participants (92.9%, n=960) had accounts on at least two social media platforms. The average number of accounts was 3.6 (SD; 1.5), with a median of 3.0, a minimum of 1, and a maximum of 8. Females averaged 3.6 accounts, while males had 3.9 (p-value = 0.011). Generation Z averaged 3.8 accounts, Millennials 3.7, and Generation X 3.1 (p-value < 0.001 for differences between Generation Z and X, and between Millennials and Generation X).

Table 2 presents daily social media use and social media accounts of our participants stratified by sex and generation.

Table 2. Social media use and social media accounts of our participants.

	Sex		**Generation**			**Total (n=1033)**
	Females (n=779)	**Males (n=254)**	**Generation Z (n=554)**	**Millennials (n=295)**	**Generation X (n=184)**	
Social media use per day (hours)						
Mean	3.4	3.3	4.0	2.9	2.1	3.3
Standard deviation	1.9	1.8	1.8	1.7	1.4	1.9
P-value[a]	0.356		<0.001[b] for all comparisons between the three groups			
Social media accounts						
Mean	3.6	3.9	3.8	3.7	3.1	3.6
Standard deviation	1.5	1.7	1.5	1.5	1.4	1.5
P-value[a]	0.011		<0.001[b] for comparisons between Generation Z and X, and between Millennials and Generation X			

[a] independent samples t-test, [b] p-values after Bonferroni correction.

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3.3. Study Scales

The mean BSMAS score was 12.12 (SD; 4.92). No significant difference was found in BSMAS scores between females (mean; 12.08, SD; 4.81) and males (mean; 12.23, SD; 5.22), (p-value = 0.690). Generation Z (mean; 13.93, SD; 5.01) had higher BSMAS scores than Millennials (mean; 10.84, SD; 4.23) and Generation X (mean; 8.70, SD; 2.71), (p-value < 0.001 in all cases).

The mean score on PHQ-4 was 4.25 (SD; 2.95), with a mean anxiety score of 2.38 (SD; 1.62) and a mean depression score of 1.87 (SD; 1.61). One-third of participants (35.0%, n=362) had an anxiety score of 3 or higher, indicating significant anxiety issues. Additionally, one-fourth (24.9%, n=257) had a depression score ≥3, indicating high levels of depressive symptoms.

The mean score on the Sleep Quality Scale was 5.73 (SD; 2.26). Sleep quality was rated as terrible by 1.5% (n=16) of participants, poor by 17.1% (n=177), fair by 39.1% (n=403), good by 33.6% (n=409), and excellent by 2.7% (n=28).

Descriptive statistics for the study scales are shown in Table 3.

Table 3. Descriptive statistics for our study scales (n=1033).

Scale	Mean	Standard Deviation	Median	Interquartile Range	Skewness	Kurtosis
Bergen Social Media Addiction Scale	12.12	4.92	11.00	7.00	0.79	-0.10
Patient Health Questionnaire-4	4.25	2.95	4.00	4.00	0.84	0.20
Anxiety	2.38	1.62	2.00	2.00	0.72	0.11
Depression	1.87	1.61	2.00	1.00	0.90	0.30
Sleep Quality Scale	5.73	2.26	6.00	3.00	-0.32	-0.52

3.4. Correlation Between Study Scales

Our findings indicated a positive correlation between social media addiction scores and anxiety scores, with a stronger correlation observed among males and Generation Z. Similarly, a positive correlation was found between social media addiction scores and depression scores, again stronger among males and Generation Z. A negative correlation was observed between social media addiction scores and sleep quality scores, with a stronger correlation among males, Generation Z, and Millennials.

Table 4 shows correlation between social media addiction score, and anxiety score, depression score and sleep quality score.

Table 4. Pearson's correlation coefficients between social media addiction score, and anxiety score, depression score and sleep quality score.

	Anxiety Score	Depression Score	Sleep Quality Score
Full sample (n=1033)	0.282*	0.381*	-0.197*
Females (n=779)	0.250*	0.355*	-0.157*
Males (n=254)	0.392*	0.454*	-0.299*
Generation Z (n=554)	0.311*	0.427*	-0.206*
Millennials (n=295)	0.240*	0.340*	-0.246**
Generation X (n=184)	0.273*	0.270*	-0.145

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Coefficients are adjusted for sex, age, educational level, socioeconomic status, social media use per day, and social media accounts. * p-value < 0.001.

