

Predicting Depressive Symptoms Among Adolescents Based on Social Media Addiction and Self-Esteem: The Mediating Role of Social Comparison

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ABSTRACT

Objective: This study aimed to predict depressive symptoms among Canadian adolescents based on social media addiction and self-esteem and to examine the mediating role of social comparison in these relationships.

Methods and Materials: This cross-sectional correlational study was conducted among 412 adolescents aged 13–18 years who were enrolled in secondary schools in Ontario, Canada, during the 2025–2026 academic year. Participants were selected using a multistage sampling procedure. Data were collected using the Bergen Social Media Addiction Scale, Rosenberg Self-Esteem Scale, Iowa-Netherlands Comparison Orientation Measure, and Patient Health Questionnaire-9. Data analysis was performed using IBM SPSS Statistics and AMOS. Pearson correlation analysis was used to examine bivariate relationships, and structural equation modeling was applied to test the hypothesized mediation model. Indirect effects were evaluated using bootstrapping with 5,000 resamples and bias-corrected 95% confidence intervals.

Findings: Social media addiction positively predicted social comparison ($\beta = .39$, $p < .001$) and depressive symptoms ($\beta = .18$, $p = .003$), whereas self-esteem negatively predicted social comparison ($\beta = -.30$, $p < .001$) and depressive symptoms ($\beta = -.34$, $p < .001$). Social comparison also positively predicted depressive symptoms ($\beta = .37$, $p < .001$). The model explained 35% of the variance in social comparison and 52% of the variance in depressive symptoms. Bootstrapping demonstrated a significant indirect effect of social media addiction on depressive symptoms through social comparison ($\beta = .14$, 95% CI [0.11, 0.24]) and a significant indirect effect of self-esteem on depressive symptoms through social comparison ($\beta = -.11$, 95% CI [-0.18, -0.08]). Because the direct effects remained significant, social comparison partially mediated both relationships.

Conclusion: Depressive symptoms among adolescents were associated with higher social media addiction, lower self-esteem, and stronger social comparison, indicating that social comparison is an important partial mechanism through which problematic social media engagement and self-evaluative vulnerability are related to adolescent depressive symptomatology.

Keywords: Adolescents; Depressive Symptoms; Social Media Addiction; Self-Esteem; Social Comparison; Mediation

1. Introduction

Adolescence is a developmental period characterized by rapid biological maturation, identity formation, heightened sensitivity to peer evaluation, increasing autonomy, and substantial changes in social relationships. These transitions create important opportunities for psychological growth but also increase vulnerability to emotional difficulties, including depressive symptoms. At the same time, adolescents now develop within a social environment deeply intertwined with digital technologies, particularly social networking platforms that provide continuous opportunities for communication, entertainment, self-presentation, information seeking, and peer interaction. Consequently, contemporary adolescent development cannot be adequately understood without considering the digital contexts in which young people establish relationships, construct identities, and evaluate themselves. Recent research has increasingly emphasized that social media is neither uniformly beneficial nor uniformly harmful; instead, its psychological consequences depend on patterns of engagement, personal vulnerabilities, social circumstances, platform characteristics, and the meanings adolescents attach to their online experiences (Rutte et al., 2024; Salehi et al., 2025). Nevertheless, concerns have intensified regarding excessive and dysregulated social media use, particularly when online engagement begins to interfere with psychological functioning, sleep, academic responsibilities, interpersonal relationships, or everyday activities (Hutson, 2025; Socol et al., 2026).

Social media has become one of the principal environments through which adolescents communicate with peers and obtain social feedback. Its interactive characteristics can facilitate belonging, emotional expression, social support, and maintenance of friendships, yet the same features can expose adolescents to continuous evaluation, idealized representations of others, social exclusion, appearance-related pressures, and quantifiable indicators of approval such as likes, comments, views, and follower counts. Reviews of adolescent digital behavior indicate that the relationship between social media use and psychological well-being is complex, with outcomes varying according to frequency, intensity, motivation, content, and psychosocial context (Bottaro & Faraci, 2022; Corke et al., 2025). Social media may therefore operate as a developmental resource under some conditions while becoming a psychological risk factor when use becomes compulsive or when adolescents rely excessively on online

environments for mood regulation, interpersonal validation, or self-evaluation (Al-Samarraie et al., 2021; Manjanatha et al., 2025).

Social media addiction, sometimes conceptualized as problematic or compulsive social media use, refers to an excessive preoccupation with social networking activities accompanied by difficulty controlling use and persistence despite negative consequences. It may involve salience, mood modification, tolerance, withdrawal-like experiences, conflict, and relapse, resembling core features identified in other behavioral addictions. Excessive engagement may displace offline relationships, reduce participation in physical and academic activities, disrupt sleep, and create persistent cognitive involvement with online social environments. Research has linked problematic social media use with reduced life satisfaction, sleep difficulties, emotional dysregulation, and broader psychological problems among adolescents and young people (Lusianawati et al., 2023; Masoed et al., 2021). Broader reviews have similarly identified associations between intensive or problematic social media engagement and psychiatric or emotional difficulties during childhood and adolescence (Cataldo et al., 2021; Huong, 2023). Although much of this literature is correlational and does not establish simple causal effects, the consistency of these associations suggests that dysregulated engagement deserves particular attention beyond measures of screen time alone.

Depressive symptoms represent one of the most important psychological outcomes examined in relation to adolescent social media use. Symptoms such as persistent sadness, loss of interest, diminished energy, concentration difficulties, negative self-evaluation, social withdrawal, and hopelessness can interfere substantially with educational functioning, interpersonal development, and quality of life. Recent evidence suggests that problematic social media engagement may be more informative for understanding depressive symptoms than simple measures of access or frequency of use. For example, research involving early adolescents has demonstrated meaningful associations among social media addiction, social support processes, and depressive symptoms, indicating that excessive engagement may operate within a broader interpersonal and family context (Dalisay et al., 2025). Studies examining platform-specific behavior also suggest that associations between social media use and depressive symptoms vary according to the platforms adolescents use and individual characteristics that may modify their susceptibility to online experiences (Gentzler et al., 2023). This heterogeneity

highlights the need to move beyond the question of whether social media is harmful and instead identify the psychological processes through which problematic engagement may become associated with depressive symptomatology.

