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Research paper

Fear of missing out in adolescence: The role of emotion regulation and self-esteem in a two-wave study

Elide Francesca De Caro [a], Luciana Paola Pagano [a], Carlo Garofalo [a], Claudia Mazzeschi [a], Agostino Brugnera [b], Valeria Donisi [c], Laura Salerno [d], Cecilia Giordano [d], Antonino La Tona [b], Silvia Poli [c], Elisa Delvecchio [a,*]

[a] Department of Philosophy, Social Sciences and Education, University of Perugia, Perugia, Italy
[b] Department of Human and Social Sciences, University of Bergamo, Bergamo, Italy
[c] Department of Neuroscience, Biomedicine and Movement Science, University of Verona, Verona, Italy
[d] Department of Psychology, Educational Science and Human Movement, University of Palermo, Palermo, Italy

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ABSTRACT

Fear of Missing Out (FoMO) is a salient factor influencing adolescents' mental health in the digital age. This two-wave longitudinal study examined whether self-esteem mediates the association between emotion regulation difficulties and FoMO over a five-month interval, while controlling for baseline levels of FoMO and self-esteem, as well as age and sex. A total of 1311 adolescents (57.5% female; M = 16.4, SD = 1.1) completed self-report measures of FoMO, self-esteem (RSES), and the Difficulties in Emotion Regulation Scale–Short Form (DERS-SF). Regression analyses showed that the DERS Strategies subscale, reflecting limited access to effective emotion regulation strategies, was the only dimension that uniquely predicted FoMO at follow-up after controlling for baseline levels. Structural equation modeling supported a mediation model, with a significant indirect effect of emotion regulation difficulties on FoMO at follow-up via self-esteem. The final model demonstrated good fit and explained 55% of the variance in FoMO at follow-up. Findings indicate that difficulties accessing adaptive regulation strategies may be associated with lower self-esteem over time, which in turn relates to higher FoMO. Interventions targeting emotion regulation and self-esteem may help mitigate FoMO-related distress in adolescence.

1. Two-wave study

Fear of missing out (FoMO) has become an increasingly important construct in understanding the psychological functioning of adolescents, particularly regarding socializing both within and outside digital environments (Littman-Ovadia and Russo-Netzer, 2024). FoMO is defined as psychological discomfort rooted in the belief that others may be participating in rewarding experiences from which one is excluded (Przybylski et al., 2013) and is often linked to a persistent desire to remain socially connected and to know what others are doing (Dogan, 2019). Originally grounded in Self-Determination Theory, FoMO has been conceptualized as arising from unmet psychological needs for relatedness, competence, and autonomy, which may heighten sensitivity to social exclusion and social comparison (Przybylski et al., 2013). Its negative consequences include increased anxiety and depressive symptoms (Baker et al., 2016), sleep disturbances (Scott and Woods, 2018), and lower levels of subjective well-being (Fabris et al., 2020; Gupta and Sharma, 2021).

FoMO has also been consistently associated with maladaptive behaviors in digital contexts such as problematic or excessive social media use, especially in adolescence (Elhai et al., 2021; Fioravanti et al., 2021), a developmental period characterized by emotional vulnerability, heightened social sensitivity, and identity consolidation (Crone and Dahl, 2012; Blakemore and Mills, 2014). Adolescents increasingly use digital platforms to build peer relationships and engage in social comparison, exposing themselves to a constant stream of information about others' experiences (Beyens et al., 2016; Fabris et al., 2020; Servidio et al., 2024). Consequently, FoMO has emerged as a significant factor

* Corresponding author at: Department of Philosophy, Social Sciences and Education, University of Perugia, Piazza Ermini 1, 06123, Perugia, Italy.
E-mail addresses: elidefrancesca.decaro@unipg.it (E.F. De Caro), lucianapaola.pagano@dottorandi.unipg.it (L.P. Pagano), carlo.garofalo@unipg.it (C. Garofalo), claudia.mazzeschi@unipg.it (C. Mazzeschi), agostino.brugnera@unibg.it (A. Brugnera), valeriadonisi@univr.it (V. Donisi), laura.salerno@unipa.it (L. Salerno), cecilia.giordano@unipa.it (C. Giordano), antonino.latona@unibg.it (A. La Tona), silvia.poli@univr.it (S. Poli), elisa.delvecchio@unipg.it (E. Delvecchio).

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contributing to problematic social media use and internet addiction (Elhai et al., 2025; Hormes et al., 2014). Although FoMO can occur in offline environments, such as face-to-face social interactions (Littman-Ovadia and Russo-Netzer, 2024), it has primarily attracted attention in online settings. However, less is known about the individual psychological mechanisms that might contribute to its development.

Recent perspectives suggest that FoMO may function as a dynamic psychological process that fluctuates in response to psychological vulnerabilities and contextual experiences (Wegmann et al., 2017), making prospective designs essential to examine whether psychological factors are associated with subsequent levels beyond prior stability. Although early conceptualizations positioned FoMO as a stable dispositional construct (Przybylski et al., 2013), emerging evidence indicates that it may vary as a function of emotional and interpersonal processes. From this standpoint, FoMO may reflect the downstream impact of broader self-regulatory and interpersonal mechanisms rather than operate solely as a fixed trait. For example, Piko et al. (2025) conceptualized FoMO as an outcome shaped by social comparison, loneliness, perfectionism, and social media addiction, highlighting its links to broader emotional and self-evaluative processes.

From a conceptual standpoint, FoMO involves heightened emotional reactivity to perceived exclusion along with increased engagement in social comparison and counterfactual thinking (Browne et al., 2018; Neumann, 2020; Verduyn et al., 2017). Adolescents experiencing FoMO may react with anxiety, fear, regret, or envy while focusing attention on others' activities and imagining missed opportunities. In line with the multidimensional model of emotion dysregulation proposed by Gratz and Roemer (2004), emotion regulation difficulties can be understood as deficits across several interrelated domains, including nonacceptance of emotional responses, impulse control difficulties, and limited perceived access to effective regulation strategies.

Because emotion regulation difficulties are strongly associated with anxiety and depressive symptoms in youth (Schäfer et al., 2017), adolescents with regulatory deficits may be especially vulnerable to these emotional and comparison-driven responses. When adolescents struggle to manage distress effectively, anxiety and envy during social comparison may intensify, increasing vulnerability to FoMO (Elhai et al., 2018; Yue et al., 2022). Difficulties in regulating negative emotions may also foster ruminative comparisons and counterfactual thinking, sustaining attention on missed opportunities and reinforcing feelings of social inadequacy (Verduyn et al., 2017). Moreover, adolescents with emotion regulation difficulties may be more likely to interpret online social cues as signs of exclusion and to engage in reassurance-seeking or monitoring behaviors to reduce uncertainty (Wolniewicz et al., 2018).

