



Exploring the Mediating Role of Social Media and Gaming in the Relationship between Adolescents' Feelings of Loneliness, Ostracism and Internalizing and Externalizing symptoms

Steven Bruneel¹ · Jeremia Sjöblom² · Martin Lagerström² · Katarina Alanko¹

Received: 9 January 2026 / Accepted: 5 May 2026
© The Author(s) 2026

Abstract

Social outsiderhood – particularly loneliness and ostracism – has a significant impact on mental health issues such as internalizing symptoms (e.g., depression, anxiety) and externalizing symptoms (e.g., aggression, conduct problems). Yet, the mechanisms underlying these effects are multifaceted and likely include multiple mediating processes that may either amplify or mitigate the emergence of internalizing and externalizing symptoms. This cross-sectional study examines whether digital behaviors – social media use and gaming – mediate the relationship between school-based loneliness, school-based ostracism, and externalizing and internalizing symptoms in Finnish adolescents. Data were collected from 1,742 secondary school students (mean age 14.9 years; 47.6% male). Results reveal that both social media use and gaming were only weakly correlated with school-based loneliness, school-based ostracism, and mental health outcomes. Mediation analyses demonstrated that neither social media nor gaming robustly mediated the link between social disconnection and externalizing and internalizing symptoms. However, social media use weakly but significantly mediated the ostracism – internalizing symptoms link among girls, and gaming partially mediated the loneliness – internalizing symptoms link among boys. The findings suggest that digital behaviors are not primary explanations for the impact of school-based loneliness and ostracism on adolescent mental health. Future research should utilize longitudinal approaches and other measures of digital engagement to further clarify these relationships and identify alternative mediating processes.

Keywords Loneliness · Ostracism · Gaming · Social media · Internalizing symptoms · Externalizing symptoms

Introduction

Loneliness and ostracism peak during adolescence due to heightened expectations, emotional intensity, and peer evaluation [1–3]. Research increasingly highlights the psychological impact of social disconnection – particularly loneliness and ostracism – on mental health issues, including internalizing symptoms (e.g., depression, anxiety) [1, 4] and externalizing symptoms (e.g., aggression, conduct problems) [3, 5]. The pathways through which these effects

manifest are complex and may involve mediators that can either increase or decrease internalizing and externalizing symptoms.

Adolescents today navigate their social lives offline and online, making the psychological impact of digital platforms particularly relevant [6]. Social media enables adolescents to maintain peer connections and seek validation, with friendship maintenance being a primary usage motivation [7, 8]. Video gaming, especially since the COVID-19 pandemic, has also become integral to adolescent leisure activities, providing distraction, competition, and social interaction [9]. However, the psychological consequences of time spent on social media and gaming are contested. While some studies suggest these activities may address a response to social distress, others report limited or inconsistent associations with mental health. For example, a systematic review by Tang et al., [10] highlighted only small associations between screen time and depressive symptoms,

✉ Katarina Alanko
katarina.alanko@utu.fi

¹ Turku Research Center for Learning Analytics, University of Turku, Turku, Finland

² Faculty of Humanities, Psychology and Theology, Åbo Akademi University, Turku, Finland

with no consistent longitudinal links to other internalizing symptoms.

Given these mixed findings, establishing relationships among loneliness, ostracism, digital behaviors, and internalizing and externalizing symptoms remains challenging. Therefore, this study aims to explore whether time spent on social media and gaming mediates associations between loneliness, ostracism, and both internalizing and externalizing symptoms among adolescents.

Building on and expanding the work of Alanko et al., [11], this study utilizes the same dataset collected in May 2021, during a period marked by elevated social isolation among adolescents following the COVID-19 pandemic. Previous systematic reviews confirm that adolescents during this time reported higher levels of loneliness, which predicted increases in depression and anxiety [12, 13]. School closures intensified isolation, restricting students' social interactions to online formats. By revisiting this dataset, this study seeks to clarify the mediating role of digital behaviors in the relationship between social disconnection and mental health trajectories.

Ostracism and Loneliness

Ostracism, defined as being ignored or excluded by others [14], describes individuals' feelings of being 'invisible' [15]. In schools, ostracism manifests through both indirect exclusion (e.g., bullying) and direct rejection. Adolescence, characterized by increased peer evaluation, renders ostracism a significant threat to healthy development [16]. Loneliness, a subjective feeling stemming from unfulfilled social needs [17], primarily reflects the quality of social connections rather than quantity [18]. Adolescents often grapple with closer peer relationships amid changing parental dynamics, leading to school-based loneliness and ostracism [6, 19]. Notably, adolescents spend significant time in schools, where social dynamics foster feelings of loneliness and ostracism [20].

Unsurprisingly, research indicates a robust association between loneliness and ostracism. For example, Çiftci et al., [16] found that adolescents' loneliness increases with greater ostracism. While both experiences involve social exclusion, they are treated as distinct constructs due to their unique theoretical backgrounds and definitions [14]. Ostracism pertains to behaviors enacted by others, whereas loneliness denotes individuals' emotional experiences.

Studies consistently show ties between loneliness and internalizing symptoms [1, 3, 5]. Ostracism's psychological effects manifest in increased depression (Cacioppo & Hawley, 2003; [21]), helplessness, and feelings of unworthiness [22]. Ostracized individuals experience profound negative emotions, such as sadness and humiliation [23]. Vulnerable

groups, like migrant children, may be particularly susceptible to ostracism's adverse effects [24]. Likewise, feelings of loneliness correlate with mental health problems, showing links to increased depression [1, 25] and anxiety [18]. While our prior work indicated that ostracism correlates more strongly with internalizing symptoms than loneliness [11], both experiences raise mental health concerns, including self-harm [15] and suicidal thoughts [26, 27].

Ostracism and loneliness also relate to externalizing symptoms. Social control theory emphasizes that societal attachment prevents delinquency [28]. Yet, ostracism undermines these social bonds, increasing externalizing symptom vulnerability [24]. Studies frequently connect ostracism with adolescent aggression [24, 29, 30]. Isolated adolescents are more likely to engage in antisocial behavior [14] and experience police contact [5]. Loneliness links to substance use [31] and particularly to aggression [1]. Thus, prior findings show how loneliness and ostracism similarly affect both internalizing and externalizing symptoms [32].

Screen Time: Gaming and Social Media

As adolescents face growing digital interactions [6], understanding links between loneliness, ostracism, and screen time has gained importance. Although screen time often coincides with loneliness and ostracism, longitudinal studies reveal limited support for causal relationships, especially regarding social media [10, 33]. Descarpentry et al., [34] further complicate this picture by reporting weak and inconsistent associations between screen time and both internalizing (e.g., depression, anxiety) and externalizing (e.g., aggression, conduct problems) behaviors in children and young adolescents. Notably, their findings suggest persistent high screen use weakly correlates with peer issues but not broader internalizing symptoms. Moreover, the directionality of these relationships remains ambiguous [35], leading Hall [7] to conclude that screen use, particularly social media, does not significantly alter loneliness over time. There is, however, growing evidence that gender may be a meaningful variable in the relationship between screen time and internalizing symptoms. This evidence suggests that the negative effects of self-relevant comparisons may pose a greater threat to self-worth and thus have a stronger impact on well-being for girls than for boys [36].