The developmental implications of digital media may be especially important during puberty, when biological changes coincide with intensified peer awareness and sensitivity to social status. Social media can amplify these developmental pressures by making peer activities, appearance, popularity, and perceived success continuously observable. Emerging evidence on social media and puberty has emphasized that exposure to digitally mediated peer environments during this sensitive developmental stage may interact with emotional and behavioral vulnerabilities (Agnolotto et al., 2025). Furthermore, family processes remain important in shaping both adolescents' media behavior and their psychological responses to digital experiences. A systematic review of family factors associated with adolescent screen media use and mental health outcomes has shown that parental practices, family relationships, and the broader home environment may influence how digital engagement relates to psychological well-being (Liu et al., 2024). These findings reinforce the view that social media addiction should be understood within adolescents' developmental ecology rather than as an isolated technological behavior.

One particularly important psychological construct in this context is self-esteem. Self-esteem reflects an individual's overall evaluation of personal worth, adequacy, and value and is central to adolescent identity development and emotional adjustment. Adolescence involves frequent reappraisal of personal competence, attractiveness, popularity, and social acceptance, making self-esteem especially sensitive to interpersonal experiences. Digital platforms may intensify this evaluative process because adolescents can receive immediate public feedback about their appearance, opinions, relationships, and activities. Research has demonstrated associations between problematic social networking use and lower self-esteem, suggesting that adolescents and young people who evaluate themselves less positively may be particularly vulnerable to maladaptive patterns of online engagement (Abrar-ul-Hassan & Safdar, 2022; Zam et al., 2022). At the same time, excessive reliance on social media for validation may further destabilize self-evaluation, creating a potentially reciprocal relationship between self-esteem and problematic use.

Several mechanisms may account for this association. Adolescents with lower self-esteem may turn to social media to seek reassurance, social approval, interpersonal connection, or opportunities to construct more desirable online identities. However, dependence on externally generated indicators of acceptance may make self-worth increasingly contingent on online feedback. Studies focused on adolescents have emphasized the role of social media validation in self-esteem, particularly where feedback and peer responses become central to evaluations of personal worth (Dhingra & Parashar, 2022). Other research indicates that associations between social media use and self-esteem can vary according to gender and aspects of digital competence or digital citizenship (Si et al., 2023). Family relationships may also influence these processes; family intimacy has been associated with adolescent self-esteem, while social media use may alter or moderate aspects of this relationship (Shao & Ni, 2021). Thus, self-esteem may function simultaneously as a vulnerability factor, a protective resource, and a psychological pathway through which adolescents interpret their online social experiences.

The relationship between self-esteem and problematic social networking is also embedded in broader patterns of emotional regulation and family functioning. Research testing mediation models has demonstrated that parenting, emotional dysregulation, and self-esteem can contribute to adolescents' problematic social network site use through interconnected pathways (Costantini et al., 2022). Such findings suggest that problematic social media engagement may develop partly because digital environments provide immediate mechanisms for coping with negative emotions, seeking social reassurance, or temporarily escaping unfavorable self-perceptions. Conversely, adolescents with stronger self-esteem may be less dependent on external digital validation and potentially more capable of navigating unfavorable online feedback without substantial disruption to their self-concept. Protective psychological characteristics such as self-compassion have likewise been proposed as buffers against adverse social media outcomes, further emphasizing the importance of self-evaluative processes in understanding digital well-being (Manjanatha et al., 2025).

Social comparison may represent a particularly important mechanism linking both social media addiction and self-esteem with depressive symptoms. Social comparison refers to the process through which individuals evaluate their own abilities, appearance, achievements, opinions, circumstances, or social standing by comparing themselves

with others. Although social comparison is a normal aspect of human functioning, social media provides unusually frequent and accessible opportunities for such evaluation. Users are continuously exposed to carefully selected photographs, achievements, relationships, lifestyles, and social experiences presented by peers, influencers, celebrities, and other users. Because online content is often selectively positive, adolescents may compare ordinary aspects of their own lives with idealized representations of others. Such comparisons may generate perceptions of inferiority, inadequacy, exclusion, or failure, particularly among adolescents whose self-concepts remain under development.

The structure of social media platforms may further encourage comparison by making social indicators visible and measurable. Numbers of followers, likes, comments, shares, and views provide explicit markers through which popularity and social approval can be compared. Research examining teenagers has identified social comparison as an important process associated with materialistic and status-oriented attitudes, demonstrating that comparison can extend beyond appearance into possessions, consumption, and social prestige (Waqar et al., 2023). Social media influencers may intensify these processes by presenting highly curated lifestyles and socially desirable identities that can shape teenagers' attitudes and behavior (Lajnef, 2023). In appearance-related contexts, social media exposure has also been associated with body-image concerns among secondary-school youth, illustrating how repeated comparison with idealized images may influence adolescents' perceptions of themselves (Niklová & Zošáková, 2024). These mechanisms are important because dissatisfaction arising from repeated upward comparison may extend beyond specific domains and contribute to more generalized negative self-evaluation and emotional distress.

Social comparison is also theoretically relevant to the association between self-esteem and depressive symptoms. Adolescents with lower self-esteem may be more likely to interpret others' achievements or appearance as evidence of their own inadequacy, while those with stronger self-esteem may be less psychologically dependent on comparative information. Online environments can magnify these tendencies because they provide a continuous stream of comparison targets and social feedback. Research on adolescents' online sexual self-presentation and social media behavior has demonstrated meaningful relationships involving self-esteem and patterns of digital engagement, underscoring the importance of self-evaluative vulnerability

in online interpersonal contexts (Verrastro et al., 2023). More generally, social media may influence adolescents' emotional and cognitive states by repeatedly directing attention toward interpersonal evaluation and socially salient information (Chaeycharoen, 2022). Accordingly, social comparison may help explain why adolescents with lower self-esteem are more vulnerable to depressive symptoms in highly evaluative digital environments.

The peer context is particularly important because adolescence is marked by increasing psychological investment in peer acceptance and belonging. Digital communication does not simply replicate offline peer relationships; it alters their temporal and social structure by making interpersonal information continuously accessible and by expanding the audience for social evaluation. Reviews of social media and adolescent peer relationships indicate that online communication can strengthen friendships and social support while simultaneously creating opportunities for exclusion, conflict, co-rumination, and unfavorable comparison (Véronneau & Schwartz-Mette, 2021). Negative social experiences may also become more persistent because adolescents can encounter peer-related information beyond school hours and across multiple platforms. Consequently, a young person who is already prone to social comparison may have difficulty disengaging from perceived discrepancies between the self and others.