In addition to their association with emotional distress, emotion regulation difficulties have been shown to influence adolescents' broader psychological functioning. Meta-analytic evidence indicates that maladaptive emotion regulation strategies are a central vulnerability factor for anxiety and depressive symptoms in youth (Schäfer et al., 2017), experiences that are frequently associated with FoMO (Elhai et al., 2016). Furthermore, the quality of emotion regulation strategies has been found to shape adolescents' subjective well-being and self-esteem over time (Martínez-Líbano et al., 2025; Verzeletti et al., 2016). Taken together, these findings suggest that emotion regulation difficulties may be associated with FoMO both directly and through their impact on self-evaluative processes.

Self-esteem has been proposed as a second central mechanism through which adolescents interpret exclusion and online comparison experiences. Research on FoMO has increasingly emphasized the role of self-esteem as a proximal psychological mechanism. Studies have shown that individuals with lower self-esteem are more vulnerable to FoMO and problematic social media engagement (Mahmud et al., 2023; Ortega-Barón et al., 2025). Evidence also indicates that self-esteem can mediate the association between maladaptive online behaviors and FoMO (Servidio et al., 2024).

To better understand the role of self-esteem in the relationship between emotion regulation and FoMO, sociometer theory (Leary, 2005) provides a useful framework. From this perspective, self-esteem reflects perceived social acceptance and is shaped by ongoing emotional and interpersonal experiences, rather than serving as a primary causal driver. Adolescents who struggle to regulate distress may be more likely to interpret social interactions negatively, which lowers their perceived relational value. Reduced self-esteem, in turn, may heighten sensitivity to exclusion and increase vulnerability to FoMO. Adolescents with low self-esteem are more likely to perceive themselves as socially inadequate or unworthy (Rosenberg, 1965), which may increase feelings of exclusion and intensify the stress associated with FoMO (Mahmud et al., 2023; Ortega-Barón et al., 2025). Within this framework, self-esteem may function as a mechanism linking emotional regulation processes to experiences of social exclusion. Taken together, Self-Determination Theory, the multidimensional model of emotion dysregulation, and sociometer theory converge in suggesting that difficulties in regulating affective responses to perceived threats to belonging may undermine adolescents' sense of relational value, thereby increasing vulnerability to FoMO.

However, most available evidence derives from cross-sectional studies, limiting understanding of the direction of the relationships between these variables over time (San Martín Iñiguez et al., 2024; Milyavskaya et al., 2018). In line with MacKinnon et al. (2023), longitudinal studies are methodologically essential for clarifying the temporal ordering of associations and for avoiding overlap between mediating effects with other effects, including moderating and confounding effects (MacKinnon and Luecken, 2008). Although emotion regulation difficulties are inherently multidimensional, prior research has often relied on overall dysregulation scores. Consequently, it remains unclear whether specific facets of emotion dysregulation are uniquely associated with FoMO. Identifying which specific aspects of emotion regulation are most predictive of FoMO could significantly refine prevention and intervention strategies.

Overall, previous evidence highlights the importance of examining both emotion regulation processes and self-esteem as key psychological mechanisms associated with adolescents' FoMO over time. However, to our knowledge, no longitudinal study has examined the role of emotion regulation difficulties and self-esteem in predicting FoMO after five months while accounting for prior levels of these constructs, nor has research simultaneously tested the unique contributions of specific emotion regulation dimensions and self-esteem within the same model (MacKinnon and Luecken, 2008). Unlike models that focus on specific regulation strategies such as cognitive reappraisal or expressive suppression (Gross, 2014), the present study adopts the multidimensional emotion dysregulation framework assessed by the DERS-SF, which conceptualizes dysregulation as involving deficits in six areas: Awareness, Clarity, Acceptance, Impulse control, Goal-directed behavior, and perceived access to effective regulation Strategies.

2. The present study

This two-wave longitudinal study examined predictors of FoMO at follow-up while controlling for its baseline levels. Specifically, we investigated whether emotion regulation difficulties, conceptualized within the multidimensional model of emotion dysregulation, were associated with FoMO over a five-month interval, with self-esteem considered as a potential mediator (see Fig. 1). Consistent with theoretical perspectives highlighting the role of affective regulation and perceived relational value in experiences of social exclusion, and with evidence linking emotion regulation deficits to affective vulnerability in youth (Schäfer et al., 2017) and the conclusions of Mahmud et al. (2023), we tested the following hypotheses:

H1. Baseline emotion regulation difficulties would predict FoMO at follow-up above and beyond the contribution of self-esteem.

H2. Self-esteem would mediate the longitudinal association between

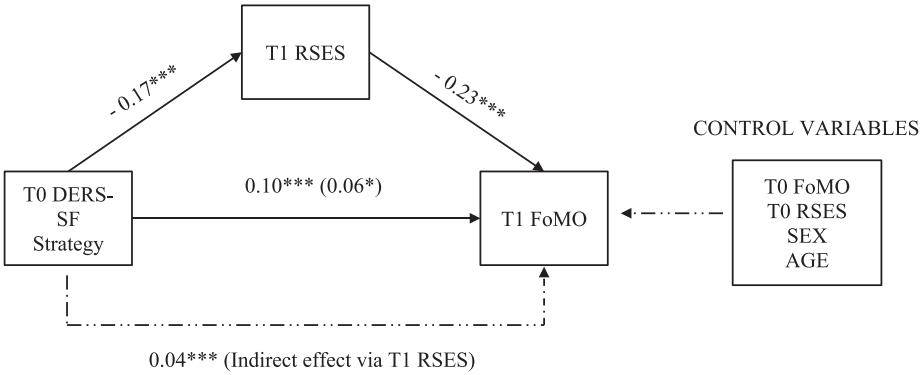

Fig. 1. Two-wave mediation model.
Note. The direct effect of T0 DERS-SF Strategy on FoMO is reported in parenhesis. Standardized coefficients are reported; FoMO = Fear of missing out; RSES = Rosenberg Self-Esteem Scale; DERS-SF = Difficulties in Emotion Regulation Scale – Short Form T0 = Time 0; T1 = Time 1. *$p \leq .05$. **$p \leq .01$.

emotion regulation difficulties and FoMO. Following MacKinnon and Luecken (2008), MacKinnon (2011), MacKinnon et al. (2023) and consistent with Martínez-Líbano et al. (2025), we tested whether baseline emotion regulation difficulties predicted FoMO at follow-up (path a), whether baseline emotion regulation difficulties predicted self-esteem at follow-up (path b), and whether self-esteem at follow-up was associated with FoMO at follow-up (path c), resulting in a significant indirect effect.

H3. As competing hypotheses, we also examined the moderating role of self-esteem and the reverse model with difficulties in emotion regulation as a mediator. Consistent with the theoretical framework, we expected to confirm *H1* and *H2* but not *H3*. All the analyses were controlled for age and sex.

3. Method

The present study is part of a larger longitudinal project (SMART Project, CUP 2022LC4FT7) involving schools from Northern, Central, and Southern Italy. Data collection took place between November 2023 and May 2024, with a five-month interval between the first measurement (T0) and the follow-up (T1). The study was conducted in accordance with the guidelines of the Declaration of Helsinki and was approved by the Regional Ethics Committee of Umbria (CER Umbria), Perugia Hospital Authority (Registry CER N. 4627/23, approval date: November 8, 2023), as part of the SMART project funded by the Italian Ministry of University and Research (Ministero dell'Università e della Ricerca, MUR) [PNRR per la Missione 4, Componente 2, Investimento 1.1, finanziato dall'Unione europea – NextGenerationEU].

