

Explaining FOMO Symptoms Based on Maladaptive Perfectionism and Emotional Loneliness with Emphasis on the Mediating Role of Artificial Intelligence Dependency among Female High School Adolescents

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ABSTRACT

Objective: The present study aimed to explain FOMO (Fear of Missing Out) symptoms based on maladaptive perfectionism and emotional loneliness, with a particular focus on the mediating role of artificial intelligence dependency among female high school adolescents.

Methods and Materials: This correlational study employed a structural equation modeling approach to investigate the relationships among maladaptive perfectionism, emotional loneliness, artificial intelligence dependency, and FOMO symptoms. The statistical population consisted of all female students enrolled in secondary high schools in Dezful, Iran, during the 2025–2026 academic year. A total of 250 students were selected through convenience sampling. Data were collected using the Fear of Missing Out Scale developed by Przybylski et al. (2013), the Multidimensional Perfectionism Questionnaire by Hewitt and Flett (2004), the Social and Emotional Loneliness Scale by DiTommaso et al. (2004), and the Artificial Intelligence Dependency Questionnaire developed by Huang et al. (2024). Data analysis was conducted using descriptive and inferential statistics in SPSS and AMOS software packages. Path analysis and structural equation modeling were utilized to evaluate both direct and indirect relationships among the study variables and to assess the overall model fit.

Findings: The results demonstrated that maladaptive perfectionism and emotional loneliness significantly predicted FOMO symptoms both directly and indirectly through artificial intelligence dependency. Maladaptive perfectionism showed a significant positive effect on artificial intelligence dependency ($\beta = 0.411, p < .01$), while emotional loneliness also exhibited a significant positive effect on artificial intelligence dependency ($\beta = 0.506, p < .01$). Furthermore, maladaptive perfectionism had a significant direct effect on FOMO symptoms ($\beta = 0.267, p < .01$) and a significant indirect effect through artificial intelligence dependency ($\beta = 0.124, p < .01$). Similarly, emotional loneliness exerted a significant direct effect on FOMO symptoms ($\beta = 0.259, p < .01$) and a significant indirect effect mediated by artificial intelligence dependency ($\beta = 0.152, p < .01$). Artificial intelligence dependency itself significantly and positively predicted FOMO symptoms ($\beta = 0.301, p < .01$). Model fit indices indicated a satisfactory fit of the proposed structural model to the observed data.

Conclusion: The findings suggest that adolescents with higher levels of maladaptive perfectionism and emotional loneliness are more likely to develop dependency on artificial intelligence technologies, which in turn intensifies FOMO symptoms. Artificial intelligence dependency functions as a significant psychological mechanism linking individual vulnerabilities and social-emotional difficulties to heightened fear of missing out. These results highlight the importance of addressing maladaptive perfectionistic standards, strengthening real-world emotional relationships, and promoting healthy patterns of AI use in interventions designed to reduce FOMO among adolescents.

Keywords: *Fear of Missing Out (FOMO), Maladaptive Perfectionism, Emotional Loneliness, Artificial Intelligence Dependency, Female Adolescents.*

1. Introduction

Adolescence is a sensitive developmental period in which rapid biological, cognitive, emotional, and social changes increase vulnerability to internalizing symptoms, social comparison, identity concerns, and risk-oriented behaviors. During this period, adolescents progressively move from family-centered emotional regulation toward peer-oriented belonging, social validation, and digital interaction. This developmental transition can create new psychological sensitivities, particularly when adolescents experience uncertainty about their social position, feel excluded from peer networks, or perceive that important relational experiences are occurring without them. From a developmental perspective, adolescence is also marked by heightened reward sensitivity, increased salience of peer evaluation, and ongoing maturation of self-regulatory systems, which together may intensify the psychological impact of social feedback and perceived exclusion (Steinberg, 2017). In contemporary contexts, these developmental characteristics are increasingly expressed within digital environments, where social information is immediate, continuous, and often emotionally charged. Therefore, understanding adolescents' psychological adaptation requires attention not only to traditional personality and interpersonal variables but also to emerging forms of technology-related dependence and digital social anxiety.