Social Media, Loneliness/ostracism and Internalizing and Externalizing Symptoms

Empirical literature presents mixed findings on social media's effects on mental well-being [37–39]. While some studies indicate social media may improve well-being [40, 41], many report negative impacts [42], particularly among

girls [39, 43]. Research correlates social media use with heightened anxiety [36, 44], increased depression (Primack et al., [45], [36]), and lowered self-esteem [46]. However, effect sizes are often small [47], and some studies find no significant connections [48]. Regarding social media's relationship with loneliness, Song et al., [49] argued that establishing a causal direction is challenging, suggesting a bidirectional link [6, 50]. Similarly, Hall, [7] concluded that social media plays a limited role in predicting loneliness changes over time. Methodological inconsistencies in how social media use is evaluated may contribute to inconsistent findings [39, 47]. These findings underscore the ongoing uncertainty surrounding social media's impact on mental health, highlighting the need to examine its relationship with internalizing symptoms in this study.

Gaming, Loneliness/ostracism and Internalizing and Externalizing Symptoms

Gaming has become a key part of adolescent lives, especially during the COVID-19 pandemic [9]. Research into gaming's connection to loneliness, ostracism, and internalizing and externalizing symptoms is also growing. Video games are often studied in experimental settings of social exclusion recovery, focusing on pro- and anti-social behaviors. Studies indicate that gaming may help ostracized individuals foster social behaviors and reduce aggression [30, 51]. Like social media, gaming can create digital environments that promote social connections among isolated adolescents.

However, the relationship between gaming and loneliness reveals mixed results [52]. Some studies show positive effects, with games reducing lockdown-induced loneliness among college students [53]. These positive effects apply mainly to males, as the gaming market tends to be more tuned towards men's preferences [9]. Other research suggests online multiplayer games can alleviate loneliness if gameplay is voluntary and balanced with offline activities [54, 55]. On the contrary, using gaming as a coping strategy can worsen anxiety, depression, and loneliness for vulnerable individuals [52]. Nguyen et al., [56] found that excessive multiplayer gaming during the pandemic correlated with increased feelings of loneliness. These conflicting findings align with Williams' [57] hypothesis of gaming's dualistic effect on psychosocial factors: it can both expand and limit meaningful social contacts.

Beyond loneliness, research suggests that moderate gaming may reduce anxiety, stress, and depression while offering cognitive and emotional benefits [58]. Conversely, problematic gaming correlates with higher stress, anxiety, depression, and low self-esteem [59]. Such gaming problems are linked not only to internalizing but also to

externalizing symptoms, like aggression and attention-deficit hyperactivity disorder (ADHD) [59]. Prior discussions highlight the dual nature of digital media use, indicating that both social media and gaming can act as risk and protective factors for adolescent mental health, depending on the intensity and context of use. Some studies reveal that boys are at greater risk of developing problematic gaming behaviors [9, 59, 60]. Research should thus examine the complex and context-dependent nature of gaming's impact on adolescent well-being, and also investigate males and females separately, given that problematic gaming is more prevalent among males than females [9].

Social Media and Gaming as Mediating Factors

Consequently, social media and gaming may significantly mediate the association between loneliness, ostracism, and internalizing and externalizing symptoms. For internalizing symptoms – such as depression and anxiety – adolescents who feel lonely or ostracized may seek validation and connection through social media [7]. While evidence indicates some social media benefits such as opportunities for connection and support [8], higher engagement generally correlates with increased risks for depression, anxiety, and lowered self-esteem [42]. These risks are compounded for those who passively consume content or face negative experiences like cyberbullying, intensifying the internalizing effects of pre-existing loneliness or ostracism.

For externalizing symptoms, such as aggression or anti-social behavior, both social media and gaming provide outlets for the expression of frustration stemming from social isolation. Problematic gaming is linked to greater aggression, particularly among boys [59], and online environments can elevate exposure to aggressive content or hostile interactions. Thus, while social media and gaming can serve as coping mechanisms, excessive or maladaptive use may reinforce cycles of disengagement from offline relationships and heighten problematic behaviors.

In conclusion, social media and gaming do not function uniformly as risk or protective factors. Instead, the context, motivations, and usage intensity dictate whether these digital activities amplify or buffer mental health risks linked to loneliness and ostracism. Examining these digital behaviors as mediating variables is vital in understanding how adolescents' social disconnection experiences translate into specific patterns of internalizing or externalizing symptoms.

Aims of the Present Study

This study aims to examine the mediating role of social media and gaming in the relationship between school-based ostracism, school-based loneliness, and both internalizing and externalizing symptoms, while also accounting for potential gender differences. Although existing literature has established connections among these constructs, limited research has specifically examined the influence of digital media on these relationships. Given that social media and gaming are prevalent in adolescents' lives and tied to both ostracism and loneliness alongside mental health outcomes, this study investigates whether time spent on these activities serves as mediating factors, and whether these mediating mechanisms differ across gender. Specifically, this study aims to:

1. Examine the associations among feelings of school-based loneliness, school-based ostracism, internalizing and externalizing symptoms, and gaming and social media, while also accounting for potential gender differences.
2. Explore the mediating role of gaming and social media in the relationship between school-based loneliness and school-based ostracism and both internalizing and externalizing symptoms, and whether these mediating mechanisms differ across gender.

Based on these aims, the hypotheses of this study are:

H1a: school-based loneliness is associated with internalizing and externalizing symptoms.

H1b: school-based ostracism is associated with internalizing and externalizing symptoms.

H2a: school-based loneliness is associated with time spent on social media and gaming.

H2b: school-based ostracism is associated with time spent on social media and gaming.

H3a: time spent on social media is associated with internalizing symptoms.

H3b: time spent on gaming is associated with externalizing symptoms.

H4a: the association between school-based loneliness, ostracism, and internalizing symptoms is mediated by the time spent on social media.

H4b: the association between school-based loneliness, ostracism and externalizing symptoms is mediated by the time spent on gaming.

H5: gender moderates the associations and mediating pathways between school-based ostracism, school-based loneliness, digital media use (social media and gaming), and internalizing and externalizing symptoms.

Methodology

Participants, Sampling, and Process

This study utilized data from the School Absence in Finland project (as outlined by [61]). Participant recruitment occurred in two phases. Initially, school principals and teachers were approached and provided with detailed information about the study, along with an invitation to an online seminar on school absence. This information was disseminated via e-mail and relevant educational Facebook groups. The seminar, held in January 2021, included presentations on school absence and data collection procedures. Following this, 15 upper primary schools from southern and western Finland agreed to participate. These schools sent information to parents via e-mail, requesting consent for their children's involvement. Consistent with the Finnish National Board on Research Integrity (TENK) guidelines, parental consent was required for participants under 15. Additionally, all adolescent participants provided written informed consent before completing the survey.

Data were collected from 2,137 youths, with 395 excluded due to lack of consent, implausible age, or missing responses, resulting in a final sample of 1,742 adolescents (average age: 14.93 years, $SD=0.86$). The gender distribution was male (47.6%) and female (52.4%). Participants reported their parents' highest educational level: 50% university or higher, 28% upper secondary or vocational, 3% comprehensive school or equivalent, and 0.1% none, with 19% unknown. 76% lived with both parents, 13% alternated between two parents, 10% lived with one parent, 0.6% in residential childcare, and 2% had other or missing arrangements; percentages may not sum to 100 due to rounding.

Data collection occurred during standard school hours in May 2021, with a research assistant or teacher present to provide clarification and technical support. To engage students with chronic school absence, school personnel directly contacted absent students, even conducting home visits as necessary, obtaining an additional 42 responses.

Measures

Social Media and Gaming

Participants rated their average weekday time spent on gaming and social media on a 4-point scale (from 0 min to over 5 h). This item was specifically designed for this study, focusing on weekday behaviors associated with school absence.

Symptoms of Loneliness and Ostracism

Loneliness and ostracism were assessed using the Inventory of School Attendance Problems (ISAP; [62]), a questionnaire screening for school attendance issues. Participants rated their agreement with two statements on a 4-point Likert scale (1 = never, 4 = most of the time): “Before or at school I feel excluded by my classmates” (indicating ostracism) and “Before or at school I feel unhappy because I only have a few friends” (reflecting loneliness). The ISAP has shown consistent reliability across various contexts, including the current sample [11], and in prior studies [62, 63].