3.1. Participants

A total of 1311 adolescents (57.5% female) aged between 14 and 18 years provided valid data at the first measurement (T0, baseline) and were included in the analyses. Most participants ($n = 1234$; 94.3%) were born in Italy, as were most of their parents (78.9% of mothers and 81.8% of fathers were born in Italy).

Recruitment was conducted on a voluntary basis through prior collaborations with schools across Italy. Written informed consent was obtained from all participants, from parents in the case of minors, and verbal assent was obtained from each student. At the second measurement time point (T1), 947 adolescents provided valid longitudinal data. At T1, 27.8% of participants dropped out, primarily due to school absences.

3.2. Measures

Participants completed validated Italian versions of the following self-report instruments. All scales underwent confirmatory factor analyses to verify their factorial structure, which showed satisfactory fit across all measures. Detailed results are reported in the Supplementary Materials (see Table S3).

3.2.1. *The Fear of Missing Out Scale (FoMO; Przybylski et al., 2013; Casale and Fioravanti, 2020)*

This 10-item self-report instrument assesses concerns about missing rewarding social experiences. The items describe worries about being excluded or missing out (e.g., "I get worried when I find out my friends are having fun without me"; "When I miss out on a planned get-together it bothers me"). Each item is rated on a five-point Likert scale ranging from 1 (*not at all true of me*) to 5 (*extremely true of me*). Higher scores indicating greater levels of FoMO. In the present sample, internal consistency of the scale was good ($\alpha = 0.84$).

3.2.2. *Difficulties in Emotion Regulation Scale - Short Form (DERS-SF; Gratz and Roemer, 2004; Kaufman et al., 2016; Rossi et al., 2023; Mancinelli et al., 2024)*

This 18-item self-report scale measures six dimensions related to emotion dysregulation: awareness and understanding of emotions (Awareness subscale, item 10: "When I'm upset, I acknowledge my emotions"); lack of acceptance of emotions (Nonacceptance subscale, item 12: "When I'm upset, I become embarrassed for feeling that way"); ability to identify emotions (Clarity subscale, item 5: "I have difficulty making sense out of my feelings"); ability to engage in goal-directed behavior (Goals subscale, item 26: "When I'm upset, I have difficulty concentrating"); access to and perceived effectiveness of strategies of emotion regulating strategies (Strategies subscale, item 28: "When I'm upset, I believe there is nothing I can do to make myself feel better"); and impulse control, or the ability to refrain from impulsive behavior when experiencing negative emotions (Impulse subscale, item 27: When I'm upset, I have difficulty controlling my behavior"). Items are rated on a 5-point Likert scale ranging from 1 (*almost never*) to 5 (*almost always*) and can be summed to yield a total score reflecting overall emotion dysregulation. In the present study, the internal consistencies of the subscales ranged from fair to good (α ranges = 0.67–0.88; for detailed results, see Table 1).

3.2.3. *Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965; Prezza et al., 1997)*

This 10-item scale is a widely validated self-report measure of global self-worth. Respondents indicate their agreement with each statement (e.g., "On the whole, I am satisfied with myself"). Items are rated on a 4-point Likert scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). Higher scores indicate greater self-esteem. In the present study, the internal consistency of the scale was good ($\alpha = 0.87$).

Table 1
Descriptive statistics, Cronbach's alpha and bivariate Pearson's correlations at baseline (T0).

Variables T0	M(SD)	α	Skew.	Kurt	Test-retest	1	2	3	4	5	6	7
1. Fear of Missing Out	26.37(7.60)	0.84	0.30	0.21	0.72	1						
2. Self-Esteem	27.06(5.86)	0.87	−0.20	−0.33	0.75	−0.38**	1					
DERS-SF subscales												
3. Awareness	8.76(2.86)	0.67	0.01	−0.78	0.61	0.01	−0.25**	1				
4. Non-acceptance	6.98(3.28)	0.73	0.69	−0.43	0.57	0.40**	−0.50**	0.21**	1			
5. Goal	9.38(3.36)	0.84	0.04	−1.00	0.61	0.35**	−0.41**	0.07*	0.47**	1		
6. Strategy	7.08(3.16)	0.73	0.69	−0.42	0.65	0.37**	−0.57**	0.09**	0.58**	0.56**	1	
7. Impulse	7.51(3.69)	0.88	0.62	−0.71	0.66	0.31**	−0.30**	0.08**	0.40**	0.53**	0.53**	1
8. Clarity	7.79(3.19)	0.78	0.49	−0.61	0.61	0.33**	−0.50**	−0.07*	0.48**	0.42**	0.53**	0.40**

Note. ($N = 947$). DERS-SF = Difficulties in Emotion Regulation Scale – Short Form; M = mean; SD = standard deviation.
* $p < .05$.
** $p < .01$.

3.3. Statistical analysis

All statistical analyses were performed using IBM SPSS 25 (IBM Corp Released, 2017) for correlations and regressions, and the statistical framework R (R Core Team, 2019) within the software JASP Team (2024) structural equation model module for testing mediation models. First, the correlations between the study variables were examined at T0 (i.e., the beginning of the study). A stepwise multiple regression analysis was then performed to examine the unique contribution (testing overall effects, *H1*) of the DERS-SF subscales and self-esteem in predicting FoMO at 5-month intervals. Controlling for baseline levels of FoMO (*Step 1*) and for sex and age (*Step 2*), DERS-SF related variables were allowed to enter in the model with self-esteem (*Step 3*). Both DERS-SF and RSES were measured at T0. The significant predictors among the adjusted DERS-SF scales resulting from the regression analysis were then used as independent variables in the mediation model.

The structural equation model (SEM) was used to test the hypothesized mediation model (*H2*) and the competing moderating role of self-esteem and mediation model of emotion regulation difficulties (*H3*). A two-wave mediation model was examined primarily at the observed level, but also from a latent variable perspective (Ledgerwood and Shrout, 2011; Yuan et al., 2024). Because the accuracy and precision of observed and latent models may depend on several factors, such as sample size, the number of parameters included, and model complexity (i.e., the relationships among variables), especially in longitudinal studies, we present both analyses (the graph of the latent model in the Supplementary Material) to allow interpretation of the results as complementary rather than redundant.

At the observed level, we tested the mediation effect of T1 RSES on the association between T0 DERS-SF-related variable scores and FoMO at T1 (over a 5-month interval), controlling for baseline scores of both the mediator and outcome variables as well as age and sex (MacKinnon and Luecken, 2008; Winer et al., 2016; Preacher, 2015). Indirect effects were tested using bootstrapping procedures (Bollen-Stine) and 95% bias-corrected confidence intervals based on 1000 random samples.