One of the psychological constructs that has received increasing attention in relation to adolescent digital life is fear of missing out, commonly referred to as FoMO. FoMO was initially conceptualized as a pervasive apprehension that others might be having rewarding experiences from which one is absent, accompanied by a desire to remain continuously connected with what others are doing (Przybylski et al., 2013). This construct has motivational, emotional, and behavioral components: motivationally, it reflects an unmet need for relatedness and social inclusion; emotionally, it is associated with anxiety, dissatisfaction, and restlessness; and behaviorally, it may lead to frequent

checking, excessive engagement with digital platforms, and difficulty disengaging from online environments. Reviews of FoMO emphasize that it is not merely a transient concern about missing specific events, but rather a broader psychological pattern linked to social comparison, unmet belongingness needs, problematic technology use, and vulnerability to emotional distress (Tanhan et al., 2022). In adolescents, FoMO may be especially important because peer acceptance, social belonging, and participation in shared experiences are central developmental tasks.

FoMO has been examined in different digital and behavioral contexts, including social media use, smartphone dependency, nomophobia, problematic Internet use, and risk-related behaviors. Studies suggest that individuals with higher FoMO are more likely to experience difficulties in regulating digital engagement and may use technology to reduce immediate anxiety while unintentionally reinforcing dependence on continuous connection. For example, emotion dysregulation has been associated with problematic smartphone use through the mediating role of FoMO, indicating that FoMO may operate as a psychological bridge between internal affective vulnerability and maladaptive digital behavior (Arrivillaga et al., 2023). Similarly, research on event-specific behaviors has shown that FoMO can be associated with problematic engagement in social contexts, including alcohol-related risk behaviors, suggesting that the desire not to be excluded from social experiences may extend beyond online environments and shape offline decision-making as well (Riordan et al., 2021). In Iranian adolescent samples, structural research has also linked FoMO with nomophobia through mediating psychological factors, reinforcing the relevance of FoMO as an explanatory construct in adolescent digital mental health (Heydari & Izadi, 2023).

The rapid expansion of digital technologies has transformed the psychological ecology of adolescence. Earlier evidence on digital technology use among adolescents indicated that intensive or dysregulated use of digital tools can be associated with mental health difficulties, including anxiety, depressive symptoms, sleep disruption,

and social difficulties (Khan et al., 2019). However, the digital environment has changed considerably with the emergence of artificial intelligence tools that provide not only information and task assistance, but also conversational interaction, emotional feedback, academic support, entertainment recommendations, and decision-making guidance. Unlike earlier forms of digital media, AI-based systems can simulate responsiveness, personalization, empathy, and availability. These qualities may be beneficial when used adaptively, but they may also increase psychological dependence when adolescents rely on AI tools to satisfy cognitive, emotional, relational, or decision-making needs that are not adequately met in real-life contexts. Ethical analyses of artificial intelligence have emphasized that the implementation of AI in human life requires careful consideration of autonomy, responsibility, dependency, and psychosocial consequences (Ghavamipour Sershkeh & Mahmoudi, 2024).

Artificial intelligence dependency is therefore an emerging issue in adolescent psychology. Recent research has begun to examine whether reliance on AI technologies is associated with psychological well-being or distress. Huang et al. examined AI dependence among adolescents through a cross-lagged panel model and emphasized that motivations for AI use can mediate the relationship between AI dependence and mental health outcomes (Huang et al., 2024). This line of evidence suggests that AI dependence should not be reduced to frequency of use alone; instead, it should be understood in terms of psychological function. Adolescents may turn to AI for academic help, emotional reassurance, social companionship, or decision support. When this reliance becomes excessive, it may weaken real-world problem-solving, interpersonal engagement, and self-regulatory capacities. Similarly, research among university students has shown that artificial intelligence may play a mediating role in the relationship between academic engagement and mental health, indicating that AI use can become psychologically meaningful within educational and emotional functioning (Wang & Wang, 2024). In the Iranian context, efforts to develop and validate measures related to students' attitudes toward artificial intelligence show the growing relevance of AI-related constructs for educational and psychological research (Shomali Ahmadabadi & Barkhordari Ahmadabadi, 2024). Moreover, analyses of individual and social life based on dependence on artificial intelligence have highlighted the potential psychological and social harms of excessive reliance on AI systems (Ghorbani, 2025).