Internalizing and Externalizing Symptoms

Internalizing and externalizing symptoms were measured using the Strengths and Difficulties Questionnaire (SDQ; [64]), a 25-item instrument comprising five subscales: Emotional Symptoms, Conduct Problems, Hyperactivity-Inattention, Peer Problems, and Prosocial Behavior, each containing five items. Responses followed a 3-point Likert scale (0 = not true, 2 = certainly true), resulting in subscale scores of 0 to 10. For this study, the Emotional Symptoms and Peer Problems subscales represented internalizing symptoms, while Conduct Problems and Hyperactivity-Inattention served as indicators of externalizing symptoms. All subscales exhibited acceptable internal consistency ($\alpha = 0.74$).

Data-analysis

Data preparation and analyses were conducted in R version 4.2.0, utilizing *tidyverse* [65] for data cleaning, *lavaan* [66] for path models, and *Hmisc* [67] for correlations. The analysis included Pearson product-moment correlations and mediation models. Missing data patterns were examined using the *mice* [68] and *VIM* [69] packages in R. Given that the primary missing data reasons were drop-out and missing responses on gender ($n = 84$), no data imputation was performed.

Results

Descriptive Results

Table 1 presents descriptive statistics for all main variables, disaggregated by gender. Girls ($n=913$) reported significantly higher perceived ostracism levels than boys ($n=829$). Similarly, girls exhibited higher loneliness scores than boys, although the effect size was small ($d=0.14$). Gender differences were particularly pronounced in leisure activities. Boys reported significantly more gaming than girls (large effect size: $d=0.90$), while girls frequented social media more. Additionally, girls reported higher levels of internalizing and externalizing symptoms compared to boys.

Correlations between Loneliness, Ostracism, Social Media, Gaming, and Internalizing and Externalizing Symptoms

Among boys, ostracism and loneliness correlated strongly, whereas this association was moderate for girls. Loneliness and ostracism correlated moderately with internalizing symptoms for both genders, with no significant gender differences observed, as presented in Table 2.

Externalizing symptoms correlated moderately with ostracism and loneliness, especially among boys. Notably, correlations between social media use and internalizing symptoms were generally low; however, a small yet significant positive correlation emerged among girls, indicating a subtle gender-specific association.

4.3 The Mediating Role of Social Media and Gaming for the Association of Loneliness and Ostracism with Internalizing and Externalizing Symptoms.

The Mediating Role of Social Media

Separate, saturated, just-identified path models were fit for girls and boys to assess the mediation of social media in the association between loneliness, ostracism, and both internalizing and externalizing symptoms. All reported regression coefficients are standardized, with the two models illustrated in Fig. 1; Table 3.

Table 1 Descriptive Data

	Boys		Girls		Range	t (df)	p	d
	M	SD	M	SD				
Ostracism	1.29	0.62	1.51	0.78	1–4	5.99 (1471.9)	<0.001	0.31
Loneliness	1.23	0.62	1.32	0.69	1–4	2.56 (1461.7)	0.011	0.14
Gaming	2.41	0.92	1.60	0.87	1–4	16.85 (1367.8)	<0.001	0.90
Social media	2.19	0.87	2.78	0.86	1–4	13.79 (1656.7)	<0.001	0.68
Internalizing symptoms	6.44	3.11	8.39	3.06	0–20	12.44 (1514.9)	<0.001	0.63
Externalizing symptoms	6.50	3.05	7.29	2.47	0–20	5.52 (1386.9)	<0.001	0.28

Table 2 Bivariate Correlations between Study Variables, Separate for Boys and Girls

	1.	2.	3.	4.	5.	6.
1. Ostracism	-	0.59***	0.13***	0.18***	0.33***	0.20***
2. Loneliness	0.68***	-	0.13***	0.16***	0.23***	0.14***
3. Social media	0.01	0.04	-	0.02	0.13***	0.14***
4. Gaming	0.08*	-0.01	0.10**	-	0.01	0.02
5. Internalizing symptoms	0.35***	0.29***	0.05	0.10*	-	0.47***
6. Externalizing symptoms	0.28***	0.20***	0.06	0.00	0.61***	-

Correlations for boys below the diagonal, correlations for girls above the diagonal. All correlations are significant at $p < .05$. Asterisks indicate significant correlations: * = $p < .05$, ** = $p < .01$, *** = $p < .001$, bold correlations are significantly different for boys and girls

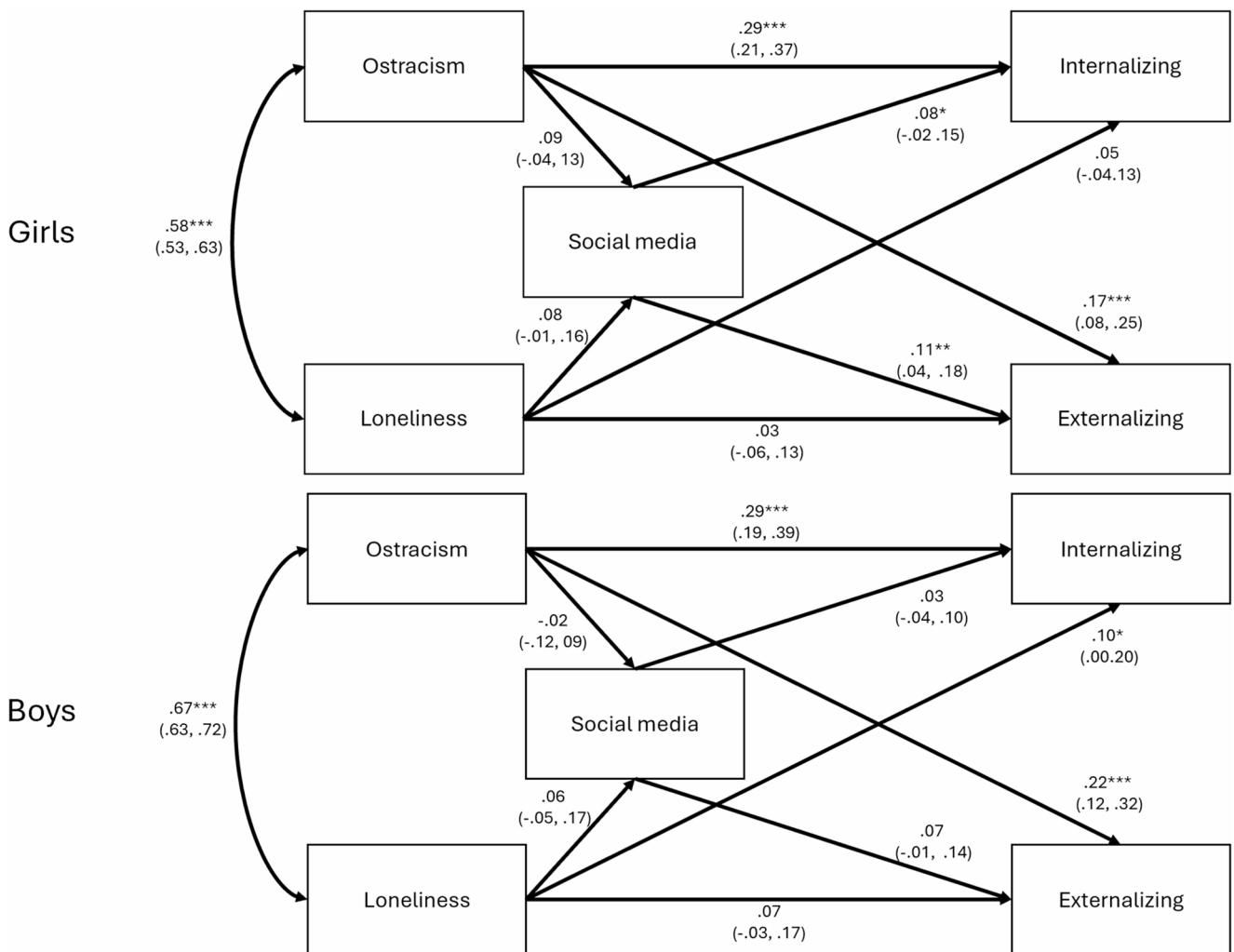


Fig. 1 Path Model on Social Media. Standardized estimates of the path model. *** $p < .001$, ** $p < .01$, * $p < .05$