To test the two-wave mediation model at the latent level (Fig. S1 in the Supplementary Material), we first ensured longitudinal measurement invariance by comparing three successive levels of measurement invariance, each with additional and progressively stricter equality constraints across the two measurement time points (T0 and T1): configural, metric, and scalar (Putnick & Bornstein, 2016). The criteria for determining measurement invariance were as follows (Chen, 2007; Putnick & Bornstein, 2016): $\Delta\chi^2$ $p > .05$, $\Delta CFI \leq 0.01$, $\Delta TLI \leq 0.01$, $\Delta RMSEA \leq 0.015$, and $\Delta SRMR \leq 0.03$ for metric invariance or $\Delta SRMR \leq 0.015$ for scalar invariance. Changes in fit indices above these thresholds indicated non-invariance. We then tested the latent constructs based on their observed indicators measured at each time point and examined the pattern of direct (both autoregressive and cross-lagged) and indirect (i.e., mediated) relations among the constructs over time. Overall, at both levels, we controlled for autoregressive and cross-lagged patterns among the outcome, independent variable, and mediator across time (Little et al., 2007).

The models were estimated by using the maximum likelihood parameter with robust standard errors (MLR). Model fit was evaluated using both relative and absolute standard goodness-of-fit indices (Bhale and Bedi, 2023; Weston and Gore Jr, 2006), which were considered according to the different purposes of the models tested to ensure a robust understanding of model fit (Kline and Tamer, 2016; Kline, 2023). The relative fit indices, used to compare models fit, included the Comparative Fit Index (CFI $\geq$ 0.95) and the Tucker-Lewis Index (TLI $\geq$ 0.95). Absolute model fit indices were used to directly assess model fit as the differences between observed and estimated covariance matrices and included the Goodness of Fit Index (GFI $\geq$ 0.90), the Root Mean Square Error of Approximation (RMSEA $\leq$0.06), and the Standardized Root Mean Square Residual (SRMR $\leq$ 0.08). We implemented a full information maximum likelihood estimation model (FIML) to manage cases with missing values on the model variables.

4. Results

4.1. Preliminary analyses

The data were close to normality, with skewness values between −0.20 and 0.69 and kurtosis values between −1.00 and 0.21. Test-retest correlations showed that FoMO and RSES were quite stable across 5 months and had reasonable test-retest correlations, while the test-retest correlations for DERS-SF related subscales were moderate. The correlations between the design variables at T0 also show that FoMO was positively correlated with all DERS-SF-related variables and negatively correlated with RSES (Table 1).

In addition, a One-way ANOVA was used to examine both sex and age differences with Holm's adjusted p-values for multiple comparisons, for age differences. We found that girls scored higher compared to boys on FoMO and all DERS-SF-related subscales except Awareness, while lower on RSES compared to boys. Regarding age-related differences, results showed that 15-year-old adolescents had lower levels on the DERS-SF Strategy subscale and higher levels on the DERS-SF Awareness subscale, compared with 17- and 18-year-olds, respectively. We further examined the mean values by time and found significant differences only in the mean values of DERS-SF clarity (see Table S1 in Supplementary Material for descriptives by sex, time and age).

4.2. Longitudinal multiple regression analysis for predicting FoMO

The stepwise multiple regression results (Table 2) showed that, among the DERS-SF dimensions, only the Strategy subscale uniquely

Table 2
Longitudinal multiple regression analysis for predicting FoMO after 5 months (T1).

	R^2	β	b	SE	t	p value
Step 1	0.51					
T0 FoMO		0.71	0.70	0.02	30.93	<.001
Age		−0.06	−0.38	0.15	−2.48	<.01
Step 2	0.52					
T0 DERS-SF Strategy		0.06	0.24	0.06	4.01	<.001

Note. FoMO = Fear of missing out; RSES = Rosenberg Self-Esteem Scale; DERS-SF = Difficulties in Emotion Regulation Scale – Short Form; β = Standardized estimates are reported; the standard error refers to β as used for the interpretation of the results; the table contains only the significance results from the stepwise procedure; sex and the other DERS-SF were systematically removed, as no significant $p > .05$.

predicted FoMO at 5 months, after controlling for sex, age, and baseline FoMO. Therefore, DERS-SF Strategy was retained as the independent variable in the subsequent mediation models.

4.3. Longitudinal measurement invariance

For all measures included in the study, longitudinal measurement invariance was fully supported at the three levels – configural, metric, and scalar invariance (see Table S2 in the Supplementary Material for details).

4.4. Two-wave mediation model

The SEM model (Fig. 1) fitted the data well, robust $\chi^2 = 3421$ (8000), $p < .001$, CFI = 0.99, TLI = 0.98, RMSEA = 0.06, 90% CI [0.04, 0.08], SRMR = 0.04. The model explained 55% of the variance in FoMO at follow up. The results (Table 3) confirmed the hypothesized indirect effects of DERS-SF strategy on FoMO at T1. More specifically, the baseline DERS-SF strategy was found to be indirectly related to FoMO through the mediating role of RSES after 5-months controlling for sex, baseline levels of FoMO and RSES. In addition, the direct path from baseline DERS-SF strategy to FoMO after 5 months was significant. In particular, the result of the mediation analysis indicated a partially mediated effect. Based on the results of the SEM analysis, baseline levels of DERS-SF strategy had a significant positive and direct effect on RSES at 5 months, and RSES covaried significantly negatively with FoMO at follow up after controlling for baseline scores of FoMO and RSES, age and sex. Sex did not account for a significant variance proportion, while age was significantly negatively associated with FoMO (Table 2). The indirect effect was significant and was tested by bootstrapping to 95% of the confidence interval ($\beta = 0.03$, $SE = 0.02$, $z = 3.27$; *95% CI* [0.03, 0.09]), $p < .001$).

Table 3
Estimates for the two-wave mediation analysis of Self-esteem on the temporal association between DERS-SF Strategy and FoMO ($N = 934$).

	R^2	β	b	SE	z	p value
Total effect						
T0 DERS-SF Strategy ⇒ T1 FoMO	0.52	0.10	0.24	0.07	3.32	<.001
Direct path						
T1 RSES (MV)	0.57					<.001
T0 DERS-SF Strategy (IV)		−0.17	−0.31	0.06	−5.62	<.001
T0 RSES (MV)		0.65	0.65	0.03	23.93	<.001
T1 FoMO (DV)	0.55					<.001
T0 DERS-SF Strategy		0.06	0.15	0.07	1.96	≤.05
T1 RSES		−0.23	−0.30	0.06	−4.96	<.001
Indirect path						
T0 DERS-SF Strategy ⇒ T1 RSES ⇒ T1 FoMO		0.04	0.09	0.03	3.16	<.01
Covariates						
Age		−0.06	0.35	0.15	−2.35	<.05
Sex		0.01	0.12	0.36	0.33	>.05
T0 FoMO		0.68	0.67	0.02	27.76	<.001
T0 RSES		0.19	0.24	0.05	5.21	<.001

Note. FoMO = Fear of missing out; RSES = Rosenberg Self-Esteem Scale; DERS-SF = Difficulties in Emotion Regulation Scale – Short Form; IV = Independent variable; DV = Dependent variable; MV = Mediator variable; T0 = baseline; T1 = after 5-month; β = standardized estimates; b = unstandardized estimates; SE = standard error; the standard error refers to β as used for the interpretation of the results; R^2 = R squared for variance explained.