Despite the growing body of work on FoMO and digital technology, the mechanisms through which personality vulnerability and interpersonal distress lead to FoMO symptoms remain insufficiently clarified, especially in relation to AI dependency. One important personality-related factor in this regard is maladaptive perfectionism. Perfectionism is a multidimensional construct that may include both adaptive striving and maladaptive self-evaluation. Maladaptive perfectionism is characterized by excessively rigid standards, chronic concern over mistakes, fear of negative evaluation, conditional self-worth, and persistent dissatisfaction with performance. In adolescence, maladaptive perfectionism can be particularly harmful because adolescents are still developing self-concept, academic identity, and social competence. Recent research has shown that perfectionism in adolescence is associated with psychosocial maladjustment across time, supporting the view that perfectionistic patterns may contribute to persistent emotional and relational difficulties (Bien et al., 2024). Multi-method research on perfectionism in adolescence has also emphasized the relevance of perfectionism for mental health and the potential value of cognitive-behavioral psychoeducation in reducing its maladaptive consequences (Chęć et al., 2025).

Maladaptive perfectionism may contribute to FoMO through several psychological pathways. First, adolescents with maladaptive perfectionism may feel that they must constantly remain informed, socially visible, and responsive in order to avoid failure or rejection. Second, perfectionistic adolescents often compare themselves with others, and digital environments provide endless opportunities for upward social comparison. Third, these adolescents may interpret missed social events, delayed responses, or lack of online presence as evidence of personal inadequacy. Research among university students has shown that FoMO is associated with social comparison, social media addiction, loneliness, and perfectionism, suggesting that perfectionistic self-evaluation may be one of the cognitive-affective roots of FoMO (Piko et al., 2025). Similarly, research on state FoMO, loneliness, adaptive perfectionism, and social media use indicates that perfectionism and loneliness are relevant factors in understanding momentary and situational experiences of missing out (Zhang et al., 2025). In the Iranian literature, maladaptive perfectionism has also been linked to psychological problems such as sleep quality difficulties and rumination, indicating that perfectionistic cognitive patterns can intensify psychological distress among students (Zarei & Hemmati, 2022).

The relationship between perfectionism and technology-related dependency has also been supported in previous research. Maladaptive perfectionism has been associated with Internet addiction, and this relationship may be mediated or moderated by emotional variables such as depression and gender-related differences (Yang et al., 2021). In the Iranian context, perfectionism has been examined alongside social anxiety and loneliness in relation to Internet addiction, with procrastination functioning as a mediating variable, suggesting that perfectionistic and interpersonal vulnerabilities may contribute to maladaptive patterns of digital engagement (Hassanzadeh Banakar & Nosrati, 2024). Moreover, maladaptive perfectionism has been associated with interpersonal problems through obsessive-compulsive symptoms in adolescents, indicating that rigid standards and fear of error may disrupt interpersonal functioning during a critical developmental stage (Hefazi Torqabeh et al., 2025). These findings provide a conceptual foundation for assuming that maladaptive perfectionism may increase FoMO directly and may also increase it indirectly by strengthening dependence on AI-based tools, especially when adolescents use AI to reduce uncertainty, optimize performance, avoid mistakes, or receive immediate reassurance.

Another important factor in the development of FoMO symptoms is emotional loneliness. Emotional loneliness refers to the perceived absence of close, intimate, and emotionally supportive relationships. It differs from social loneliness, which concerns the lack of a broader social network, because emotional loneliness specifically involves the absence of attachment, warmth, and deep relational security. Loneliness across the lifespan has been associated with multiple psychological risk factors, and its determinants include individual characteristics, relational disruptions, and contextual vulnerabilities (Hutten et al., 2021). Studies among young adults have shown that loneliness may arise from social disconnection, structural disadvantage, lack of meaningful relationships, and perceived emotional invalidation (Fardghassemi & Joffe, 2022). In everyday life, loneliness can show temporal persistence, meaning that feeling lonely at one time point increases the likelihood of feeling lonely later, and it is associated with psychopathological symptoms (Buecker et al., 2024). These findings suggest that loneliness is not simply an occasional emotional state, but a dynamic and potentially self-reinforcing condition.