The broader literature also indicates that excessive social media involvement may affect multiple dimensions of adolescent functioning that could indirectly increase susceptibility to depressive symptoms. Problematic digital lifestyles have been associated with physical inactivity, reduced well-being, and psychological difficulties (Lusianawati et al., 2023), while studies of social media dependency have raised concerns about disruption to students' academic, personal, and social lives (Dhiman, 2024). Negative effects on interpersonal functioning have also been described, including deterioration in the quality of face-to-face interactions and changes in young people's social lives (Noori et al., 2023). Social media-related psychological processes may also intersect with other risk behaviors, and mediation-based research has demonstrated that social mechanisms can help explain relationships between social media involvement and behavioral outcomes among youth (Pavić, 2023). Collectively, these findings support an explanatory approach focused on intervening psychological mechanisms rather than assuming that exposure alone directly produces adverse outcomes.

The COVID-19 period further illustrated the complexity of the relationship between digital media and adolescent mental health. During periods of physical distancing, digital media often provided essential opportunities for social connection, education, and emotional support, while increased exposure was also associated with psychological risks. A systematic review and meta-analysis of digital media use and adolescent mental health during the pandemic demonstrated substantial heterogeneity in effects, reinforcing the importance of considering forms and contexts of media engagement rather than treating all digital use as equivalent (Marciano et al., 2022). Similarly, evidence from diverse cultural contexts indicates that the psychological implications of social media addiction may depend on social support, socioeconomic conditions, cultural norms, and available offline resources (Awopetu et al., 2024). These observations underscore the importance of examining psychological pathways that may generalize across contexts while remaining sensitive to developmental and cultural differences.

Despite the substantial literature linking social media use with adolescent psychological functioning, several limitations remain. First, many studies focus primarily on time spent online rather than distinguishing ordinary use from addictive or dysregulated engagement. Second, social media addiction, self-esteem, social comparison, and depressive symptoms are frequently examined in separate models, although theory suggests that these constructs may operate as an interconnected psychological system. Third, existing research often identifies direct associations without testing whether social comparison explains part of the relationship between problematic social media engagement and depressive symptoms. This omission is important because problematic users may encounter comparison opportunities more frequently, attend more strongly to social feedback, and have greater difficulty disengaging from unfavorable interpersonal information. Fourth, although self-esteem is consistently associated with both online behavior and emotional adjustment, fewer studies have simultaneously examined whether adolescents with lower self-esteem report greater social comparison and whether this process, in turn, is associated with depressive symptoms.

Recent scholarship increasingly calls for more developmentally sensitive models of adolescent digital well-being that identify who is vulnerable, under what circumstances, and through which psychological processes adverse outcomes emerge (Corke et al., 2025; Socol et al., 2026). The contemporary literature also emphasizes that

online risks must be interpreted alongside potential benefits and protective factors rather than through deterministic assumptions about technology (Salehi et al., 2025). From this perspective, self-esteem may represent an important protective psychological resource, whereas social comparison may function as a mechanism through which digital engagement becomes emotionally consequential. Research on emotional adjustment in digital environments similarly suggests that individual characteristics and developmental processes are central to understanding why adolescents respond differently to comparable levels of technological exposure (Rutte et al., 2024). Examining these variables within a single model may therefore provide a more precise account of how social media addiction and self-perception relate to depressive symptoms.

This issue is particularly relevant in the context of adolescent mental-health prevention because social media is deeply integrated into everyday life and complete avoidance is neither realistic nor necessarily desirable. Identifying modifiable mechanisms may be more useful than focusing exclusively on reducing access or screen time. If social comparison explains part of the association between addictive social media engagement and depressive symptoms, interventions could address comparison habits, interpretation of curated online content, and awareness of algorithmically amplified social information. Likewise, if self-esteem is associated with depressive symptoms both directly and through reduced social comparison, prevention efforts may benefit from strengthening stable internal sources of self-worth. Such an approach is consistent with evidence indicating that adolescent responses to social media are shaped by psychological resources, family relationships, peer contexts, and patterns of engagement rather than by technology alone (Dalisy et al., 2025; Liu et al., 2024). It also accommodates evidence that self-esteem, social validation, and online relational experiences are closely intertwined during adolescence (Abrar-ul-Hassan & Safdar, 2022; Dhingra & Parashar, 2022).

Accordingly, the aim of the present study was to predict depressive symptoms among Canadian adolescents based on social media addiction and self-esteem and to examine the mediating role of social comparison in these relationships.

2. Methods and Materials

2.1. Study Design and Participants

The present study employed a cross-sectional correlational design to investigate the relationships among

social media addiction, self-esteem, social comparison, and depressive symptoms in adolescents and to examine the mediating role of social comparison in the relationships between social media addiction and self-esteem as predictor variables and depressive symptoms as the outcome variable. The target population consisted of adolescents enrolled in secondary schools in Canada during the 2025–2026 academic year. A total of 412 adolescents participated in the study. Participants were recruited from public secondary schools located in urban and suburban areas of Ontario, Canada, using a multistage sampling procedure. Initially, several secondary schools were selected from participating school districts, after which classes were randomly selected from different grade levels. Students who met the eligibility criteria were invited to participate in the study. The inclusion criteria were being between 13 and 18 years of age, being currently enrolled in a Canadian secondary school, having used at least one social media platform regularly during the previous six months, having sufficient proficiency in English to understand and complete the questionnaires, and providing informed assent along with parental or guardian consent for participants younger than the age of legal consent. Adolescents were excluded if they submitted substantially incomplete questionnaires, demonstrated patterned or indiscriminate responding, or reported circumstances that prevented them from independently understanding the questionnaire items. Participation was voluntary, and students were informed that they could discontinue their participation at any stage without penalty or adverse consequences. Data were collected anonymously, and no personally identifying information was included in the analytical dataset. Prior to data collection, participants were informed about the study objectives, confidentiality of their responses, voluntary nature of participation, and their right to withdraw. Ethical principles concerning research involving adolescents, including confidentiality, informed consent, assent, privacy, and protection from potential psychological discomfort, were observed throughout the research process.

2.2. Measures

Social media addiction was assessed using the Bergen Social Media Addiction Scale (BSMAS). The BSMAS is a brief self-report instrument designed to assess problematic and potentially addictive patterns of social media use. It consists of six items corresponding to core components of behavioral addiction, including salience, mood

modification, tolerance, withdrawal, conflict, and relapse. Participants indicate the extent to which each statement has characterized their social media behavior during the specified period using a five-point Likert-type response format ranging from 1 (very rarely) to 5 (very often). Total scores are obtained by summing responses across the six items, with higher scores indicating a greater degree of problematic or addictive social media use. The scale was selected because of its brevity, applicability to contemporary social media behavior, and established psychometric properties among adolescent and young populations. In the present study, the total score was used as a continuous indicator of social media addiction, with higher values reflecting more pronounced addictive patterns of social media engagement.