4.5. The latent two-wave mediation model

The SEM latent mediation model (Fig. 1S in the Supplemental Material) fit the data adequately: robust $\chi^2 = 4945.97$ (1065), $p < .001$; GFI = 0.96, RMSEA = 0.06, 90% CI [0.06, 0.07], SRMR = 0.06. The results confirmed the hypothesized indirect effects of DERS-SF strategy on FoMO at T1. Specifically, baseline DERS-SF strategy was indirectly related to FoMO through the mediating role of RSES after 5 months, controlling for sex, age, and baseline levels of FoMO and RSES. Additionally, the direct path from baseline DERS-SF strategy to FoMO after 5 months was not significant (β = 0.07, SE = 0.05, z = 1.37; 95% CI [−0.03, 0.16], $p > .05$). The mediation analysis indicated a fully mediated effect. Based on the SEM latent model analysis, the effect of baseline DERS-SF strategy was completely mediated by RSES levels (β = −0.16, SE = 0.04, z = 3.84; 95% CI [−0.24, −0.07], p < .001), which covaried significantly and negatively with FoMO at follow-up (β = −0.45, SE = 0.06, z = −7.27; 95% CI [−0.58, −0.33], p < .001), after controlling for FoMO, RSES, age, and sex. The indirect effect was significant and was tested by bootstrapping to a 95% confidence interval (β = 0.03, SE = 0.01, z = 3.34; 95% CI [0.01, 0.04], $p < .01$).

4.6. Competing models

When we attempted to test the reverse model with the T1 DERS-SF strategy as a mediator, the model fit worsened (robust $\chi^2 = 7386$ (2000), $p = .02$, *CFI* = 0.98, *TLI* = 0.98, *RMSEA* = 0.05, 90% *CI* [0.02, 0.09], *SRMR* = 0.02), and although a significant indirect effect ($\beta = -0.05$, $SE = 0.01$, $z = -4.72$, $p < .001$) no significant total ($\beta = -0.00$, $SE = 0.04$, $z = 0.03$, $p > .05$) and direct effects ($\beta = 0.05$, SE = 0.04, $z = 1.45$, $p > .05$) of RSES on changes in FoMO after 5 months were found. The moderation model including the interaction between RSES and DERS-SF Strategy was also not supported (β = −0.00, SE = 0.01, z = −0.08, p > .05).

5. Discussion

The present longitudinal study investigated the mediating role of self-esteem in the temporal relationship between emotion regulation difficulties and FoMO in adolescents. To our knowledge, this is the first study to longitudinally examine whether self-esteem mediates the association between emotion regulation difficulties and fear of missing out in adolescents. Longitudinal designs are essential for testing mediation models and clarifying the direction of associations, reducing the risk of conflating mediators with third-variable effects (Goldsmith et al., 2018; MacKinnon and Luecken, 2008; MacKinnon et al., 2023).

The results were largely consistent with our hypotheses. In line with *H1*, emotion regulation difficulties uniquely contributed to FoMO over time. Notably, limited access to emotion regulation Strategies emerged as the only dimension that uniquely predicted FoMO at follow-up. This dimension reflects feelings of being ineffective in managing emotional experiences, which may heighten adolescents' sensitivity to social comparison and perceived exclusion in online contexts. These findings are consistent with both sociometer theory (Leary, 2005) and previous evidence linking emotion regulation difficulties to anxiety-related dimensions associated with FoMO and problematic social media use (Schäfer et al., 2017; Yue et al., 2022).

The SEM analysis supported the hypothesized two-wave mediation model (*H2*) At the observed level, emotion regulation difficulties predicted FoMO at follow-up both directly and indirectly through self-esteem. Consistent with previous findings, which are sparse in the literature, results seem to confirm that emotion regulation strategies have a strong influence on self-esteem in adolescence (Martínez-Líbano et al., 2025) which in turn impacted on the adolescents 'intense anxiety and fear of being excluded (Mahmud et al., 2023; Servidio et al., 2024; Yue et al., 2022). When the mediation model was tested at the latent level, the estimates of the indirect effect did not vary statistically. Consistent with previous studies (DeShon, 2006; Ledgerwood and Shrout, 2011), our results from these two analytical approaches provide evidence for differences in the estimation process that warrant attention. Although mediation effect estimates are, on average, more accurate when using latent variables compared to observed variables, these estimates tend to vary more across studies. Given that estimates produced by a latent variable approach could differ significantly from the average estimate, especially for indirect effects, while those produced by an observed variable approach could differ for path coefficients, this suggests the importance of systematically including both analytical approaches in a study when possible. Indeed, our findings show that the *p* value of the direct paths at the observed level is negligibly significant and becomes not significant at the latent level, suggesting that the latter is more accurate (Ledgerwood and Shrout, 2011). Thus, a full mediation model, based on the more accurate estimate of the direct path in the latent model, is supported.

Importantly, FoMO was assessed using the original Przybylski scale (2013). Although the instrument captures a relatively stable dispositional tendency, the longitudinal design allowed us to examine whether emotion regulation difficulties and self-esteem predicted changes in FoMO over time, rather than merely its absolute level at follow-up. FoMO showed substantial stability across the five-month interval, consistent with the dispositional orientation of the Przybylski scale (Przybylski et al., 2013). By controlling for baseline FoMO, our model captured individual variations in FoMO change, showing that emotion regulation difficulties and self-esteem were associated with increases or decreases in FoMO across time. These findings support the relevance of these psychological mechanisms while remaining consistent with the trait-like nature of the construct.

To further support our *H1* and *H2*, we also tested self-esteem as a) a temporal precursor of FoMO with emotion regulation difficulties as mediator, and b) as moderator of the impact of emotion regulation (*H3*). We found no significant overall effect of self-esteem, i.e., total effect, which means that the hypothesis of self-esteem as a temporal precursor of FoMO is not supported, nor is the reverse mediation model of emotion regulation. Furthermore, we found no significant moderating effect of self-esteem on emotion regulation strategies.

Beyond these mechanisms, it is important to situate the present findings within the broader literature. FoMO has been linked to individual differences in personality, particularly higher neuroticism and lower conscientiousness, as well as to emotional distress and maladaptive digital behaviors in adolescents (Rozgonjuk et al., 2021, 2023). Although personality traits were not assessed in the present study, emotion regulation difficulties and self-esteem may represent more proximal psychological processes through which broader dispositional factors influence vulnerability to FoMO. With regard to demographic factors, girls reported higher baseline FoMO, and age showed a small negative association with FoMO in the longitudinal model. By controlling for age and sex, the present findings indicate that the identified mediation pathway operates beyond these demographic differences.

Taken together, the present findings contribute to situating FoMO within broader models of adolescent emotional vulnerability. Although FoMO has been associated with anxiety, problematic social media use, and emotional distress (Mahmud et al., 2023; Yue et al., 2022), the current results suggest that underlying difficulties in emotion regulation may represent a proximal mechanism linking internal emotional processes to adolescents' experiences of online exclusion and social anxiety. In this sense, self-esteem appears to operate as a central self-evaluative process through which regulatory vulnerabilities are translated into heightened FoMO.