Across both genders, ostracism remained a strong predictor of internalizing and externalizing symptoms. However, social media did not significantly mediate any hypothesized paths for either gender. Among girls, social media use showed weak associations with internalizing and externalizing symptoms. Despite these direct paths, the overall indirect effects of ostracism and loneliness through social media on mental health outcomes were not statistically significant. The models had modest explanatory power, with R^2 values

for internalizing symptoms ranging from 0.12 to 0.14 and externalizing symptoms being less explained ($R^2 = 0.05$ to 0.08). Social media accounted for minimal variance, particularly among boys ($R^2 = 0.00-0.02$), suggesting its limited mediating role.

Table 3 Path Model Parameter Estimates Social Media

Path	Boys				Girls				Diff	
	B	SE	Beta	<i>p</i>	B	SE	Beta	<i>p</i>		
Direct effects										
Ostracism → Internalizing	1.47	0.26	0.29	<0.001	1.14	0.16	0.29	<0.001	ns.	
Ostracism → Externalizing	1.09	0.26	0.22	<0.001	0.53	0.14	0.17	<0.001	ns.	
Loneliness → Internalizing	0.51	0.26	0.10	0.050	0.20	0.18	0.05	0.269	ns.	
Loneliness → Externalizing	0.34	0.26	0.07	0.192	0.09	0.16	0.03	0.547	ns.	
Ostracism → Social media	-0.02	0.08	-0.02	0.777	0.10	0.05	0.09	0.048	ns.	
Loneliness → Social media	0.08	0.08	0.06	0.282	0.09	0.06	0.08	0.087	ns.	
Social media → Internalizing	0.11	0.14	0.03	0.413	0.30	0.12	0.08	0.014	ns.	
Social media → Externalizing	0.24	0.14	0.07	0.081	0.33	0.10	0.11	0.001	ns.	
Indirect effects										
Ostracism → Social media → Internalizing	-0.00	0.01	-0.00	0.789	0.03	0.02	0.01	0.123		
Ostracism → Social media → Externalizing	-0.01	0.02	-0.00	0.780	0.03	0.02	0.01	0.092		
Loneliness → Social media → Internalizing	0.01	0.01	0.00	0.515	0.03	0.02	0.01	0.160		
Ostracism → Social media → Loneliness	0.02	0.02	0.00	0.360	0.03	0.02	0.01	0.131		
R2										
Internalizing	0.14				0.12					
Externalizing	0.08				0.05					
Social Media	0.00				0.02					

$N_{Boys} = 620$, $N_{Girls} = 767$. Diff=Significant difference in beta values between boys and girls based on confidence intervals. ns=non-significant

The Mediating Role of Gaming

The same path models were fit to estimate whether gaming mediates the association between loneliness, ostracism, and both internalizing and externalizing symptoms, separately for girls and boys, with the path models illustrated in Fig. 2; Table 4.

For girls, ostracism significantly affected both internalizing and externalizing symptoms, while loneliness did not predict either outcome. Gaming was not a significant mediator for girls, as none of the indirect paths were significant. Notably, the path from gaming to internalizing symptoms was non-significant and negative, reflecting gender differences in gaming behaviors and their psychological implications.

For boys, ostracism also significantly impacted both internalizing and externalizing symptoms. Gaming partially mediated the relationship between ostracism and internalizing symptoms, although the indirect effect was not statistically significant. Loneliness directly predicted internalizing symptoms but was negatively associated with gaming, indicating different coping mechanisms may be involved.

Discussion

The present findings indicate that school-based loneliness and ostracism are associated with internalizing and externalizing symptoms (hypotheses 1a and 1b), with ostracism showing a stronger relationship to these symptoms than

loneliness. Ostracism proved to be a robust predictor for both genders, while loneliness uniquely predicted internalizing symptoms only among boys. The correlation between loneliness and ostracism was moderate, slightly higher among boys.

These results reveal significant gender differences across key variables. Girls reported higher levels of perceived ostracism, loneliness, internalizing and externalizing symptoms, and social media use, while boys engaged more in gaming. This aligns with literature suggesting adolescent girls experience greater loneliness and ostracism [5, 70] externalizing symptoms [71], internalizing symptoms [72, 73], and social media use [36, 74]. Some studies, however, indicate that boys may experience higher levels of loneliness [36], externalizing behavior [72, 75], and internalizing behavior [76]. Thus, incorporating gender in future studies is essential to clarify mixed findings on this topic.

The findings support hypothesis 5, as mediation analyses revealed gender-specific patterns: for boys, gaming partially – but not significantly – mediated the relationship between ostracism and internalizing symptoms, while no such effects were observed for girls. Hypothesis 3a is partially supported, as time spent on social media emerged as a weak but significant predictor of mental health symptoms in girls, yet did not mediate relationships, indicating its limited explanatory role. Overall, the strength of associations between loneliness and ostracism with internalizing and externalizing symptoms was moderate, and path models accounted for modest variance, particularly in externalizing outcomes. These findings highlight distinct gendered pathways in