Self-esteem was measured using the Rosenberg Self-Esteem Scale (RSES), a widely used measure of global self-worth and overall evaluation of the self. The instrument contains 10 items assessing positive and negative attitudes toward oneself. Participants respond to statements concerning feelings of personal value, competence, self-respect, and satisfaction with themselves using a four-point Likert-type scale ranging from strongly disagree to strongly agree. Five negatively worded items are reverse-scored before calculating the total score. After appropriate reverse scoring, item scores are summed to generate an overall self-esteem score, with higher scores indicating higher levels of global self-esteem. The Rosenberg Self-Esteem Scale has been extensively used with adolescent populations and has demonstrated satisfactory internal consistency, construct validity, and convergent validity across different cultural and educational contexts. In this study, self-esteem was conceptualized as a protective psychological resource and was examined as a predictor of both social comparison tendencies and depressive symptoms.

Social comparison was assessed using the Iowa-Netherlands Comparison Orientation Measure (INCOM). This instrument evaluates individual differences in the tendency to compare one's abilities, opinions, circumstances, and personal characteristics with those of other people. The scale consists of 11 items that assess the general orientation toward engaging in interpersonal comparison. Participants rate the extent to which each statement describes them using a five-point Likert-type response format ranging from strongly disagree to strongly agree. Following reverse scoring of negatively keyed items, responses are summed or averaged to generate a total social comparison orientation score. Higher scores represent a stronger tendency to

evaluate oneself by comparing personal attributes, achievements, opinions, and experiences with those of others. In the context of the present study, social comparison was considered particularly relevant because adolescents are frequently exposed to highly selective and idealized representations of peers through social media environments, which may intensify self-evaluation and contribute to emotional distress. The total INCOM score was therefore used as the proposed mediating variable in the hypothesized structural model.

Depressive symptoms were assessed using the Patient Health Questionnaire-9 (PHQ-9). The PHQ-9 consists of nine items corresponding to major depressive symptom domains, including diminished interest or pleasure, depressed mood, sleep disturbances, fatigue, appetite changes, feelings of worthlessness or excessive guilt, concentration difficulties, psychomotor changes, and thoughts related to death or self-harm. Participants indicate how frequently they have experienced each symptom during the previous two weeks on a four-point scale ranging from 0 (not at all) to 3 (nearly every day). Item scores are summed to produce a total score ranging from 0 to 27, with higher scores reflecting greater severity of depressive symptoms. The PHQ-9 has been widely applied in adolescent research and provides a concise measure of depressive symptom severity. For the purposes of the present study, the PHQ-9 score was analyzed as a continuous outcome variable rather than being used to establish a clinical diagnosis. Because the questionnaire includes an item addressing thoughts of death or self-harm, appropriate ethical procedures were incorporated into the data collection protocol, including providing participants with information regarding available school-based and community mental health support services and following institutional safeguarding procedures when required.

A brief demographic questionnaire was also administered to collect background information, including age, gender, school grade, average daily time spent on social media, and the social media platforms used most frequently. These variables were collected to characterize the study sample and to permit evaluation of potentially relevant demographic characteristics. Before conducting the primary analyses, the internal consistency of each multi-item measure was evaluated in the study sample using Cronbach's alpha coefficients. Higher scores on each respective instrument represented greater social media addiction, higher self-esteem, stronger social comparison orientation, and greater depressive symptom severity.

2.3. Data Analysis

Data analysis was conducted using IBM SPSS Statistics and AMOS. Prior to the main statistical analyses, the dataset was screened for completeness, accuracy, missing values, univariate and multivariate outliers, and violations of the assumptions underlying multivariate analysis. Descriptive statistics, including means, standard deviations, minimum and maximum scores, skewness, and kurtosis, were calculated for the primary study variables. The distributional characteristics of the variables were examined to assess the assumption of normality. The presence of multivariate outliers was evaluated using Mahalanobis distance, while multicollinearity among the predictor variables was examined using tolerance values and variance inflation factors. Internal consistency reliability was assessed using Cronbach's alpha coefficients. Pearson product-moment correlation coefficients were subsequently calculated to determine the magnitude and direction of the bivariate relationships among social media addiction, self-esteem, social comparison, and depressive symptoms.

The hypothesized mediating model was examined using structural equation modeling. In the proposed model, social media addiction and self-esteem were specified as exogenous predictor variables, social comparison was specified as the mediating variable, and depressive symptoms were specified as the endogenous outcome variable. Direct paths were estimated from social media addiction and self-esteem to social comparison and depressive symptoms, as well as from social comparison to depressive symptoms. This specification permitted simultaneous evaluation of the direct effects of social media addiction and self-esteem on depressive symptoms and their indirect effects through social comparison. Model adequacy was evaluated using multiple goodness-of-fit indices, including the chi-square statistic relative to degrees of freedom (χ^2/df), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Goodness-of-Fit Index (GFI), and Root Mean Square Error of Approximation (RMSEA). Values of χ^2/df below 3, CFI, TLI, and GFI values approaching or exceeding .90, and an RMSEA value below .08 were considered indicative of an acceptable model fit, while more stringent values were interpreted as evidence of a good fit.

The statistical significance of the indirect effects was evaluated using a nonparametric bootstrapping procedure with 5,000 resamples and bias-corrected 95% confidence intervals. An indirect effect was considered statistically significant when its 95% bootstrap confidence interval did

not include zero. Standardized path coefficients were reported to facilitate comparison of the magnitude of relationships across variables. The total, direct, and indirect effects of social media addiction and self-esteem on depressive symptoms were examined separately to determine whether social comparison significantly mediated the proposed associations. The coefficient of determination (R^2) was also calculated for the endogenous variables to indicate the proportion of variance in social comparison and depressive symptoms explained by the model. All statistical tests were two-tailed, and the level of statistical significance was set at $p < .05$.

3. Findings and Results

A total of 412 adolescents were included in the final analyses after data screening. Participants ranged in age from 13 to 18 years, with a mean age of 15.54 years ($SD = 1.43$). Of the participants, 211 (51.21%) identified as girls, 194 (47.09%) identified as boys, and 7 (1.70%) identified as another gender or preferred not to report their gender.