3.5. Association Between Problematic Social Media Use and Anxiety

We identified a positive correlation between problematic social media use and anxiety across the entire sample (adjusted coefficient beta = 0.104, 95% CI = 0.083 to 0.126, p-value < 0.001). Stratified analysis revealed that this association was similar among females (adjusted coefficient beta = 0.097, 95% CI = 0.070 to 0.124, p-value < 0.001) and males (adjusted coefficient beta = 0.127, 95% CI = 0.090 to 1.165, p-value < 0.001), and no differences were observed between generations. Specifically, the association between problematic social media use and anxiety was consistent across Generation Z (adjusted coefficient beta = 0.110, 95% CI = 0.083 to 0.138, p-value < 0.001), Millennials (adjusted coefficient beta = 0.099, 95% CI = 0.052 to 0.146, p-value < 0.001), and Generation X (adjusted coefficient beta = 0.123, 95% CI = 0.061 to 0.184, p-value < 0.001).

Table 5. Linear regression models with anxiety score as the dependent variable.

Predictor: BSMAS	**Univariate Model**			**Multivariable Model[a]**					
	Unadjusted Coefficient Beta	**95% CI for Beta**	**P-Value**	**Adjusted Coefficient Beta**	**95% CI for Beta**	**P-Value**	**VIF**	**R^2 (%)**	**P-Value for ANOVA**
Full sample (n=1033)	0.164	0.526 to 1.006	<0.001	0.104	0.083 to 0.126	<0.001	1.478	20.4	<0.001
Females (n=779)	0.126	0.104 to 0.147	<0.001	0.097	0.070 to 0.124	<0.001	1.535	16.3	<0.001
Males (n=254)	0.155	0.121 to 1.188	<0.001	0.127	0.090 to 1.165	<0.001	1.372	31.4	<0.001
Generation Z (n=554)	0.117	0.091 to 0.142	<0.001	0.110	0.083 to 0.138	<0.001	1.204	16.1	<0.001
Millennials (n=295)	0.130	0.089 to 0.171	<0.001	0.099	0.052 to 0.146	<0.001	1.364	14.1	<0.001
Generation X (n=184)	0.096	0.037 to 0.156	0.002	0.123	0.061 to 0.184	<0.001	1.184	13.9	<0.001

[a] Multivariable models are adjusted for sex, age, educational level, socioeconomic status, social media use per day, and social media accounts. CI: confidence interval, BSMAS: Bergen Social Media Addiction Scale, VIF: variance inflation factor.

3.6. Association Between Problematic Social Media Use and Depression

The final multivariable linear regression model in the full sample showed a positive association between problematic social media use and depression (adjusted coefficient beta = 0.145, 95% CI =

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0.123 to 0.166, p-value < 0.001). After stratification, this positive association was consistent among both females (adjusted coefficient beta = 0.140, 95% CI = 0.114 to 0.165, p-value < 0.001) and males (adjusted coefficient beta = 0.158, 95% CI = 0.119 to 0.197, p-value < 0.001). Additionally, our stratified analysis revealed that the link between problematic social media use and depression was stronger in Generation Z (adjusted coefficient beta = 0.152, 95% CI = 0.124 to 0.180, p-value < 0.001) and Millennials (adjusted coefficient beta = 0.140, 95% CI = 0.094 to 0.185, p-value < 0.001) compared to Generation X (adjusted coefficient beta = 0.111, 95% CI = 0.053 to 0.170, p-value < 0.001). Table 6 shows linear regression models with depression score as the dependent variable.

Table 6. Linear regression models with depression score as the dependent variable.

Predictor: BSMAS	**Univariate Model**			**Multivariable Model[a]**					
	Unadjusted Coefficient Beta	**95% CI for Beta**	**P-Value**	**Adjusted Coefficient Beta**	**95% CI for Beta**	**P-Value**	**VIF**	**R^2 (%)**	**P-Value for ANOVA**
Full sample (n=1033)	0.149	0.132 to 0.167	<0.001	0.145	0.123 to 0.166	<0.001	1.478	21.7	<0.001
Females (n=779)	0.148	0.127 to 0.169	<0.001	0.140	0.114 to 0.165	<0.001	1.535	19.7	<0.001
Males (n=254)	0.155	0.121 to 0.189	<0.001	0.158	0.119 to 0.197	<0.001	1.372	27.6	<0.001
Generation Z (n=554)	0.148	0.122 to 0.174	<0.001	0.152	0.124 to 0.180	<0.001	1.204	20.0	<0.001
Millennials (n=295)	0.153	0.114 to 0.192	<0.001	0.140	0.094 to 0.185	<0.001	1.364	17.6	<0.001
Generation X (n=184)	0.091	0.036 to 0.147	0.001	0.111	0.053 to 0.170	<0.001	1.184	10.0	<0.001