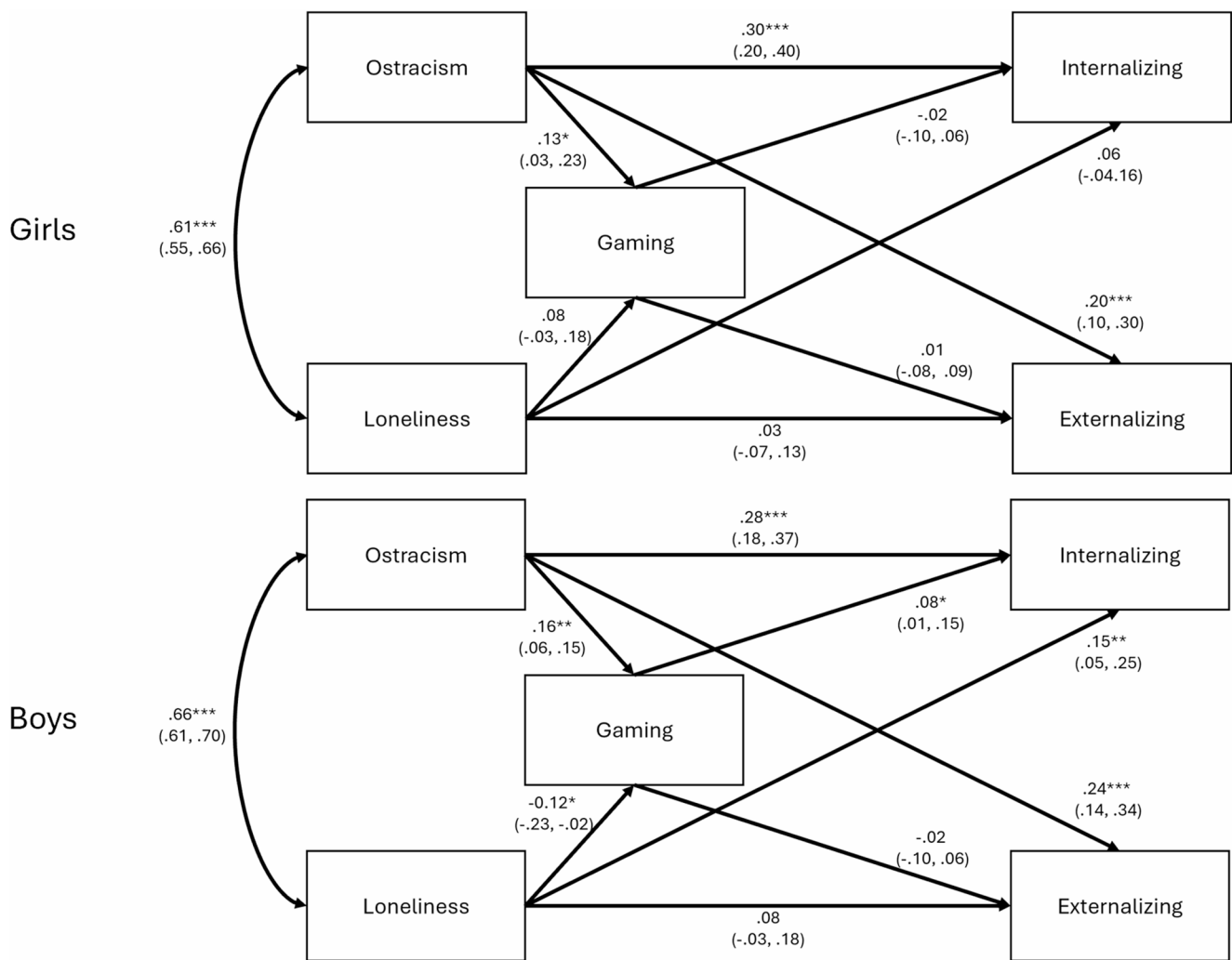


Fig. 2 Path Model on Gaming. Standardized estimates of the path model. *** $p < .001$, ** $p < .01$, * $p < .05$

adolescents' emotional and behavioral adjustment, with differential roles for digital media use in these processes.

Notably, correlations between social media use and internalizing symptoms were generally low; however, a small yet significant positive correlation emerged among girls, indicating a subtle gender-specific association.

Hypotheses 2a and 2b anticipated associations between school-based loneliness and ostracism with time spent on social media and gaming. For boys, both social media use and gaming displayed only weak correlations with loneliness and internalizing and externalizing symptoms. This contrasts with significant literature linking social media and various mental health outcomes, albeit often with small effect sizes and disregarding potential gender differences [39, 42, 47]. Mediation analyses show that social media was a weak but significant predictor of internalizing symptoms among girls, aligning with findings that girls may be more vulnerable to negative social comparison and self-esteem issues related to social media [39, 43]. However, our results differ

from studies reporting no association between social media and internalizing symptoms [48] or suggesting positive outcomes from social media use [40, 41]. Future research should explore how diverse social media activities (like or dislike photos and videos, chatting) are related with mental health [39]. Notably, ostracism is infrequently conceptualized as a condition improved by social media; rather, it may serve as a platform for exclusion. Cyber-ostracism's psychological consequences mirror those of offline ostracism [29], underscoring digital platforms' dual role as connection tools and exclusion instruments. For gaming, mediation analyses indicated significant mediation of the relationship between loneliness and internalizing symptoms, but only for boys [59, 60].

Overall, these results suggest limited mediating effects of both social media and gaming, indicating these digital activities are not primary pathways through which loneliness and ostracism affect mental health. This leads to the rejection of hypotheses 4a and 4b, suggesting that time spent on social

Table 4 Path Model Parameter Estimates Gaming

Path	Boys				Girls				Diff	
	B	SE	Beta	<i>p</i>	B	SE	Beta	<i>p</i>		
Direct effect										
Ostracism → Internalizing	1.41	0.25	0.28	<0.001	1.17	0.20	0.30	<0.001	ns.	
Ostracism → Externalizing	1.17	0.26	0.24	<0.001	0.65	0.170	0.20	<0.001	ns.	
Loneliness → Internalizing	0.76	0.25	0.15	0.003	0.28	0.23	0.06	0.236	ns.	
Loneliness → Externalizing	0.37	0.26	0.08	0.150	0.11	0.20	0.03	0.589	ns.	
Ostracism → Gaming	0.23	0.08	0.16	0.004	0.14	0.06	0.13	0.013	ns.	
Loneliness → Gaming	-0.18	0.08	-0.12	0.025	0.10	0.07	0.08	0.152	ns.	
Gaming → Internalizing	0.28	0.13	0.08	0.030	-0.06	0.15	-0.02	0.685	ns.	
Gaming → Externalizing	-0.06	0.13	-0.02	0.617	0.02	0.13	0.01	0.856	ns.	
Indirect effects										
Ostracism → Gaming → Internalizing	0.06	0.04	0.01	0.082	-0.01	0.02	-0.00	0.689	ns.	
Ostracism → Gaming → Externalizing	-0.02	0.03	-0.00	0.622	0.00	0.02	0.00	0.856	ns.	
Loneliness → Gaming → Internalizing	-0.05	0.03	-0.01	0.119	-0.01	0.02	-0.00	0.696	ns.	
Ostracism → Gaming → Loneliness	0.01	0.02	0.00	0.626	0.00	0.01	0.00	0.857	ns.	
R2										
Internalizing	0.16				0.11					
Externalizing	0.09				0.05					
Gaming	0.01				0.04					

$N_{Boys} = 606$, $N_{Girls} = 545$, Diff=Difference in beta values between boys and girls based on confidence intervals. ns=non-significant

media and gaming mediates relationships between school-based loneliness, ostracism, and internalizing and externalizing symptoms.

Contextually, data collection occurred in May 2021, following the COVID-19 pandemic, likely affecting participants' experiences of loneliness, ostracism, and digital engagement. Such contextual factors may have influenced the relationships observed, reflecting the social dynamics characteristic of the post-pandemic period. Barbieri and Mercado, [26], for instance, noted that adolescents' loneliness levels were higher during the pandemic.

Importantly, these findings are based on group-level analyses, meaning reported associations represent average trends across the sample. Individual variation may be obscured; thus, while some adolescents may experience strong links between school-based loneliness and time spent on social media, others may observe no association or even the opposite. Therefore, caution is warranted when generalizing group-level patterns to individuals.

Strengths and Limitations

This study is the first, to our knowledge, to investigate potential mediating factors in the well-established relationship between ostracism, loneliness, and internalizing and externalizing symptoms. While gaming and social media were not significant mediators for either gender, the findings – derived from a large sample and gender-stratified analyses

– contribute valuable insights to the field. Given the prevalence of ostracism, loneliness, and mental health symptoms during adolescence, and all are associated with potentially severe long-term consequences [77], further exploration of alternative mediating mechanisms is essential to understand these relationships.

This study also comes with limitations. First, reliance on self-report measures for assessing social media and gaming use introduces potential biases, as self-reported data depend on subjective perceptions, leading to inaccurate responses. Critics argue that media effects research typically favors content-based measures over time-based measures [78]. Additionally, the absence of clear definitions for concepts like “social media” and “gaming” within the questionnaire may result in varied participant interpretations. For example, some may consider single-player mobile games as gaming while others may not, affecting data accuracy [78].

Second, data collection was part of a larger project focused on school-related experiences of loneliness and ostracism (see [11]). Consequently, questionnaire items primarily addressed participants' feelings within the school setting, potentially limiting ecological validity by not fully capturing feelings of loneliness and ostracism outside this setting. Moreover, each variable was measured using a single item, which presents certain limitations for assessing measurement validity and internal consistency. Additionally, they may not fully capture the complex nature of these

psychological constructs which can affect the precision of measurements.