Regarding school grade, 96 participants (23.30%) were in Grade 9, 108 (26.21%) were in Grade 10, 104 (25.24%) were in Grade 11, and 104 (25.24%) were in Grade 12. Participants reported spending an average of 3.71 hours per day ($SD = 1.84$) on social media. Regarding the social media platform used most frequently, 149 adolescents (36.17%) reported Instagram, 133 (32.28%) reported TikTok, 78 (18.93%) reported Snapchat, 37 (8.98%) reported YouTube, and 15 (3.64%) reported other platforms as their primary social media platform. Preliminary screening indicated that the amount of missing data was minimal and did not demonstrate a systematic pattern. Cases with substantial questionnaire incompleteness had been removed before the final analyses. Examination of standardized scores and Mahalanobis distance did not reveal influential multivariate outliers requiring additional case deletion. Moreover, tolerance statistics and variance inflation factors indicated that multicollinearity was not problematic among the predictor variables. Accordingly, all 412 eligible cases were retained for the descriptive, correlational, and mediation analyses.

Table 1

Descriptive Statistics, Distributional Characteristics, and Internal Consistency of the Study Variables

Variable	Possible Range	Observed Range	M	SD	Skewness	Kurtosis	Cronbach's α
Social media addiction	6–30	6–30	18.42	5.11	0.21	-0.47	.84
Self-esteem	10–40	13–40	27.36	5.42	-0.18	-0.31	.88
Social comparison	11–55	14–55	36.81	8.17	0.16	-0.52	.86
Depressive symptoms	0–27	0–26	9.74	5.86	0.61	-0.19	.90

As shown in Table 1, the adolescents obtained a mean score of 18.42 ($SD = 5.11$) on social media addiction, indicating substantial variability in problematic engagement with social media across the sample. The mean self-esteem score was 27.36 ($SD = 5.42$), while the mean social comparison score was 36.81 ($SD = 8.17$). The mean depressive symptoms score was 9.74 ($SD = 5.86$), demonstrating considerable variability in the level of depressive symptomatology reported by participants. Examination of the distributional indices indicated no substantial departures from univariate normality. Skewness coefficients ranged from -0.18 for self-esteem to 0.61 for

depressive symptoms, whereas kurtosis coefficients ranged from -0.52 for social comparison to -0.19 for depressive symptoms. All values were well within conventional acceptable limits for the use of parametric and multivariate statistical procedures. The internal consistency coefficients were also satisfactory to high across all instruments. Cronbach's alpha was .84 for social media addiction, .88 for self-esteem, .86 for social comparison, and .90 for depressive symptoms. These coefficients indicated that each scale demonstrated adequate internal consistency within the present adolescent sample and supported the use of the total scores in subsequent analyses.

Table 2

Pearson Correlations Among Social Media Addiction, Self-Esteem, Social Comparison, and Depressive Symptoms

Variable	1	2	3	4
1. Social media addiction	1			
2. Self-esteem	-.41***	1		
3. Social comparison	.52***	-.46***	1	
4. Depressive symptoms	.49***	-.56***	.61***	1

The correlation coefficients presented in Table 2 showed statistically significant associations among all primary study variables. Social media addiction was moderately and negatively correlated with self-esteem, $r = -.41$, $p < .001$, indicating that adolescents reporting more problematic social media use tended to report lower levels of global self-esteem. Social media addiction also showed a moderate positive relationship with social comparison, $r = .52$, $p < .001$, suggesting that greater addictive involvement with social media was associated with a stronger tendency to evaluate oneself in relation to others. Furthermore, social media addiction was positively correlated with depressive symptoms, $r = .49$, $p < .001$, indicating that higher levels of problematic social media use were associated with greater depressive symptom severity. Self-esteem was negatively associated with social comparison, $r = -.46$, $p < .001$, and

demonstrated an even stronger negative association with depressive symptoms, $r = -.56$, $p < .001$. Thus, adolescents who reported more positive evaluations of themselves were less inclined toward frequent social comparison and experienced fewer depressive symptoms. The strongest bivariate association observed in the correlation matrix was between social comparison and depressive symptoms, $r = .61$, $p < .001$. This finding indicated that adolescents with a stronger tendency to compare themselves with others also tended to report substantially greater depressive symptomatology. The direction and magnitude of these correlations were consistent with the hypothesized mediation model and provided the necessary preliminary support for examining social comparison as a mediator of the associations of social media addiction and self-esteem with depressive symptoms.

Table 3

Path Coefficients for the Prediction of Social Comparison and Depressive Symptoms

Endogenous Variable	Predictor	B	SE	β	Critical Ratio	p	95% CI for B
Social comparison	Social media addiction	0.63	0.07	.39	8.73	<.001	[0.49, 0.77]
Social comparison	Self-esteem	-0.45	0.07	-.30	-6.68	<.001	[-0.58, -0.32]
Depressive symptoms	Social media addiction	0.21	0.07	.18	3.01	.003	[0.07, 0.35]
Depressive symptoms	Self-esteem	-0.37	0.05	-.34	-7.20	<.001	[-0.47, -0.27]
Depressive symptoms	Social comparison	0.27	0.03	.37	8.14	<.001	[0.20, 0.33]

The structural path estimates presented in Table 3 demonstrated that all hypothesized direct pathways were statistically significant. Social media addiction significantly and positively predicted social comparison, $B = 0.63$, $SE = 0.07$, $\beta = .39$, $p < .001$. Accordingly, after controlling for self-esteem, a one-unit increase in social media addiction was associated with an estimated 0.63-point increase in social comparison. Self-esteem significantly and negatively predicted social comparison, $B = -0.45$, $SE = 0.07$, $\beta = -.30$, $p < .001$, demonstrating that adolescents with higher self-esteem exhibited a lower tendency toward social comparison even after accounting for differences in social media addiction. Together, social media addiction and self-esteem explained 35% of the variance in social comparison,

indicating substantial explanatory power for the proposed mediator. When depressive symptoms were examined as the outcome variable, social media addiction retained a significant positive direct association with depressive symptoms after social comparison and self-esteem were simultaneously included in the model, $B = 0.21$, $SE = 0.07$, $\beta = .18$, $p = .003$. Self-esteem also remained a significant negative predictor of depressive symptoms, $B = -0.37$, $SE = 0.05$, $\beta = -.34$, $p < .001$. Most importantly for the proposed mediation mechanism, social comparison significantly and positively predicted depressive symptoms, $B = 0.27$, $SE = 0.03$, $\beta = .37$, $p < .001$. Thus, greater social comparison was associated with higher depressive symptom severity independently of adolescents' level of social media addiction

and self-esteem. The complete model accounted for 52% of the variance in depressive symptoms, indicating that the combination of social media addiction, self-esteem, and social comparison explained more than half of the observed individual differences in depressive symptoms. In terms of

standardized effects, social comparison and self-esteem emerged as particularly important proximal predictors of depressive symptoms, whereas social media addiction retained a smaller but statistically significant direct effect after the mediating mechanism was considered.