In adolescents, emotional loneliness may intensify FoMO because lonely individuals are more sensitive to cues of

exclusion and more likely to monitor social information for signs of belonging or rejection. When adolescents feel emotionally disconnected, they may seek compensatory connection through digital tools and online platforms. FoMO may then emerge as a cognitive-emotional manifestation of unmet belongingness needs: the adolescent fears not only missing an event, but also missing evidence of relational inclusion. Evidence linking loneliness with FoMO supports this assumption. Studies have shown that loneliness is among the contributors to FoMO and that individuals who feel socially or emotionally disconnected may be more vulnerable to excessive monitoring of others' activities (Piko et al., 2025; Zhang et al., 2025). In this sense, FoMO can be viewed as a digital expression of attachment insecurity and emotional disconnection, particularly when adolescents attempt to manage loneliness through continuous connection rather than through stable and reciprocal relationships.

Artificial intelligence dependency may serve as a mediating mechanism between emotional loneliness and FoMO. Adolescents who experience emotional loneliness may use AI systems as accessible, nonjudgmental, and constantly available sources of conversation, reassurance, advice, and emotional support. Although this use may temporarily reduce distress, it may also reduce motivation to seek real-life emotional intimacy and may strengthen a cycle of dependence. When AI tools become substitutes for human relationships, adolescents may become increasingly sensitive to digital availability and social information, thereby increasing FoMO symptoms. This mechanism is consistent with research showing that motivations for AI use are central to understanding the association between AI dependence and mental health outcomes (Huang et al., 2024). It is also consistent with broader findings that digital technologies can be linked to adolescent mental health problems when they are used in dysregulated ways or as substitutes for adaptive coping and interpersonal connection (Khan et al., 2019). Therefore, AI dependency may represent a new psychological pathway through which emotional loneliness contributes to FoMO.

Taken together, the literature suggests that FoMO symptoms among adolescents may be rooted in the interaction of intrapersonal vulnerabilities, interpersonal deficits, and emerging technology-related dependencies. Maladaptive perfectionism may create chronic pressure to be socially updated, successful, and free from mistakes; emotional loneliness may heighten the need for connection, reassurance, and belonging; and AI dependency may provide an immediate but potentially maladaptive coping route

through which these vulnerabilities are translated into stronger FoMO symptoms. Although previous studies have examined FoMO in relation to social media use, smartphone dependency, loneliness, perfectionism, and emotional dysregulation, fewer studies have investigated AI dependency as a mediator in the relationship between maladaptive perfectionism, emotional loneliness, and FoMO symptoms. This gap is particularly important in female high school adolescents, because this group may be simultaneously exposed to academic pressure, interpersonal sensitivity, peer comparison, and increasing engagement with AI-based educational and conversational tools. Therefore, the present study aimed to explain FoMO symptoms based on maladaptive perfectionism and emotional loneliness, with emphasis on the mediating role of artificial intelligence dependency among female students in the second cycle of secondary school.

2. Methods and Materials

2.1. Study Design and Participants

The present study was applied in terms of its objective and descriptive-correlational in terms of the method of data collection. Moreover, considering the aim of the study, which was to test an explanatory model with a mediating role, the path analysis approach, as one of the methods of structural equation modeling, was used. The statistical population of the present study included all female students enrolled in the second cycle of secondary schools in Dezful during the 2025–2026 academic year. Due to existing limitations in accessing all students and the limited cooperation of schools, random sampling and access to the entire population were not possible. Therefore, convenience sampling was used in the present study. In this method, individuals who were accessible and willing to participate in the study were examined. To determine the sample size, given the correlational nature of the study and the use of structural equation modeling, Delavar's (2006) view was used. According to him, for correlational modeling studies, a minimum sample size of 200 participants is sufficient. In the present study, to increase internal validity and ensure more accurate parameter estimation, the sample size was set at 250 participants, which is scientifically adequate.