Third, the study's reliance on self-report and lack of clear definitions hindered differentiation between types of social media activities. Prior research indicates that specific activities, such as chatting, may differently relate to internalizing symptoms, particularly among girls [39]. Similarly, Sarmiento et al., [44] highlighted the importance of distinguishing effects based on specific social media use aspects. Hence, more nuanced measurement is needed to enhance understanding of these relationships.

Fourth, the cross-sectional design restricts causal conclusions. Although associations between social media use and mental well-being – especially among girls – were found, it remains unclear whether social media contributes to mental health difficulties or if those experiencing such difficulties are more likely to engage with social media. This ambiguity aligns with literature emphasizing the complex, bidirectional relationship between social media and adolescent mental health ([39]; [43]).

Conclusion

Despite numerous studies examining associations between loneliness, ostracism, and internalizing and externalizing symptoms, no prior research has investigated the mediating roles of gaming and social media in this context. This study indicates that school-based ostracism is more strongly linked to internalizing and externalizing symptoms than school-based loneliness. Among girls, the relationship between ostracism and internalizing symptoms was weakly mediated by social media use, while among boys, gaming significantly mediated loneliness and internalizing symptoms. However, neither gaming nor social media emerged as key mediators in the broader relationship between ostracism, loneliness, and internalizing and externalizing across genders. These findings highlight the need for future research to explore these complex associations using longitudinal designs to draw causal inferences. Additionally, studies should differentiate between various types of social media and gaming activities, and investigate alternative mediating factors that clarify how loneliness and ostracism impact adolescent mental health challenges. A nuanced understanding is crucial for informing prevention and intervention strategies given the potential long-term consequences of these issues.

Author contributions S.B. & K.A. wrote the main manuscript text. J.S. & M.L. collected and analyzed the data-set. All authors reviewed the manuscript.

Funding Open Access funding provided by University of Turku (including Turku University Central Hospital). The present study is part of the EDUCA Flagship funded by the Research Council of Finland (#358924, #358947).

Data Availability The dataset generated and analyzed during the current study is available from the corresponding author upon request.

Declarations

Consent for Publication Not applicable.

Competing interests The authors declare no competing interests.

Ethical Approval The study protocol received approval from the Research Ethics Committee of Åbo Akademi University (Reference number: 2020/06/26).

Consent to participate Parental consent was verbally required for adolescents' involvement.

Conflict of interest.

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

References

1. Heinrich LM, Gullone E (2006) The clinical significance of loneliness: A literature review. *Clin Psychol Rev* 26:695–718. <https://doi.org/10.1016/j.cpr.2006.04.002>
2. Lyyra N, Junntila N, Tynjälä J, Villberg J, Välimaa R (2022) Loneliness, subjective health complaints, and medicine use among Finnish adolescents 2006–2018. *Scand J Public Health* 50(8):1097–1104. <https://doi.org/10.1177/14034948221117970>
3. Schinka KC, Van Dulmen MH, Mata AD, Bossarte R, Swahn M (2013) Psychosocial predictors and outcomes of loneliness trajectories from childhood to early adolescence. *J Adolesc* 36(6):1251–1260. <https://doi.org/10.1016/j.adolescence.2013.08.002>
4. Qualter P, Brown SL, Munn P, Rotenberg KJ (2010) Childhood loneliness as a predictor of adolescent depressive symptoms: An 8-year longitudinal study. *Eur Child Adolesc Psychiatry* 19(6):493–501. <https://doi.org/10.1007/s00787-009-0059-y>
5. Kiuru N, Salmela-Aro K, Laursen B, Vasalampi K, Beattie M, Tunkkari M, Junntila N (2024) Profiles of loneliness and ostracism during adolescence: Consequences, antecedents, and protective factors. *Child Psychiatry Hum Dev* 1–21. <https://doi.org/10.1007/s10578-024-01664-8>
6. Teppers E, Luyckx K, Klimstra TA, Goossens L (2014) Loneliness and Facebook motives in adolescence: A longitudinal inquiry into directionality of effect. *J Adolesc* 37(5):691–699. <https://doi.org/10.1016/j.adolescence.2013.11.003>
7. Hall JA (2025) Loneliness and social media. *Ann N Y Acad Sci* 1543(1):5–16. <https://doi.org/10.1111/nyas.15275>