From a preventive perspective, these findings align with previous research highlighting the importance of emotion regulation processes in adolescent adjustment (Martínez-Líbano et al., 2025) and in problematic digital engagement (Mahmud et al., 2023; Yue et al., 2022). Interventions aimed at reducing emotion regulation difficulties may indirectly attenuate adolescents' vulnerability to FoMO by supporting more stable self-evaluations during a developmentally sensitive period. Such approaches may be particularly relevant in contemporary contexts characterized by pervasive social media exposure and intensified peer comparison.

5.1. Limitations

While the longitudinal design represents a methodological strength, certain limitations should be acknowledged. Although the two-wave design provided a prospective perspective over a five-month interval, it reflects a relatively short-term longitudinal framework rather than a multi-wave design. The limited number of assessment points restricts stronger causal inferences and does not allow examination of longer-term developmental trajectories or reciprocal associations among the study variables. The longitudinal design strengthens the temporal validity of the findings, yet causal inferences remain limited. Nonetheless, additional analyses did not support reverse or reciprocal pathways, offering further support for the hypothesized model direction. Future research could employ experimental, daily diary (EMS), or other sampling methodologies to further elucidate temporal dynamics among these constructs.

The study experienced a notable attrition rate, with approximately 28% of participants not completing the second wave of data collection. While this level of attrition is consistent with longitudinal studies, administrations were carried out in class during regular school hours, so this dropout was predominantly attributable to student absenteeism rather than refusal to participate. However, the overall sample size at follow-up remained sufficiently large and demographically diverse to support meaningful conclusions. These findings offer insights to Italian adolescents with potential for cross-cultural comparison given that constructs like self-esteem and emotion regulation may vary across sociocultural contexts (Liddell and Williams, 2019; Laconi et al., 2025).

All constructs were measured using self-report instruments. Although validated measures were employed, self-report data may not fully capture the complex or implicit processes related to emotion regulation and self-esteem, especially considering that adolescence is a critical period of identity formation influenced by multiple dynamic factors (Crocetti, 2018; Marcia, 1980). Future studies would benefit from incorporating multi-method approaches to better reflect the multifaceted and evolving nature of these constructs.

6. Conclusion

This study adds to the existing literature on fear of missing out by examining the predictive role of emotion regulation strategies and the mediating role of self-esteem. The analysis showed that emotion regulation strategies negatively affect adolescents' self-esteem, which in turn increases FoMO at follow-up. However, these findings should be interpreted with caution due to the study's inherent limitations. Overall, the results highlight the importance of further research on emotion regulation skills in adolescence, as these skills are crucial for adolescents' self-evaluation and sense of efficacy. Strengthening these abilities can enhance their sense of connection with themselves and help them better cope with fears, anxieties, and concerns about rejection, exclusion, and neglect in both real-life and digital contexts.

CRediT authorship contribution statement

Elide Francesca De Caro: Writing – original draft, Formal analysis, Data curation. **Luciana Paola Pagano:** Writing – original draft. **Carlo Garofalo:** Writing – review & editing, Conceptualization. **Claudia Mazzeschi:** Writing – review & editing, Supervision, Conceptualization. **Agostino Brugnera:** Writing – review & editing, Project administration, Funding acquisition. **Valeria Donisi:** Writing – review & editing, Project administration, Funding acquisition. **Laura Salerno:** Writing – review & editing, Project administration, Funding acquisition. **Cecilia Giordano:** Writing – review & editing, Formal analysis, Data curation. **Antonino La Tona:** Writing – review & editing, Formal analysis, Data curation. **Silvia Poli:** Writing – review & editing, Formal analysis, Data curation. **Elisa Delvecchio:** Writing – review & editing, Supervision, Project administration, Funding acquisition, Conceptualization.

Consent to participate

Written informed consent was obtained from parents or caregivers, and assent was obtained from adolescents. For participants aged 18 years, written informed consent was obtained directly.

Consent for publication

Written informed consent for publication of anonymized data was obtained from participants and their parents/caregivers.

Ethical approval

This study was approved by the Regional Ethical Committee of Umbria, Italy (Code: 4627/23) and conducted in accordance with the Declaration of Helsinki and its later amendments.

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Declaration of competing interest

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

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jad.2026.121622.

Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request. The present study was not preregistered; however, the broader longitudinal project was preregistered on OSF Registries (https://osf.io/2ucnk/; IRRID: DERR1-https://doi.org/10.2196/58739; (Donisi, Salerno, Delvecchio, & Brugnera, 2024).

References

Baker, Z.G., Krieger, H., LeRoy, A.S., 2016. Fear of missing out: relationships with depression, mindfulness, and physical symptoms. Transl. Issues Psychol. Sci. 2 (3), 275–282. https://doi.org/10.1037/tps0000075.

Beyens, I., Frison, E., Eggermont, S., 2016. "I don't want to miss a thing": adolescents' fear of missing out and its relationship to adolescents' social needs, Facebook use, and Facebook related stress. Comput. Human Behav. 64, 1–8. https://doi.org/10.1016/j.chb.2016.05.083.

Bhale, U., Bedi, H.S., 2023. Sem Model Fit Indices Meaning and Acceptance of Model Literature Support. Available at SSRN 4659352.

Blakemore, S.-J., Mills, K.L., 2014. Is adolescence a sensitive period for sociocultural processing? Annu. Rev. Psychol. 65, 187–207. https://doi.org/10.1146/annurev-psych-010213-115202.

Browne, B.L., Aruguete, M.S., McCutcheon, L.E., Medina, A.M., 2018. Social and emotional correlates of the fear of missing out. N. Am. J. Psychol. 20 (2), 341–354.

Casale, S., Fioravanti, G., 2020. Factor structure and psychometric properties of the Italian version of the fear of missing out scale in emerging adults and adolescents. Addict. Behav. 102, 106179. https://doi.org/10.1016/j.addbeh.2019.106179.

Chen, F.F., 2007. Sensitivity of goodness of fit indexes to lack of measurement invariance. Struct. Equ. Model. 14 (3), 464–504. https://doi.org/10.1080/10705510701301834.

Crocetti, E., 2018. Identity dynamics in adolescence: processes, antecedents, and consequences*. Eur. J. Dev. Psychol. 15 (1), 11–23. https://doi.org/10.1080/17405629.2017.1405578.

Crone, E.A., Dahl, R.E., 2012. Understanding adolescence as a period of social–affective engagement and goal flexibility. Nat. Rev. Neurosci. 13 (9), 636–650. https://doi.org/10.1038/nrn3313.

DeShon, R.P., 2006 May. Monkeys, Ostriches and Measurement Error Corrections. Invited address at the annual convention of the Association for Psychological Science, New York, NY.

Dogan, V., 2019. Why do people experience the fear of missing out (FoMO)? Exposing the link between the self and the FoMO through self-construal. J. Cross-Cult. Psychol. 50 (4), 524–538. https://doi.org/10.1177/0022022119839145.

Elhai, J.D., Levine, J.C., Dvorak, R.D., Hall, B.J., 2016. Fear of missing out, need for touch, anxiety and depression are related to problematic smartphone use. Comput. Human Behav. 63, 509–516. https://doi.org/10.1016/j.chb.2016.05.079.