The inclusion criteria were as follows: students had to be enrolled in the second cycle of secondary education, namely grades 10, 11, or 12, in schools in Dezful during the 2025–2026 academic year. Given the objective of the study, which was to examine the variables in a homogeneous group and

control for gender effects, all participants had to be female. Students also had to have sufficient willingness to participate in the study and provide informed consent to complete the questionnaires. The exclusion criteria were as follows: if the questionnaires were completed incompletely, that is, if more than 10% of the items were left unanswered, they were excluded from statistical analysis. In addition, if the response pattern indicated carelessness or lack of cooperation, such as selecting the same response option for all items, that questionnaire was excluded from the analysis.

2.2. Measures

Fear of Missing Out Scale (FoMO): This questionnaire was developed by Przybylski, Murayama, DeHaan, and Gladwell (2013). The instrument consists of 10 items and assesses fear of missing out on others' positive experiences, the constant need to stay connected to social networks, and anxiety caused by lack of awareness of social events. Responses are scored on a 5-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree. The minimum possible score is 10 and the maximum is 50, with higher scores indicating greater FoMO symptoms. Przybylski et al. (2013) reported the reliability of the questionnaire using Cronbach's alpha as 0.87 and its test-retest reliability after four weeks as 0.83. In Iran, Heidari and Izadi (2023) standardized this questionnaire and calculated a Cronbach's alpha coefficient of 0.84. In the present study, the reliability of this questionnaire, calculated using Cronbach's alpha, was 0.85.

Multidimensional Perfectionism Scale (MPS): This questionnaire was developed by Hewitt and Flett (2004). Contrary to the initial view that regarded perfectionism as a unidimensional construct, Hewitt and Flett introduced three independent dimensions of perfectionism. This instrument consists of 45 items and three 15-item subscales. The self-oriented perfectionism subscale assesses the setting of very high standards for oneself, self-motivation to achieve perfection, and precise self-evaluation. The other-oriented perfectionism subscale assesses the setting of unrealistic standards for others, criticism of others for being imperfect, and strictness toward others' performance. The socially prescribed perfectionism subscale assesses the individual's perception that others, such as family members, teachers, and peers, have set very high standards for them and judge them harshly. Responses are scored on a 7-point Likert scale ranging from 1 = strongly disagree to 7 = strongly agree. The minimum possible score is 45 and the maximum is 315.

Hewitt and Flett (1991) reported Cronbach's alpha reliability coefficients of 0.89 for the self-oriented subscale, 0.79 for the other-oriented subscale, and 0.86 for the socially prescribed subscale. In Iran, Zarei and Hemmati (2022) standardized this questionnaire and obtained reliability coefficients of 0.87, 0.78, and 0.84 for the subscales, respectively. In the present study, the reliability of the total questionnaire was calculated using Cronbach's alpha and was 0.87.

Social and Emotional Loneliness Scale for Adults–Short Form (SELSA-S): This questionnaire was developed by DiTommaso, Brannen, and Best (2004) and is the short form of the original 37-item questionnaire developed by DiTommaso and Spinner (1993). The instrument consists of 15 items and three 5-item subscales. The emotional loneliness in family relationships subscale assesses lack of intimacy, emotional support, and attachment in the family. The emotional loneliness in romantic relationships subscale assesses the lack of a deep and intimate relationship with a spouse or romantic partner. The social loneliness subscale assesses the lack of an extensive network of friends and acquaintances and the feeling of not belonging to a social group. Responses are scored on a 7-point Likert scale ranging from 1 = strongly disagree to 7 = strongly agree. The score of each subscale ranges from 5 to 35, and the total score ranges from 15 to 105, with higher scores indicating a greater sense of loneliness in that domain. DiTommaso et al. (2004) reported Cronbach's alpha reliability coefficients of 0.88 for family loneliness, 0.92 for romantic loneliness, and 0.83 for social loneliness, and confirmatory factor analysis confirmed the three-factor structure of this questionnaire. In Iran, Hasanzadeh Banakar and Nosrati (2024) calculated a Cronbach's alpha coefficient of 0.88 for the total questionnaire. In the present study, the reliability of this questionnaire was 0.89.