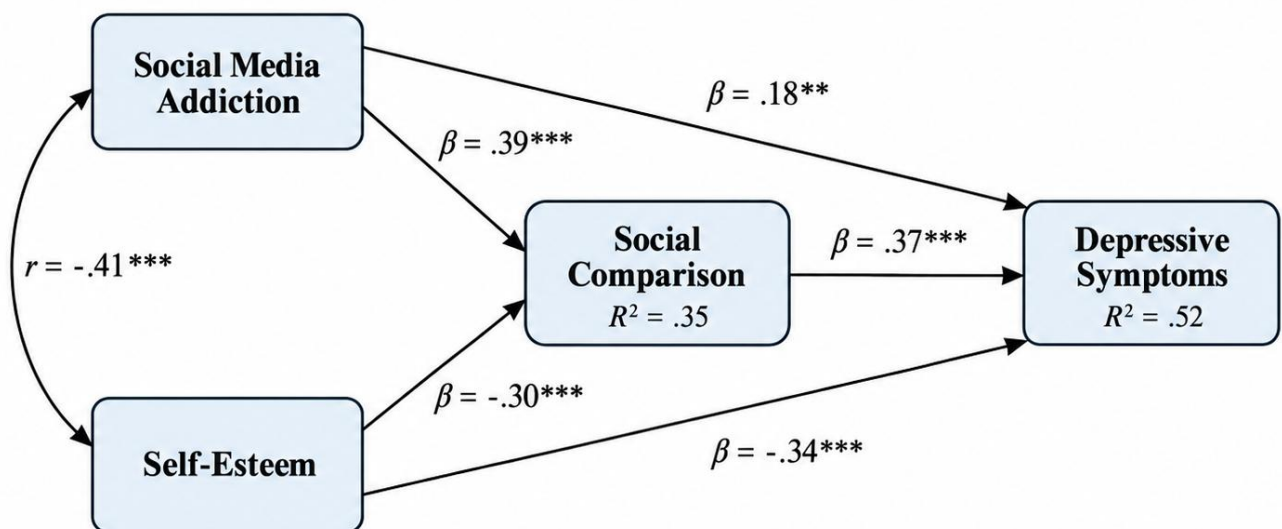
Table 4

Bootstrapped Direct, Indirect, and Total Effects on Depressive Symptoms

Predictor	Effect Type	B	Standardized Effect (β)	Bootstrapped SE	95% Bootstrap CI	p
Social media addiction	Direct effect	0.21	.18	0.07	[0.07, 0.35]	.003
Social media addiction	Indirect effect through social comparison	0.17	.14	0.03	[0.11, 0.24]	<.001
Social media addiction	Total effect	0.38	.32	0.06	[0.27, 0.50]	<.001
Self-esteem	Direct effect	-0.37	-.34	0.05	[-0.47, -0.27]	<.001
Self-esteem	Indirect effect through social comparison	-0.12	-.11	0.03	[-0.18, -0.08]	<.001
Self-esteem	Total effect	-0.49	-.45	0.05	[-0.59, -0.39]	<.001

Figure 1

Structural Model of the Relationships Among Social Media Addiction, Self-Esteem, Social Comparison, and Depressive Symptoms



As reported in Table 4, the bootstrapping analysis provided clear evidence for the mediating role of social comparison in the relationships of both social media addiction and self-esteem with depressive symptoms. The indirect effect of social media addiction on depressive symptoms through social comparison was positive and statistically significant, $B = 0.17$, standardized indirect effect = .14, with a 95% bootstrap confidence interval ranging from 0.11 to 0.24. Because this confidence interval did not include zero, the indirect pathway was statistically significant. This result indicated that adolescents with greater social media addiction tended to engage in more social comparison, which in turn was associated with more severe depressive symptoms. At the same time, the direct effect of social media

addiction remained significant, $B = 0.21$, $\beta = .18$, $p = .003$, demonstrating that social comparison did not completely account for the association between problematic social media use and depressive symptoms. The total standardized effect of social media addiction on depressive symptoms was .32, of which approximately 44% was transmitted through social comparison, supporting a partial mediation pattern. A statistically significant indirect effect was also identified for self-esteem. Higher self-esteem predicted lower social comparison, which subsequently predicted lower depressive symptoms, producing a negative indirect effect of $B = -0.12$ and a standardized indirect effect of $-.11$. The corresponding 95% bootstrap confidence interval, $[-0.18, -0.08]$, excluded zero and therefore confirmed the statistical significance of

this mediation pathway. The direct effect of self-esteem on depressive symptoms also remained significant after social comparison was included in the model, $B = -0.37$, $\beta = -.34$, $p < .001$. The total standardized effect of self-esteem was $-.45$, indicating a comparatively strong protective relationship with depressive symptoms. Approximately one quarter of this total association was transmitted through reduced social comparison, whereas the remaining association operated independently of the proposed mediator. Collectively, the findings supported the hypothesized mediating role of social comparison for both predictors. Adolescents characterized by higher social media addiction were more likely to engage in social comparison and consequently report more depressive symptoms, whereas adolescents with higher self-esteem were less likely to engage in social comparison and consequently reported fewer depressive symptoms. However, because the direct effects of both social media addiction and self-esteem remained statistically significant, social comparison functioned as a partial mediator rather than a full mediator in the proposed model.

4. Discussion

The present study examined whether depressive symptoms among Canadian adolescents could be predicted by social media addiction and self-esteem and whether social comparison mediated these relationships. The findings supported the proposed model. Social media addiction was positively associated with depressive symptoms, self-esteem was negatively associated with depressive symptoms, and social comparison showed a substantial positive association with depressive symptoms. Social media addiction also positively predicted social comparison, whereas self-esteem negatively predicted it. Most importantly, the bootstrapping analysis demonstrated significant indirect effects from both social media addiction and self-esteem to depressive symptoms through social comparison. Because the direct effects of social media addiction and self-esteem remained statistically significant after social comparison was included in the model, social comparison functioned as a partial mediator. The model explained 35% of the variance in social comparison and 52% of the variance in depressive symptoms, indicating that the combination of problematic social media engagement, self-evaluation, and comparison tendencies accounted for a substantial proportion of differences in adolescents' depressive symptomatology.