8. Karsay K, Matthes J, Schmuck D, Ecklebe S (2023) Messaging, posting, and browsing: A mobile experience sampling study investigating youth's social media use, affective well-being, and loneliness. *Social Sci Comput Rev* 41(4):1493–1513. <https://doi.org/10.1177/08944393211058308>
9. Park K, Chang H, Hong JP, Kim MH, Park S, Jung JY, An JH (2024) The effect of time spent on online gaming on problematic game use in male: Moderating effects of loneliness, living alone, and household size. *Psychiatry Invest* 21(2):181. <https://doi.org/10.30773/pi.2023.0027>
10. Tang S, Werner-Seidler A, Torok M, Mackinnon AJ, Christensen H (2021) The relationship between screen time and mental health in young people: A systematic review of longitudinal studies. *Clin Psychol Rev* 86:102021. <https://doi.org/10.1016/j.cpr.2021.102021>
11. Alanko K, Söderberg P, Lagerström M, Laakso MJ, Junttila N (2025) The association between social outsiderhood and school absence is mediated by internalizing symptoms. *School Mental Health*. <https://doi.org/10.1007/s12310-025-09793-8>
12. Farrell AH, Vitoroulis I, Eriksson M, Vaillancourt T (2023) Loneliness and well-being in children and adolescents during the COVID-19 pandemic: A systematic review. *Children* 10(2):279. <https://doi.org/10.3390/children10020279>
13. Houghton S, Kyron M, Hunter SC, Lawrence D, Hattie J, Carroll A, Zadow C (2022) Adolescents' longitudinal trajectories of mental health and loneliness: The impact of COVID-19 school closures. *J Adolesc* 94(2):191–205. <https://doi.org/10.1002/jad.12017>
14. Williams KD (2009) Ostracism: A temporal need-threat model. In: Zanna MP (ed) *Advances in experimental social psychology*. Elsevier, pp 275–314
15. Williams KD (2001) *Ostracism: The power of silence*. Guilford
16. Çiftci N, Yildiz M, Çiftci K (2023) The mediating role of social ostracism in the effect of social media addiction on loneliness in adolescents. *J Pediatr Nurs* 73:177–183. <https://doi.org/10.1016/j.pedn.2023.09.005>
17. Miguel C, Lutz C, Perez-Vega R, Majetić F (2025) Alone on the road: Loneliness among digital nomads and the use of social media to foster personal relationships. *Media Cult Soc* 47(3):546–566. <https://doi.org/10.1177/01634437241290087>
18. Hawkey LC, Cacioppo JT (2010) Loneliness matters: A theoretical and empirical review of consequences and mechanisms. *Ann Behav Med* 40(2):218–227
19. Qualter P, Vanhalst J, Harris R, Van Roekel E, Lodder G, Bangee M, Maes M, Verhagen M (2015) Loneliness across the life span. *Perspect Psychol Sci* 10:250–264. <https://doi.org/10.1177/1745691615568999>
20. Jefferson R, Barreto M, Verity L, Qualter P (2023) Loneliness during the school years: How it affects learning and how schools can help. *J Sch Health* 93(5):428–435. <https://doi.org/10.1111/josh.13306>
21. Niu GF, Zhou ZK, Sun XJ, Yu F, Xie XC, Liu QQ, Lian SL (2018) Cyber-ostracism and its relation to depression among Chinese adolescents: The moderating role of optimism. *Pers Individ Differ* 123:105–109. <https://doi.org/10.1016/j.paid.2017.10.032>
22. Rudert SC, Janke S, Greifeneder R (2021) Ostracism breeds depression: Longitudinal associations between ostracism and depression over a three-year-period. *J Affect Disorders Rep* 4:100118. <https://doi.org/10.1016/j.jadr.2021.100118>
23. Wesselmann ED, Grzybowski MR, Steakley-Freeman DM, DeSouza ER, Nezek JB, Williams KD (2016) Social exclusion in everyday life. In: Riva P, Eck J (eds) *Social exclusion: Psychological approaches to understanding and reducing its impact*. Springer International Publishing, pp 3–23
24. Jiang S, Jiang C, Wang L, Dong L (2023) Effect of ostracism on internalizing and externalizing problems of Chinese migrant children: Exploring the mediating role of marginalization. *Curr Psychol* 42:31333–31341. <https://doi.org/10.1007/s12144-022-04009-7>
25. Richardson T, Elliott P, Roberts R (2017) Relationship between loneliness and mental health in students. *J Public Mental Health* 16(2):48–54. <https://doi.org/10.1108/jpmh-03-2016-0013>
26. Barbieri M, Mercado E (2022) The impact of stay-at-home regulations on adolescents' feelings of loneliness and internalizing symptoms. *J Adolesc* 94:1022–1034. <https://doi.org/10.1002/jad.12084>
27. Schrum LJ, Fumagalli E, Lowrey TM (2023) Coping with loneliness through consumption. *J Consumer Psychol* 33(2):441–465. <https://doi.org/10.1002/jcpsy.1329>
28. Hirschi T (1969) *Causes of Delinquency*. University of California Press
29. Chen Z, Poon K-T, Jiang T, Teng F (2025) Psychosocial and behavioural consequences of ostracism across contexts. *Nat Reviews Psychol* 4(2):112–126. <https://doi.org/10.1038/s44159-024-00393-y>
30. Tamplin-Wilson J, Smith R, Morgan J, Maras P (2019) Video games as a recovery intervention for ostracism. *Comput Hum Behav* 97:130–136. <https://doi.org/10.1016/j.chb.2019.03.008>
31. Stickley A, Koyanagi A, Kopusov R, Schwab-Stone M, Ruchkin V (2014) Loneliness and health risk behaviours among Russian and U.S. adolescents: A cross-sectional study. *BMC Public Health* 14:366. <https://doi.org/10.1186/1471-2458-14-366>
32. Bilgin A, Sloan S, Neville RD (2024) Is the association between infant regulatory problems and trajectories of childhood co-developing internalizing and externalizing symptoms moderated by early screen media exposure? *Eur Child Adolesc Psychiatry* 34(7):2229–2239. <https://doi.org/10.1007/s00787-024-02634-0>
33. Lawrence D, Hunter SC, Cunneen R, Houghton SJ, Zadow C, Rosenberg M, Wood L, Shilton T (2022) Reciprocal relationships between trajectories of loneliness and screen media use during adolescence. *J Child Fam Stud* 31(5):1306–1317. <https://doi.org/10.1007/s10826-021-02066-3>
34. Descarpentry A, Melchior M, Galera C, Hazo J-B, Falissard B, Warszawski J, Davige-Paturet C, Rouquette A (2023) High screen time and internalizing and externalizing behaviours among children aged 3 to 14 years during the COVID-19 pandemic in France. *Eur Child Adolesc Psychiatry* 33:1151–1161. <https://doi.org/10.1007/s00787-023-02241-5>
35. Zahedi S, Jaffer R, Iyer A (2021) A systematic review of screen-time literature to inform educational policy and practice during COVID-19. *Int J Educational Res Open* 2:100094. <https://doi.org/10.1016/j.ijedro.2021.100094>
36. Rutter LA, Thompson HM, Howard J, Riley TN, Jesús-Romero D, R., Lorenzo-Luaces L (2021) Social media use, physical activity, and internalizing symptoms in adolescence: Cross-sectional analysis. *JMIR Mental Health* 8(9):e26134. <https://doi.org/10.2196/26134>
37. Fassi L, Thomas K, Parry DA (2024) Social media use and internalizing symptoms in clinical and community adolescent samples. A systematic review and meta-analysis. *JAMA Pediatr* 178(8):814–822. <https://doi.org/10.1001/jamapediatrics.2024.2078>
38. Jin J, Kim HK (2025) Exploring the effect of social media use on loneliness among older adults: A meta-analysis. *J Health Psychol* 30(11):2844–2859. <https://doi.org/10.1177/13591053251316673>
39. Svensson R, Johnson B, Olsson A (2022) Does gender matter? The association between different digital media activities and adolescent well-being. *BMC Public Health* 22(1):273. <https://doi.org/10.1186/s12889-022-12670-7>
40. Odgers CL, Jensen MR (2020) Annual research review: Adolescent mental health in the digital age: Facts, fears, and future directions. *J Child Psychol Psychiatry* 61(3):336–348. <https://doi.org/10.1111/jcpp.13190>