Artificial Intelligence Dependency Scale (AIDS): This questionnaire was developed and validated by Huang et al. (2024). In a longitudinal study with a sample of 3,843 adolescents, these researchers examined the prevalence and consequences of artificial intelligence dependency and showed that 17% of adolescents in the first phase and 24% in the second phase of the study experienced artificial intelligence dependency. This instrument consists of 12 items and four 3-item subscales. The cognitive needs subscale assesses the extent of reliance on artificial intelligence to answer academic questions, solve problems, and perform cognitive tasks. The emotional needs subscale assesses the extent of reliance on artificial intelligence to

receive emotional support, empathy, and relief from negative emotions. The communicative needs subscale assesses the extent of reliance on artificial intelligence for daily interaction, conversation, and filling communicative gaps. The decision-making needs subscale assesses the extent of reliance on artificial intelligence for everyday choices, such as selecting movies, music, and clothing, as well as making minor life decisions. Responses are scored on a 5-point Likert scale ranging from 1 = never to 5 = always. The minimum possible score is 12 and the maximum is 60, with higher scores indicating greater dependency on artificial intelligence. Huang et al. (2024) reported the reliability of this questionnaire using Cronbach's alpha as 0.92 and its test-retest reliability as 0.87. In Iran, Shomali Ahmadabadi and Barkhordari Ahmadabadi (2024) translated and standardized this questionnaire and obtained a Cronbach's alpha coefficient of 0.89. In the present study, the reliability of this questionnaire was calculated as 0.90.

2.3. Data Analysis

The implementation procedure of the study was as follows: after obtaining the necessary permits from the Dezful Department of Education and coordinating with female secondary schools, the research questionnaires were administered collectively to eligible students at the scheduled time in one 45-minute session. Before distributing the questionnaires, the purpose of the study was fully explained to the students, and it was emphasized that their information would remain confidential and would be used solely for research purposes. After providing informed consent, the students completed the questionnaires. Finally, out of 270 distributed questionnaires, 250 complete and analyzable questionnaires were returned. Data analysis was conducted using SPSS version 26 and AMOS version 24 at both descriptive and inferential levels. At the descriptive level, indices such as mean, standard deviation, frequency, and percentage were used. At the inferential level, the assumptions of normality using the Kolmogorov-Smirnov test and collinearity using the variance inflation factor were first examined. Then, Pearson's correlation coefficient was used to examine the initial relationships. In the main stage, to test the mediating role of artificial intelligence dependency in the relationship between maladaptive perfectionism and emotional loneliness with FoMO symptoms, path analysis was performed in AMOS. Model fit was evaluated using the chi-square to degrees of freedom ratio, with values lower than 5; CFI, NFI, and IFI, with

values higher than 0.90; and RMSEA, with values lower than 0.08. The significance of indirect effects was also examined using the bootstrap method with 5,000 samples and a 95% confidence interval.

3. Findings and Results

In this study, both descriptive and inferential statistics were used. The data were analyzed using SPSS software version 27, based on descriptive tests including frequency, mean, and standard deviation, as well as the inferential Pearson correlation test. AMOS software was also used for data analysis.

Table 1

Descriptive Statistics and Correlation Coefficient Matrix of the Research Variables

Variable	Mean	Standard Deviation	1	2	3	4
1. Maladaptive perfectionism	171.56	13.901	1			
2. Emotional loneliness	62.69	7.109	0.622**	1		
3. Artificial intelligence dependency	35.44	7.352	0.646**	0.678**	1	
4. FoMO symptoms	34.06	5.428	0.590**	0.598**	0.627**	1

*Significant at the 0.05 level. **Significant at the 0.01 level.

Table 1 presents descriptive information for the variables, including mean and standard deviation, along with the matrix of correlation coefficients among maladaptive perfectionism, emotional loneliness, artificial intelligence dependency, and FoMO symptoms. As shown, the correlation coefficients between maladaptive perfectionism, emotional loneliness, and artificial intelligence dependency with FoMO symptoms were positive and significant at the alpha level of 0.01 ($p < 0.01$). The positive coefficients obtained indicate a direct relationship between maladaptive perfectionism, emotional loneliness, and artificial intelligence dependency with FoMO symptoms among adolescent students.