The significant positive relationship between social media addiction and depressive symptoms is consistent with a growing body of evidence suggesting that problematic, dysregulated, or compulsive social media engagement is associated with poorer adolescent mental health. In the present study, adolescents who reported stronger addictive patterns of social media use also reported more depressive symptoms, and this relationship remained significant even after self-esteem and social comparison were statistically controlled. This finding is consistent with evidence showing associations between social media addiction and depressive symptoms among early adolescents (Dalisay et al., 2025). It also aligns with broader reviews indicating that problematic or excessive social media use is associated with emotional difficulties, psychiatric symptoms, and reduced psychological well-being among adolescents and young people (Cataldo et al., 2021; Corke et al., 2025; Socol et al., 2026). The present results therefore support the distinction between ordinary social media use and addictive engagement. Social networking platforms may have neutral or even beneficial functions when used adaptively, whereas loss of control, preoccupation, and compulsive use may be more strongly connected to psychological distress.

Several mechanisms may explain the direct association between social media addiction and depressive symptoms. Problematic users may devote substantial cognitive and emotional resources to online activity, experience difficulty disengaging from platforms, and continue using social media despite interference with sleep, schoolwork, physical activity, or offline relationships. Previous research has linked adolescent social media addiction with poorer sleep quality and lower life satisfaction (Masood et al., 2021), while other studies have highlighted the broader psychological and behavioral consequences of excessive digital lifestyles (Lusianawati et al., 2023). Frequent interruptions, prolonged nighttime use, persistent checking, and emotional dependence on online feedback may gradually reduce opportunities for restorative activities and face-to-face interaction. Research on youth social media use has likewise identified multiple pathways through which addictive engagement may contribute to adverse outcomes, including emotional dysregulation, disrupted routines, social difficulties, and psychological dependence (Al-Samarraie et al., 2021). These mechanisms may help explain why social media addiction retained a significant direct effect on depressive symptoms even after the mediating role of social comparison was taken into account.

The finding that self-esteem negatively predicted depressive symptoms was also consistent with expectations and previous literature. Adolescents with higher self-esteem reported fewer depressive symptoms, and self-esteem demonstrated one of the strongest direct associations in the structural model. This finding is theoretically plausible because stable and positive self-evaluation may protect adolescents against feelings of inadequacy, rejection, hopelessness, and perceived failure, all of which are closely linked with depressive experiences. Previous studies have shown that self-esteem is meaningfully related to patterns of problematic social networking behavior (Abrar-ul-Hassan & Safdar, 2022; Zam et al., 2022). Research has also suggested that adolescents' self-esteem is influenced by family relationships, gender, and social media engagement (Shao & Ni, 2021; Si et al., 2023). The present findings extend this literature by showing that self-esteem is not only associated with problematic digital behavior but also contributes directly to the explanation of depressive symptoms when examined alongside social media addiction and social comparison.

The protective role of self-esteem may reflect the degree to which adolescents rely on internal versus external sources of self-worth. Adolescents with stronger self-esteem may interpret negative online feedback less personally, may be less dependent on digital approval, and may experience less psychological disruption when observing the achievements or appearance of others. In contrast, those with lower self-esteem may be more sensitive to likes, comments, follower counts, exclusion, and other forms of online evaluation. Prior research has specifically emphasized the relationship between social media validation and adolescent self-esteem, suggesting that repeated dependence on external approval may make self-worth more unstable (Dhingra & Parashar, 2022). Similarly, studies examining problematic social network use have shown that self-esteem interacts with emotional regulation and parenting-related variables in shaping adolescents' online behavior (Costantini et al., 2022). The present results are consistent with the possibility that stronger self-esteem functions as a psychological resource that reduces both direct depressive vulnerability and maladaptive responses to socially evaluative online content.

Another central finding was that social media addiction significantly predicted greater social comparison. This pathway was one of the strongest in the model and suggests that adolescents who engage more compulsively with social media are also more likely to compare themselves with

others. Social networking platforms provide unusually dense opportunities for comparison because they display peers' appearance, achievements, relationships, travel, possessions, popularity, and social activities in highly visible and often selectively positive forms. Research involving teenagers has identified social comparison as an important process related to materialistic attitudes and status-oriented evaluations (Waqar et al., 2023). Influencer-related research has similarly shown that curated digital content can shape adolescents' attitudes and behavior through cognitive and evaluative processes (Lajnef, 2023). Because addictive users spend more time immersed in such environments and may check platforms repeatedly throughout the day, their exposure to comparison targets is likely to be more frequent and psychologically salient.

This interpretation is also supported by research concerning appearance-related processes. Social media has been linked with body image concerns among secondary-school youth, suggesting that digital environments can intensify appearance-based comparison and dissatisfaction (Niklová & Zošáková, 2024). Adolescence is a particularly sensitive period for these processes because puberty increases awareness of physical appearance, peer acceptance, and social status. Emerging work on social media and puberty further suggests that developmental stage may heighten vulnerability to digitally mediated comparison and evaluation (Agnoletto et al., 2025). The current study did not differentiate appearance comparison from comparison involving achievement, popularity, relationships, or possessions; nevertheless, the observed association between social media addiction and general social comparison is compatible with the broader literature showing that intensive social media environments expose adolescents to a continuous stream of socially relevant information.

The negative association between self-esteem and social comparison was likewise consistent with the proposed model. Adolescents with higher self-esteem were less likely to report a strong orientation toward comparing themselves with others. One explanation is that adolescents with more stable positive self-evaluations may have less need to use external social information as a basis for judging their own worth. Conversely, adolescents with lower self-esteem may be more dependent on interpersonal reference points to determine whether they are attractive, successful, accepted, or socially competent. This process may be especially pronounced in online settings because comparative information is highly accessible and often numerically reinforced through visible popularity indicators. Research

examining self-esteem in relation to online behavior supports the importance of such external validation processes (Dhingra & Parashar, 2022; Verrastro et al., 2023). The present findings therefore suggest that lower self-esteem may increase adolescents' susceptibility to comparison-based processing, which in turn may contribute to emotional distress.

The strongest positive bivariate relationship in the present study was observed between social comparison and depressive symptoms, and social comparison remained a significant predictor of depressive symptoms in the full structural model. This finding suggests that the way adolescents interpret and evaluate themselves in relation to others may be one of the more proximal psychological mechanisms connecting digital experiences with emotional outcomes. Social comparison is not inherently harmful; however, repeated upward comparison to idealized peers, influencers, or celebrities may foster perceptions of inferiority, inadequacy, exclusion, or personal failure. Social media may intensify this tendency because users disproportionately share favorable experiences and carefully selected representations of themselves. Consequently, adolescents may compare their everyday lives with highly edited or selective portrayals of others. Research has shown that social media can influence adolescents' emotional and cognitive states (Chaeycharoen, 2022), and broader reviews emphasize that peer-based digital experiences can simultaneously provide social connection and create risks involving exclusion, conflict, and unfavorable evaluation (Véronneau & Schwartz-Mette, 2021). The present findings are consistent with the view that comparison processes may determine whether exposure to online social information becomes psychologically harmful.