41. Valkenburg PM, Meier A, Beyens I (2022a) Social media use and its impact on adolescent mental health: An umbrella review of the evidence. *Curr Opin Psychol* 44:58–68. <https://doi.org/10.1016/j.copsyc.2021.08.017>
42. Verduyn P, Ybarra O, Résibois M, Jonides J, Kross E (2017) Do social network sites enhance or undermine subjective well-being? A critical review. *Social Issues Policy Rev* 11(1):274–302. <https://doi.org/10.1111/sipr.12033>
43. Twenge JM, Martin GN (2020) Gender differences in associations between digital media use and psychological well-being: Evidence from three large datasets. *J Adolesc* 79:91–102. <https://doi.org/10.1016/j.adolescence.2019.12.018>
44. Sarmiento IG, Olson C, Yeo G, Chen YA, Toma CL, Brown BB, Bellmore A, Mares M-L (2020) How does social media use relate to adolescents' internalizing symptoms? Conclusions from a systematic narrative review. *Adolesc Res Rev* 5:381–404. <https://doi.org/10.1007/s40894-018-0095-2>
45. Primack, B. A., Shensa, A., Escobar-Viera, C.G., Barrett, E. L., Sidani, J. E., Colditz, J. B., & Everette James, A. (2017). Use of multiple social media platforms and symptoms of depression and anxiety: A nationally-representative study among U.S. young adults. *Computers in Human Behavior*, 69, 1-9. <https://doi.org/10.1016/j.chb.2016.11.013>
46. Kalpidou M, Costin D, Morris J (2011) The relationship between Facebook and the well-being of undergraduate college students. *Cyberpsychology Behav Social Netw* 14:183–189. <https://doi.org/10.1089/cyber.2010.006>
47. O'Day EB, Heimberg RG (2021) Social media use, social anxiety, and loneliness: A systematic review. *Computers Hum Behav Rep* 3:100070. <https://doi.org/10.1016/j.chbr.2021.100070>
48. Coyne SM, Rogers AA, Zurcher JD, Stockdale L, Booth M (2020) Does time spent on social media impact mental health? An eight year longitudinal study. *Comput Hum Behav* 104:106160. <https://doi.org/10.1016/j.chb.2019.106160>
49. Song H, Zmyslinski-Seelig A, Kim J, Drent A, Victor A, Omori K, Allen M (2014) Does Facebook make you lonely? A meta analysis. *Comput Hum Behav* 36:446–452. <https://doi.org/10.1016/j.chb.2014.04.011>
50. Ergün G, Alkan A (2020) The social media disorder and ostracism in adolescents: (OSTRACA-SM Study). *Eurasian J Med* 52(2):139–144. <https://doi.org/10.5152/eurasianjmed.2020.19076>
51. Liu Y, Tend Z, Lan H, Zhang X, Yao D (2015) Short-term effects of prosocial video games on aggression: An event-related potential study. *Front Behav Neurosci* 9(193). <https://doi.org/10.3389/fnbeh.2015.00193>
52. Pallavicini F, Pepe A, Mantovani F (2022) The effects of playing video games on stress, anxiety, depression, loneliness and gaming disorder during the early stages of the COVID-19 pandemic: PRISMA systematic review. *Cyberpsychology Behav Social Netw* 25(6):334–354. <https://doi.org/10.1089/cyber.2021.0252>
53. Barr M, Copeland-Stewart A (2021) Playing video games during the COVID-19 pandemic and effects on players' well-being. *Games Cult* 17(1):122–139. <https://doi.org/10.1177/1554120211017036>
54. Halbrook YJ, O'Donnell AT, Msetfi RM (2019) When and how video games can be good: A review of the positive effects of video games on well-being. *Perspect Psychol Sci* 14:1096–1104. <https://doi.org/10.1177/1745691619863807>
55. Yang J, Wang R, Cook A, Fuller R (2023) Gaming during the COVID-19 pandemic: Examining its effect on loneliness & motivation, playing and gratification differences between competitive and recreational gamers. *Telematics Inf Rep* 11:100093. <https://doi.org/10.1016/j.teler.2023.100093>
56. Nguyen MH, Gruber J, Marler W, Hunsaker A, Fuchs J, Hargittai E (2021) Staying connected while physically apart: Digital communication when face-to-face interactions are limited. *New Media Soc* 24(9):2046–2067. <https://doi.org/10.1177/1461444820985442>
57. Williams D (2018) For better or worse: Game structure and mechanisms driving social interactions and isolation. In C. J. Ferguson (Ed.), *Video game influences on aggression, cognition, and attention* (pp. 173–183). Springer. https://doi.org/10.1007/978-3-319-95495-0_14
58. Cejudo J, López-Delgado ML, Losada L (2019) Effectiveness of the videogame Spock for the improvement of the emotional intelligence on psychosocial adjustment in adolescents. *Computers Hum Behav* 101:380–386. <https://doi.org/10.1016/j.chb.2018.09.028>
59. Lau C, Stewart SL, Sarmiento C, Saklofske DH, Tremblay PF (2018) Who is at risk for problematic video gaming? Risk factors in problematic video gaming in clinically referred Canadian children and adolescents. *Multimodal Technol Interact* 2(2):19. <https://doi.org/10.3390/mti2020019>
60. Gentile DA, Swing EL, Lim CG, Khoo A (2012) Video game playing, attention problems, and impulsiveness: Evidence of bidirectional causality. *Psychol Popular Media Cult* 1(1):62–70. <https://doi.org/10.1037/a0026969>
61. Niemi S, Lagerström M, Alanko K (2022) School attendance problems in adolescent with attention deficit hyperactivity disorder. *Front Psychol* 13:1017619. <https://doi.org/10.3389/fpsyg.2022.1017619>
62. Knollmann M, Reissner V, Hebebrand J (2019) Towards a comprehensive assessment of school absenteeism: Development and initial validation of the inventory of school attendance problems. *Eur Child Adolesc Psychiatry* 28(3):399–414. <https://doi.org/10.1007/s00787-018-1204-2>
63. Strömbeck J, Heyne D, Ferrer-Wreder L, Alanko K (2025) Reliability and validity of the Swedish version of the inventory of school attendance problems (ISAP). *Eur Child Adolesc Psychiatry* 34(7):2069–2082. <https://doi.org/10.1007/s00787-024-02618-0>
64. Goodman R (1997) The strengths and difficulties questionnaires: A research note. *J Child Psychol Psychiatry* 38(5):581–586. <https://doi.org/10.1111/j.1469-7610.1997.tb01545.x>
65. Wickham H, Averick M, Bryan J, Chang W, D'Agostino McGowan L, François R, Grolemund G, Hayes A, Henry L, Hester J, Kuhn M, Pedersen L, Miller T, Bache EM, Müller S, Ooms K, Robinson J, Seidel D, Spinu DP, Yutani V, H (2019) Welcome to the Tidyverse. *J Open Source Softw* 4(43):1686. <https://doi.org/10.21105/joss.01686>
66. Rosseel Y (2012) Lavaan: An R package for structural equation modeling. *J Stat Softw* 48(2):1–36. <https://doi.org/10.18637/jss.v048.i02>
67. Harrell FE (2015) Regression modeling strategies. With applications to linear models, logistic and ordinal regression, and survival analysis, 2nd edn. Springer
68. van Buuren S, Groothuis-Oudshoorn K (2011) Mice: Multivariate imputation by chained equations in R. *J Stat Softw* 45(3):1–67. <https://doi.org/10.18637/jss.v045.i03>
69. Kowarik A, Templ M (2016) Imputation with the R package VIM. *J Stat Softw* 74(7):1–16. <https://doi.org/10.18637/jss.v074.i07>
70. Ribeiro O, Freitas M, Rubin KH, Santos AJ (2022) Loneliness profiles in adolescence: Association with sex and social adjustment to the peer group. *J Child Fam Stud* 32:1204–1217. <https://doi.org/10.1007/s10826-022-02472-1>
71. Liu Q, Zhou Y, Xie X, Xue Q, Zhu K, Wan Z, Wu H, Zhang J, Song R (2021) The prevalence of behavioral problems among school-aged children in home quarantine during the COVID-19 pandemic in China. *J Affect Disord* 279:412–416. <https://doi.org/10.1016/j.jad.2020.10.008>
72. Bate J, Pham PT, Borelli JL (2021) Be my safe haven: Parent-child relationships and emotional health during COVID-19. *J*

- Pediatr Psychol 46(6):624–634. <https://doi.org/10.1093/jpepsy/sab046>
73. Liu S, Zou S, Zhang D, Wang X, Wu X (2022) Problematic Internet use and academic engagement during the COVID-19 lockdown: The indirect effects of depression, anxiety, and insomnia in early, middle, and late adolescence. *J Affect Disord* 309:9–18. <https://doi.org/10.1016/j.jad.2022.04.043>
 74. Andreassen CS, Pallesen S, Griffiths MD (2017) The relationship between addictive use of social media, narcissism, and self-esteem: Findings from a large national survey. *Addict Behav* 64:287–293. <https://doi.org/10.1016/j.addbeh.2016.03.006>
 75. Levante A, Martis C, Bianco F, Castelli I, Petrocchi S, Lecciso F (2023) Internalizing and externalizing symptoms in children during the COVID-19 pandemic: A systematic mixed studies review. *Front Psychol* 14:1182309. <https://doi.org/10.3389/fpsyg.2023.1182309>
 76. Wang J, Wang Y, Lin H, Chen X, Wang H, Liang H, Guo X, Fu C (2021) Mental health problems among school-aged children after school reopening: A cross-sectional study during the COVID-19 post-pandemic in east China. *Front Psychol* 12:e773134. <https://doi.org/10.3389/fpsyg.2021.773134>
 77. Royuela-Colomer E, Orue I, Visu-Petra L, Fernández-González L (2024) The association between mindful parenting, and internalizing and externalizing symptoms in adolescence. *J Child Fam stud* 33(6):1844–1856. <https://doi.org/10.1007/s10826-023-02704-y>
 78. Valkenburg PM, van Driel II, Beyens I (2022b) The associations of active and passive social media use with well-being: A critical scoping review. *New Media Soc* 24(2):530–549. <https://doi.org/10.1177/14614448211065425>

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.