To test the research model, path analysis was performed using the maximum likelihood method in AMOS software. Before using path analysis, univariate outliers were examined using box plots, and multivariate outliers were examined using the Mahalanobis statistic; outlying cases were removed from the dataset. The skewness and kurtosis of the distribution of scores for the variables were calculated using SPSS software, and the results showed that none of the skewness and kurtosis values exceeded the ± 1 range. The normality of the data was examined using the Kolmogorov-

Smirnov test. The results indicated that the distribution of scores for all four variables in the model was normal ($p > 0.05$). The assumption of independence of errors was examined using the Durbin-Watson statistic for calculating the regression equations of the research model, and the obtained value indicated that this assumption was met. The assumption of collinearity among variables was examined using Pearson correlations between pairs of variables. Since a bivariate correlation of 0.90 or higher indicates collinearity, this problem was not observed in the data of the present study. In addition, tolerance statistics and the variance inflation factor were calculated to examine multicollinearity. The results showed that none of the tolerance values were smaller than the permissible threshold of 0.10, and none of the variance inflation factor values were greater than the permissible threshold of 10. Therefore, based on the two mentioned indices, multicollinearity was not observed in the data. After examining the assumptions and ensuring that they were met, path analysis was used to evaluate the model of the mediating role of artificial intelligence dependency in the relationship between maladaptive perfectionism and emotional loneliness with FoMO symptoms. The results are presented in Figure 1.

Figure 1

Standardized Coefficients of the Model of the Mediating Role of Artificial Intelligence Dependency in the Relationship Between Maladaptive Perfectionism and Emotional Loneliness with FoMO Symptoms

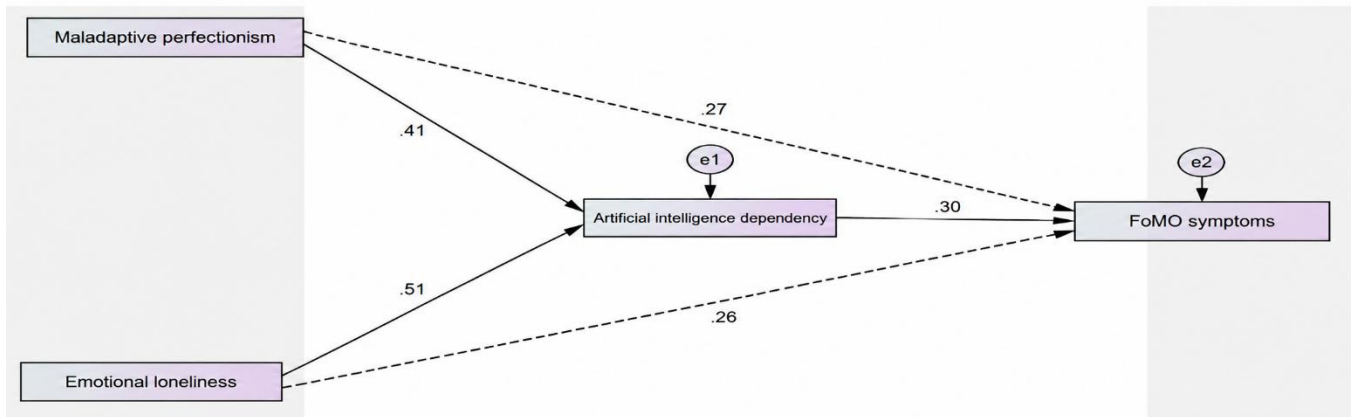


Figure 1 shows the standardized coefficients of the proposed model for examining the mediating role of artificial intelligence dependency in the relationship

between maladaptive perfectionism and emotional loneliness with FoMO symptoms. The model fit indices are presented in the following table.