The mediation results provide the most important contribution of the study. Social comparison significantly mediated the relationship between social media addiction and depressive symptoms. Specifically, higher social media addiction was associated with stronger social comparison, which was subsequently associated with greater depressive symptom severity. The standardized indirect effect was meaningful, although the direct effect of social media addiction remained significant, indicating partial rather than full mediation. This pattern suggests that social media addiction may contribute to depressive symptoms through several pathways, one of which is the intensification of comparison-based self-evaluation. The finding helps clarify why simple measures of time online often produce inconsistent associations with mental health. What may

matter is not only exposure duration but also the psychological processes activated during use. Reviews of social media and mental health increasingly emphasize this distinction, suggesting that the quality, motivation, and context of use are more informative than screen time alone (Rutte et al., 2024; Salehi et al., 2025).

The significant indirect effect from self-esteem to depressive symptoms through social comparison provides complementary evidence. Higher self-esteem was associated with less social comparison, which in turn was associated with fewer depressive symptoms. Although the direct protective effect of self-esteem remained stronger than its indirect effect, the mediation finding indicates that part of the association between self-esteem and depressive symptoms operates through adolescents' tendency to evaluate themselves relative to others. In practical terms, adolescents with more stable self-worth may be less likely to treat peers' success, attractiveness, popularity, or lifestyles as standards against which their own value should be judged. This mechanism is consistent with research suggesting that psychological resources can buffer the adverse consequences of social media exposure (Manjanatha et al., 2025). It is also consistent with evidence that self-esteem, emotional regulation, and problematic social media engagement are interconnected rather than independent processes (Costantini et al., 2022).

The finding that social comparison only partially mediated both predictor-outcome relationships is also theoretically important. For social media addiction, this implies that depressive symptoms may arise through additional mechanisms such as sleep disturbance, reduced physical activity, cyberbullying, social exclusion, emotional dysregulation, fear of missing out, or displacement of supportive offline interactions. Reviews of adolescents' digital behavior have highlighted many of these pathways (Bottaro & Faraci, 2022; Huong, 2023). Family factors may also alter these relationships because parental support, monitoring, communication, and household emotional climate influence both media practices and psychological adjustment (Liu et al., 2024). Likewise, the residual direct effect of self-esteem suggests that its association with depressive symptoms is not reducible to social comparison alone. Self-esteem may affect resilience, interpretation of stress, help-seeking, perceived competence, and interpersonal sensitivity through multiple pathways.

5. Conclusion

The present findings fit with evidence that digital media effects vary considerably across adolescents. Platform characteristics, gender, family context, personality, motives for use, and developmental stage can all shape outcomes (Gentzler et al., 2023; Si et al., 2023). Therefore, the results should not be interpreted as evidence that social media is uniformly harmful. Digital platforms may support social connection, identity exploration, and access to information, especially when use is balanced and psychologically purposeful. The more relevant concern is whether engagement becomes compulsive and whether online interaction promotes maladaptive self-evaluation. This interpretation is compatible with the double-edged conceptualization of social media, according to which benefits and risks coexist and are shaped by patterns of use and individual vulnerability (Salehi et al., 2025). It also supports contemporary developmental approaches that position digital technologies as embedded contexts of adolescent emotional adjustment rather than as isolated causes of psychopathology (Rutte et al., 2024).

6. Limitations & Suggestions

The present study has several limitations that should be considered when interpreting the findings. First, the cross-sectional design does not permit causal conclusions regarding the direction of relationships among social media addiction, self-esteem, social comparison, and depressive symptoms. Although the proposed mediation model was theoretically plausible, depressive symptoms may themselves increase compulsive social media use or intensify comparison tendencies, and reciprocal relationships are possible. Second, all variables were assessed using self-report instruments, which may be affected by social desirability, recall bias, shared method variance, or individual differences in interpretation. Third, the sample consisted of adolescents from secondary schools in Ontario, Canada, and therefore the results may not generalize to adolescents from other provinces, countries, cultural groups, socioeconomic backgrounds, or those not attending school. Fourth, the study assessed general social media addiction and general social comparison without distinguishing between different platforms, active and passive use, upward and downward comparison, appearance-related comparison, academic comparison, or comparison with peers versus influencers. Finally, potentially important variables such as anxiety,

cyberbullying, fear of missing out, sleep quality, parental monitoring, family functioning, offline peer support, and pre-existing mental health difficulties were not included in the model.

Future research should examine these relationships using longitudinal and prospective designs to determine temporal ordering and possible reciprocal effects. Multi-wave studies could clarify whether social media addiction precedes increases in social comparison and depressive symptoms or whether adolescents experiencing depressive symptoms become more vulnerable to compulsive use. Experimental and ecological momentary assessment methods could also examine short-term changes in mood following exposure to upward comparison content. Future studies should distinguish between specific platforms, types of content, active versus passive engagement, and different dimensions of social comparison. It would also be valuable to test moderated mediation models incorporating gender, age, pubertal stage, family support, socioeconomic status, digital literacy, and personality characteristics. Cross-cultural replication would help determine whether the observed pathways are stable across different social and technological contexts. Finally, future models should incorporate additional mechanisms such as fear of missing out, sleep disruption, body dissatisfaction, loneliness, emotion regulation, and cybervictimization to provide a more comprehensive account of adolescent digital mental health.

From a practical perspective, the findings suggest that interventions should focus not only on reducing excessive social media use but also on changing the psychological processes that make online engagement harmful. Schools, families, and mental health professionals may benefit from teaching adolescents how curated online content can distort perceptions of peers' lives and how repeated upward comparison can influence mood and self-worth. Programs aimed at strengthening stable self-esteem, self-compassion, critical digital literacy, and emotional regulation may reduce dependence on online validation. Parents and educators can support balanced media routines, encourage offline activities and face-to-face relationships, and discuss the unrealistic nature of many online representations without framing social media as inherently negative. Screening adolescents who show compulsive use, persistent comparison, declining self-esteem, or depressive symptoms may help identify those who would benefit from early psychological support. Interventions may be most effective when they combine healthy digital-use strategies with efforts to strengthen

adolescents' internal sources of self-worth and reduce maladaptive comparison habits.

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Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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All authors equally contributed to this article.

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