[a] Multivariable models are adjusted for sex, age, educational level, socioeconomic status, social media use per day, and social media accounts. CI: confidence interval, BSMAS: Bergen Social Media Addiction Scale, VIF: variance inflation factor.

3.7. Association Between Problematic Social Media Use and Sleep Quality

After removing confounders, we discovered a negative association between problematic social media use and sleep quality score (adjusted coefficient beta = -0.107, 95% CI = -0.139 to -0.074, p-value < 0.001). This association was more pronounced among males (adjusted coefficient beta = -0.149, 95% CI = -0.209 to -0.089, p-value < 0.001) and Millennials (adjusted coefficient beta = -0.157, 95% CI = -0.228 to -0.086, p-value < 0.001). Table 7 shows linear regression models with sleep quality score as the dependent variable.

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Table 7. Linear regression models with sleep quality score as the dependent variable.

Predictor: BSMAS	Univariate Model			Multivariable Model[a]					
	Unadjusted Coefficient Beta	95% CI for beta	P-Value	Adjusted Coefficient Beta	95% CI for beta	P-Value	VIF	R^2 (%)	P-Value for ANOVA
Full sample (n=1033)	-0.114	-0.141 to -0.087	<0.001	-0.107	-0.139 to -0.074	<0.001	1.478	9.1	<0.001
Females (n=779)	-0.089	-0.121 to -0.057	<0.001	-0.087	-0.126 to -0.048	<0.001	1.535	7.6	<0.001
Males (n=254)	-0.178	-0.230 to -0.126	<0.001	-0.149	-0.209 to -0.089	<0.001	1.372	18.7	<0.001
Generation Z (n=554)	-0.086	-0.123 to -0.049	<0.001	-0.098	-0.137 to -0.058	<0.001	1.204	6.1	<0.001
Millennials (n=295)	-0.147	-0.210 to -0.084	<0.001	-0.157	-0.228 to -0.086	<0.001	1.364	12.6	<0.001
Generation X (n=184)	-0.112	-0.214 to -0.010	0.032	-0.119	-0.230 to -0.008	0.035	1.071	2.6	0.098

[a] Multivariable models are adjusted for sex, age, educational level, socioeconomic status, social media use per day, and social media accounts. CI: confidence interval, BSMAS: Bergen Social Media Addiction Scale, VIF: variance inflation factor.

4. Discussion

4.1. Main Findings and Comparison with Prior Evidence

The present study examined PSMU among cohorts spanning three generations in Greece, with the associations between PSMU and anxiety, depression, and sleep quality. There was a moderate positive correlation between PSMU and both anxiety and depressive symptoms among all participants. This pattern is consistent with recent meta-analytic work demonstrating that compulsive or addiction-like engagement manifests a stronger relationship to mental health outcomes than do simple measures of time spent online. In fact, moderate positive correlations

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between PSMU and depression and anxiety were reported in the studies of Ahmed et al. (2024) and Galanis et al. (2025).

In a recent meta-analysis of 209 studies, researchers discovered that problematic social network use exhibited moderate positive correlations with generalized anxiety (r = 0.39), social anxiety (r = 0.44), attachment anxiety (r = 0.35), and FOMO (r = 0.50). The effect sizes varied by region, gender, and measurement instrument (Du et al., 2024). These effect sizes were markedly greater than those usually associated with a general social media use; when assessed by the means of hours per day or frequency in checking, correlations with depressive symptoms usually turned out to be small (r = 0.10-0.17) and often non-significant (Vahedi & Zannella, 2021; Valkenburg et al., 2022). Thus, our findings do lend support to the assertions that compulsive, addictive patterns of use—rather than mere screen time—pose a greater risk for mental health.