Elhai, J.D., Levine, J.C., Alghraibeh, A.M., Alafnan, A.A., Aldraiweesh, A.A., Hall, B.J., 2018. Fear of missing out: testing relationships with negative affectivity, online social engagement, and problematic smartphone use. Comput. Hum. Behav. 89, 289–298. https://doi.org/10.1016/j.chb.2018.08.020.

Elhai, J.D., Yang, H., Montag, C., 2021. Fear of missing out (FOMO): overview, theoretical underpinnings, and literature review on relations with severity of negative affectivity and problematic technology use. Rev. Brasil. Psiquiatria (Sao Paulo, Brazil: 1999) 43 (2), 203–209. https://doi.org/10.1590/1516-4446-2020-0870.

Elhai, J.D., Casale, S., Montag, C., 2025. Worry and fear of missing out are associated with problematic smartphone and social media use severity. J. Affect. Disord. 379, 258–265. https://doi.org/10.1016/j.jad.2025.03.062.

Fabris, M.A., Marengo, D., Longobardi, C., Settanni, M., 2020. Investigating the links between fear of missing out, social media addiction, and emotional symptoms in adolescence: the role of stress associated with neglect and negative reactions on social media. Addict. Behav. 106, 106364. https://doi.org/10.1016/j.addbeh.2020.106364.

Fioravanti, G., Casale, S., Benucci, S.B., Prostamo, A., Falone, A., Ricca, V., Rotella, F., 2021. Fear of missing out and social networking sites use and abuse: a meta-analysis. Comput. Hum. Behav. 122, 106839. https://doi.org/10.1016/j.chb.2021.106839.

Goldsmith, K.A., MacKinnon, D.P., Chalder, T., White, P.D., Sharpe, M., Pickles, A., 2018. Tutorial: the practical application of longitudinal structural equation mediation models in clinical trials. Psychol. Methods 23 (2), 191–207. https://doi.org/10.1037/met0000154.

Gratz, K.L., Roemer, L., 2004. Multidimensional assessment of emotion regulation and dysregulation: development, factor structure, and initial validation of the difficulties in emotion regulation scale. J. Psychopathol. Behav. Assess. 26 (1), 41–54. https://doi.org/10.1023/B:JOBA.0000007455.08539.94.

Gross, J.J., 2014. Emotion regulation: conceptual and empirical foundations. Handb. Emotion Regul. 2, 3–20.

Gupta, M., Sharma, A., 2021. Fear of missing out: a brief overview of origin, theoretical underpinnings and relationship with mental health. World J. Clin. Cases 9 (19), 4881. https://doi.org/10.12998/wjcc.v9.i19.4881.

Hormes, J.M., Kearns, B., Timko, C.A., 2014. Craving Facebook? Behavioral addiction to online social networking and its association with emotion regulation deficits. Addiction 109 (12), 2079–2088. https://doi.org/10.1111/add.12713.

IBM Corp Released, 2017. IBM SPSS Statistics for Windows, Version 25.0. IBM Corp.

JASP Team, 2024. JASP (version 0.18.3) [Computer Software].

Kaufman, E.A., Xia, M., Fosco, G., Yaptangco, M., Skidmore, C.R., Crowell, S.E., 2016. The Difficulties in Emotion Regulation Scale Short Form (DERS-SF): validation and replication in adolescent and adult samples. J. Psychopathol. Behav. Assess. 38 (3), 443–455. https://doi.org/10.1007/s10862-015-9529-3.

Kline, R.B., 2023. Principles and Practice of Structural Equation Modeling. Guilford publications.

Kline, B., Tamer, E., 2016. Bayesian inference in a class of partially identified models. Quant. Econ. 7 (2), 329–366.

Laconi, S., Kalaitzaki, A., Spritzer, D.T., Hauck, S., Gnisci, A., Sergi, I., Vally, Z., Tudorel, O., Vintila, M., Malik, S., Ramos-Diaz, J., Männikkö, N., Cikrikci, O., Salas, G., Ardila, R., Zambrano, D., Lopez-Calle, C., Sahlan, R.N., 2025. A cross-

cultural exploration of problematic Internet use, pathological personality traits, defense mechanisms, coping strategies, and self-esteem in 14 countries. Ann. Méd.-Psychol. Rev. Psychiatr. 183 (4), 400–406. https://doi.org/10.1016/j.amp.2022.09.008.

Leary, M.R., 2005. Sociometer theory and the pursuit of relational value: getting to the root of self-esteem. Eur. Rev. Soc. Psychol. 16 (1), 75–111. https://doi.org/10.1080/10463280540000007.

Ledgerwood, A., Shrout, P.E., 2011. The trade-off between accuracy and precision in latent variable models of mediation processes. J. Pers. Soc. Psychol. 101 (6), 1174.

Liddell, B.J., Williams, E.N., 2019. Cultural differences in interpersonal emotion regulation. Front. Psychol. 10. https://doi.org/10.3389/fpsyg.2019.00999.

Little, T.D., Preacher, K.J., Selig, J.P., Card, N.A., 2007. New developments in latent variable panel analyses of longitudinal data. Int. J. Behav. Dev. 31 (4), 357–365. https://doi.org/10.1177/0165025407077757.

Littman-Ovadia, H., Russo-Netzer, P., 2024. Exploring the lived experience and coping strategies of Fear of Missing Out (FoMO) among emerging adults. Curr. Psychol. 43 (42), 32665–32685. https://doi.org/10.1007/s12144-024-06793-w.

MacKinnon, D.P., 2011. Integrating mediators and moderators in research design. Res. Soc. Work. Pract. 21 (6), 675–681. https://doi.org/10.1177/1049731511414148.

MacKinnon, D.P., Luecken, L.J., 2008. How and for whom? Mediation and moderation in health psychology. Health Psychol. 27 (2, Suppl), S99–S100. https://doi.org/10.1037/0278-6133.27.2(Suppl.).S99.

MacKinnon, D.P., Cheong, J., Pirlott, A.G., Smyth, H.L., 2023. Statistical mediation analysis in psychological research. In: APA Handbook of Research Methods in Psychology: Research Designs: Quantitative, Qualitative, Neuropsychological, and Biological, 2nd ed vol. 2. American Psychological Association, pp. 435–458. https://doi.org/10.1037/0000319-020.

Mahmud, A., Fitriah, E.A., Gamayanti, W., 2023. Emotion regulation as the role moderator of self-esteem on adolescents fear of missing out. Psympathic: Jurnal Ilmiah Psikologi 10 (1), 1. https://doi.org/10.15575/psy.v10i1.20489.

Mancinelli, E., Cottu, M., Salcuni, S., 2024. Validation of the Difficulties in Emotion Regulation Scale-Short Form in a sample of Italian adolescents. J. Clin. Psychol. 80 (11), 2209–2227. https://doi.org/10.1002/jclp.23732.

Marcia, J.E., 1980. Identity in adolescence. Handbook of adolescent psychology 9 (11), 159–187.