On the other hand, systematic reviews report that only a small fraction of users fulfill the PSMU criteria (Bányai et al., 2017), but the ones that do become more likely to present depressive, anxious, and stressed symptoms (Cataldo et al., 2021; Keles et al., 2020). The associations we obtained amongst our participants in Greece echo those obtained in cross-sectional surveys, which indicate that higher PSMU and greater emotional investment predict substantially greater odds of anxiety and depression (Alsunni & Latif, 2020), with these relationships being mediated by rumination and low self-esteem (Wang et al., 2018). Contrarily, an eight-year longitudinal study stated that social media use could not predict increases in depression or anxiety amongst U.S. adolescents (Coyne et al., 2020). This contradictory finding probably has to do with the difference between problematic and normative use; only long-term engagement might not be detrimental, while compulsive engagement, being salient and causing tolerance and withdrawal, becomes directly harmful.

Our findings concur with those of Bilali et al. (2025) who reported a significant relationship between problematic TikTok usage and increased levels of anxiety and depression among Greek adolescents. Specific components such as mood modification and conflict in the case of these individuals predicted anxiety and depressive symptoms respectively. Interestingly, while girls reported higher usage, the psychological impact seemed more powerful for boys. This somewhat contradicts our findings whereby PSMU-anxiety was consistent across sexes but aligns with our depression results, which indicated that Gen Z and Millennial cohorts demonstrated stronger associations with this outcome.

In terms of sleep-related outcomes, both our findings and those of Katsiroumpa et al. (2025) pointed out the negative relationship of problem use with sleep quality. They found in their Greek young adult study that higher TikTok addiction scores were related to less nighttime sleep and increased daytime sleepiness, just as we found poorer sleep quality associated with higher levels of PSMU, especially among males and Millennials. These converging patterns would amplify the more general linkage between engaged behavior in social media and the impairment in sleep hygiene across ages.

4.2. Generational Differences and Socio-Demographic Patterns

The relationships between PSMU and mental health outcomes were higher among Millennials (born 1981–1996) and Generation Z (born 1997–2012) than among Generation X (born 1965–1980), when we looked at generational cohorts independently. Cultural and developmental variables are probably reflected in this trend. Adolescents and young adults spend more time on social media and are more integrated into online peer cultures than older adults. According to surveys conducted throughout Europe, 77% of 13–16-year-olds have a profile on at least one online social network (Livingstone et al., 2011), 92% of older European adolescents use at least one network and 70% report daily use (Tsitsika et al., 2014), and 97% of American teenagers use social media (Anderson & Jiang, 2018). This difference in normative use has meant that social media is used increasingly by the younger cohorts for the fulfilment of needs for belonging and self expression; thus, they are more exposed to upward social comparison, cyberbullying, and fear of missing out. Developmental neuroscience examines adolescent to emerging adult years as heightening sensitivity to social reward

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and peer approval (Crone & Konijn, 2018). On the other hand, Generation X adopted these technologies somewhat later on and might have had more well-established offline support systems and self-regulation skills. The cross-sectional studies associate in some way with our results, finding that younger users have a higher risk of PSMU (Bányai et al., 2017), and a longitudinal cohort study out of Croatia has also found that baseline social media use predicts lower life satisfaction in girls and higher life satisfaction in boys under low parental engagement (Keresteš & Štulhofer, 2020).

Sex differences were minimal in the sample and consistent with meta-analysis findings that sex does not reliably moderate the association between social media use and depressive symptoms (Vahedi & Zannella, 2021). However, gender differences in the fields of usage may define experience; men will refer to exploration and entertainment for the use of tech, while women might feel that they are less competent and going through more negative feelings when using tech (Sobieraj & Kraemer, 2020). Among U.S. adolescents, cross-sectional surveys have recorded that girls say they have more online harassments and pressures about the body, but boys will engage more in gaming and peer bonding (Kreski et al., 2021). Thus, while differences in sex may make no difference to the overall strength of associations, they might yield qualitatively different experiences that engender specific mental health risks; future research needs to investigate content and context of use in order to capture these nuances.

4.3. Sleep Quality and Circadian Disruptions

There are several reasons why PSMU can co-occur with anxiety, sadness, and sleep problems. Cognitive behavioral theories suggest that maladaptive cognitions (such rumination and negative self-evaluation) and personality traits like low self-esteem moderate the link between social media addiction and depression (Wang et al., 2018). While upward social comparison increases negative affect, FOMO leads to continual monitoring and can worsen anxiety (Kreski et al., 2021; Scott & Cleland Woods, 2018). Interestingly, one study found that while seeing posts about sports, friends, and family correlated with better sleep, but seeing posts about celebrities or strangers was correlated with poorer sleep, suggesting that the affordances of the platform and the content that is available matter (Bergfeld & Van den Bulck, 2021).