Martínez-Líbano, J., Serey, A.K., Barahona-Fuentes, G., 2025. Emotional regulation and subjective well-being in adolescents: a systematic review. Mental Health: Global Challenges Journal 8 (1), 1. https://doi.org/10.56508/mhgcj.v8i1.240.

Milyavskaya, M., Saffran, M., Hope, N., Koestner, R., 2018. Fear of missing out: prevalence, dynamics, and consequences of experiencing FOMO. Motiv. Emot. 42 (5), 725–737. https://doi.org/10.1007/s11031-018-9683-5.

Neumann, D., 2020. Fear of missing out. In: The International Encyclopedia of Media Psychology. John Wiley & Sons, Ltd., pp. 1–9. https://doi.org/10.1002/9781119011071.iemp0185

Ortega-Barón, J., González-Cabrera, J., Díaz-López, A., Escortell, R., Arroyo-González, M. J., Machimbarrena, J.M., 2025. Fear of missing out in an online context and dysfunctional risks in adolescents. Hum. Behav. Emerg. Technol. 2025 (1), 4374492. https://doi.org/10.1155/hbe2/4374492.

Piko, B.F., Müller, V., Kiss, H., Mellor, D., 2025. Exploring contributors to FoMO (fear of missing out) among university students: the role of social comparison, social media addiction, loneliness, and perfectionism. Acta Psychol. (Amst) 253, 104771. https://doi.org/10.1016/j.actpsy.2025.104771.

Preacher, K.J., 2015. Advances in mediation analysis: a survey and synthesis of new developments. Ann. Rev. Psychol. 66, 825–852. https://doi.org/10.1146/annurev-psych-010814-015258. Volume 66, 2015.

Prezza, M., Trombaccia, F.R., Armento, L., 1997. La scala dell'autostima di Rosenberg: Traduzione e validazione Italiana. [The Rosenberg Self-Esteem Scale: Italian translation and validation.]. Bol. Psicol. Appl. 223, 35–44.

Przybylski, A.K., Murayama, K., DeHaan, C.R., Gladwell, V., 2013. Motivational, emotional, and behavioral correlates of fear of missing out. Comput. Human Behav. 29 (4), 1841–1848. https://doi.org/10.1016/j.chb.2013.02.014.

Putnick, D.L., Bornstein, M.H., 2016. Measurement invariance conventions and reporting: the state of the art and future directions for psychological research. Dev. Rev. 41, 71–90. https://doi.org/10.1016/j.dr.2016.06.004.

R Core Team, 2019. R: A Language and Environment for Statistical Computing [Computer software]. R Foundation for Statistical Computing. https://www.r-project.org/.

Rosenberg, M., 1965. Rosenberg self-esteem scale (RSE). Acceptance and commitment therapy. Measures package 61 (52), 18.

Rossi, A.A., Panzeri, A., Mannarini, S., 2023. The Italian Version of the Difficulties in Emotion Regulation Scale – Short Form (IT-DERS-SF): a two-step validation study. J. Psychopathol. Behav. Assess. 45 (2), 572–590. https://doi.org/10.1007/s10862-022-10006-8.

Rozgonjuk, D., Sindermann, C., Elhai, J.D., Montag, C., 2021. Individual differences in Fear of Missing Out (FoMO): age, gender, and the Big Five personality trait domains, facets, and items. Personal. Individ. Differ. 171, 110546. https://doi.org/10.1016/j.paid.2020.110546.

Rozgonjuk, D., Blinka, L., Löchner, N., Faltýnková, A., Husarova, D., Montag, C., 2023. Differences between problematic internet and smartphone use and their psychological risk factors in boys and girls: a network analysis. Child Adolesc. Psychiatry Ment. Health 17 (1), 69. https://doi.org/10.1186/s13034-023-00620-z.

San Martín Iñiguez, L., García, E.L., Rosado Luna, E., García-Rodríguez, L., Aoiz Pinillos, M., De la Fuente Arias, J., Morón Henche, I., 2024. Relationship between regulatory processes and problematic social media use: a systematic review. Comput. Hum. Behav. Rep. https://doi.org/10.1016/j.chbr.2024.100507.

Schäfer, J.Ö., Naumann, E., Holmes, E.A., Tuschen-Caffier, B., Samson, A.C., 2017. Emotion regulation strategies in depressive and anxiety symptoms in youth: a meta-analytic review. J. Youth Adolesc. 46 (2), 261–276. https://doi.org/10.1007/s10964-016-0585-0.

Scott, H., Woods, H.C., 2018. Fear of missing out and sleep: cognitive behavioural factors in adolescents' nighttime social media use. J. Adolesc. 68, 61–65. https://doi.org/10.1016/j.adolescence.2018.07.009.

Servidio, R., Soraci, P., Griffiths, M.D., Boca, S., Demetrovics, Z., 2024. Fear of missing out and problematic social media use: a serial mediation model of social comparison and self-esteem. Addict. Behav. Rep. 19, 100536. https://doi.org/10.1016/j.abrep.2024.100536.

Verduyn, P., Ybarra, O., Résibois, M., Jonides, J., Kross, E., 2017. Do social network sites enhance or undermine subjective well-being? A critical review. Soc. Issues Policy Rev. 11 (1), 274–302. https://doi.org/10.1111/sipr.12033.

Verzeletti, C., Zammuner, V.L., Galli, C., Agnoli, S., 2016. Emotion regulation strategies and psychosocial well-being in adolescence. Cogent Psychol. 3 (1), 1199294. https://doi.org/10.1080/23311908.2016.1199294.

Wegmann, E., Oberst, U., Stodt, B., Brand, M., 2017. Online-specific fear of missing out and internet-use expectancies contribute to symptoms of Internet-communication disorder. Addict. Behav. Rep. 5, 33–42. https://doi.org/10.1016/j.abrep.2017.04.001.

Weston, R., Gore Jr., P.A., 2006. A brief guide to structural equation modeling. Couns. Psychol. 34 (5), 719–751. https://doi.org/10.1177/0011000006286345.

Winer, E.S., Bryant, J., Mckinney, C., Liu, R., 2016. Distinguishing mediational models and analyses in clinical psychology: atemporal associations do not imply causation. J. Clin. Psychol. 72. https://doi.org/10.1002/jclp.22298.

Wolniewicz, C.A., Tiamiyu, M.F., Weeks, J.W., Elhai, J.D., 2018. Problematic smartphone use and relations with negative affect, fear of missing out, and fear of negative and positive evaluation. Psychiatry Res. 262, 618–623. https://doi.org/10.1016/j.psychres.2017.09.058.

Yuan, K.-H., Zhang, Z., Wang, L., 2024. Signal-to-noise ratio in estimating and testing the mediation effect: structural equation modeling versus path analysis with weighted composites. Psychometrika 89 (3), 974–1006. https://doi.org/10.1007/s11336-024-09975-4.

Yue, Z., Zhang, R., Xiao, J., 2022. Passive social media use and psychological well-being during the COVID-19 pandemic: the role of social comparison and emotion regulation. Comput. Human Behav. 127, 107050. https://doi.org/10.1016/j.chb.2021.107050.