While our findings fit in with these trends, longitudinal studies reveal that the relationship between PSMU and sleep could potentially be mediated by depression and stress (Bergfeld & Van den Bulck, 2021); thus, future studies ought to analyze whether improving sleep hygiene can help safeguard against adverse mental health outcomes or whether an underlying distress drives both PSMU and sleep problems. Further support of the findings is suggested by Katsiroumpa et al. (2025), who noted that higher levels of TikTok addiction were linked not only to reduced nighttime sleep duration but also to increased levels of excessive daytime sleepiness, particularly in younger adults. This correlates with our own results in which PSMU was related to bad sleep quality, particularly in the Millennials, demonstrating how problematic digital behavior takes away recuperative sleep.

4.4. Mechanisms and Theoretical Perspectives

Several theories can explain how PSMU occurs alongside anxiety and depression as well as disturbances in sleep. Cognitive behavioral models argue that social media addiction becomes linked to depression through the mediation of maladaptive cognitions (e.g., rumination, negative self-evaluation) and personality traits such as low self-esteem (Wang et al., 2018). Thus, fear of missing out drives endless checking, which may worsen anxiety, while upward social comparison enhances negative effects (Craig & Cleland Woods, 2018; Kreski et al., 2021). Displaced activities theory argues that time spent in sedentary online activities displaces time for social interactions, physical activity, or sleep, indirectly harming mental health (Karim et al., 2020). Meanwhile, the uses and gratifications framework remind us of that people actively select media to fulfill certain psychological needs; thus, those with pre-existing mental health problems may be using social media even more intensively as a means of seeking out support, distraction, or validation (Deci & Ryan, 2000). The actual directionality of effects is still uncertain; our cross-sectional design will not allow disentangling

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whether PSMU is a cause of, or a consequence related to psychological distress. Longitudinal or experimental studies should assess the above-mentioned mechanisms, including objective measurement of use and sleep, and assess whether interventions targeting cognitions (e.g., reducing rumination) or behaviors (e.g., limiting nighttime use) would lead to better outcomes.

4.5. Limitations

Our research encountered several limitations. Firstly, although we employed valid instruments to evaluate problematic social media use, anxiety, depression, and sleep quality, participants' answers might have been swayed by social desirability bias, potentially leading to information bias in our findings. Furthermore, information bias could also stem from measuring confounding factors, such as relying on self-reported data for socioeconomic status. Secondly, we used a convenience sample of social media users in Greece. Despite meeting the sample size criteria, our sample might not fully represent all social media users. For instance, our study mainly consisted of females, which could introduce selection bias due to this gender disparity. Future studies should use random sampling to achieve more representative results. Thirdly, as our study was cross-sectional, we cannot establish a causal relationship between problematic social media use and anxiety, depression, and sleep quality. Therefore, it remains uncertain whether problematic social media use affects anxiety, depression, and sleep quality, or if these issues pre-exist and lead to increased social media use. Longitudinal studies exploring the connection between problematic social media use and these variables could offer valuable insights. Fourthly, we considered several confounders in our study. However, other factors might still confound the relationship between problematic social media use, anxiety, depression, and sleep quality. Future research should aim to eliminate additional confounders, such as personality traits, family relationships, and sleep patterns. Lastly, investigating potential mediators in the relationship between problematic social media use, anxiety, depression, and sleep quality could further enhance our understanding of social media's impact.

5. Conclusions

This work confirms the strong association between PSMU and adverse mental health outcomes (i.e., higher levels of anxiety, depression and decreased sleep quality). Although the associations between PSMU and anxiety was similar across generations and sex, its relationship to depression was stronger in Generation Z and Millennials; furthermore, it had more negative effect on sleep quality in males and Millennials. These results suggest that the psychological implications of social media use are influenced by individual practices as well as demographic characteristics. Targeted, age- and gender-sensitive interventions are needed to address compulsive digital engagement and to support mental well-being in the context of pervasive online connectivity.

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Abbreviations

The following abbreviations are used in this manuscript:

BSMAS	Bergen Social Media Addiction Scale
FOMO	Fear of missing out
PHQ-4	Patient Health Questionnaire-4
PSMU	Problematic social media use

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