Table 2

Goodness-of-Fit Indices of the Tested Research Model

Fit Index	Acceptable Range	Observed Value	Evaluation of Model Fit
χ^2/df	≤ 5	3.592	Acceptable
IFI	> 0.90	0.924	Acceptable
RMSEA	< 0.08	0.075	Acceptable
SRMR	< 0.08	0.061	Acceptable
CFI	> 0.90	0.919	Acceptable
NFI	> 0.90	0.922	Acceptable
GFI	> 0.90	0.938	Acceptable

Table 2 presents the model fit indices. The chi-square to degrees of freedom ratio (χ^2/df) confirmed the model fit, as this value falls within the range of 1 to 5, indicating that the model fits the data. The root mean square error of approximation (RMSEA) was 0.075, and the standardized root mean square residual (SRMR) was 0.061, both of which

were below the criterion value of 0.08; therefore, they confirmed the model fit. The IFI, CFI, GFI, and NFI indices were also higher than the desired criterion of 0.90. The obtained coefficients indicated an acceptable fit of the model.

Table 3

Direct, Indirect, and Total Effects and Explained Variance of the Variables

From Variable	To Variable	Direct Effect	Indirect Effect	Total Effect	Explained Variance
Maladaptive perfectionism	Artificial intelligence dependency	0.411**	—	0.411**	0.424
Emotional loneliness	Artificial intelligence dependency	0.506**	—	0.506**	
Maladaptive perfectionism	FoMO symptoms	0.267**	0.124**	0.391**	0.375
Emotional loneliness	FoMO symptoms	0.259**	0.152**	0.412**	
Artificial intelligence dependency	FoMO symptoms	0.301**	—	0.301**	

*Significant at the 0.05 level. **Significant at the 0.01 level.

Table 3 presents the direct, indirect, and total effects among the variables of the model. Based on the obtained results, maladaptive perfectionism ($\beta = 0.411$, $p < 0.01$) and emotional loneliness ($\beta = 0.506$, $p < 0.01$) had positive direct effects on artificial intelligence dependency. Maladaptive perfectionism had both a direct effect ($\beta = 0.267$, $p < 0.01$) and an indirect effect through the mediation of artificial intelligence dependency ($\beta = 0.124$, $p < 0.01$) on FoMO symptoms. Emotional loneliness also had both a direct effect ($\beta = 0.259$, $p < 0.01$) and an indirect effect through the mediation of artificial intelligence dependency ($\beta = 0.152$, $p < 0.01$) on FoMO symptoms. Artificial intelligence dependency also had a positive direct effect ($\beta = 0.301$, $p < 0.01$) on FoMO symptoms.

4. Discussion

The present study aimed to explain FoMO symptoms based on maladaptive perfectionism and emotional loneliness, with emphasis on the mediating role of artificial intelligence dependency among female adolescents enrolled in secondary schools. The findings indicated that maladaptive perfectionism and emotional loneliness were significantly associated with FoMO symptoms both directly and indirectly through artificial intelligence dependency. In addition, maladaptive perfectionism and emotional loneliness positively predicted artificial intelligence dependency, and artificial intelligence dependency itself significantly predicted FoMO symptoms. The acceptable fit indices obtained for the proposed model further supported the adequacy of the hypothesized relationships among the study variables. Overall, the results suggest that both intrapersonal vulnerability factors and interpersonal emotional deficits contribute to the development of FoMO symptoms, while dependence on artificial intelligence functions as an important psychological mechanism through which these vulnerabilities intensify adolescents' fear of missing out.

One of the main findings of the study was that maladaptive perfectionism had a significant direct effect on FoMO symptoms. This finding is consistent with previous studies that have emphasized the role of perfectionistic tendencies in the emergence of emotional distress, social comparison, and maladaptive technology-related behaviors (Piko et al., 2025; Zhang et al., 2025). Individuals with maladaptive perfectionism typically establish unrealistically high standards for themselves and experience chronic concerns regarding mistakes, social evaluation, and personal

inadequacy. Such individuals constantly compare their achievements, appearance, and social status with those of others. In digital environments where social information is continuously available, perfectionistic adolescents are frequently exposed to idealized portrayals of peers' lives. Consequently, they may become increasingly concerned that others are experiencing rewarding opportunities, achievements, or social interactions that they are missing. From a cognitive perspective, perfectionism contributes to rigid self-evaluation and heightened sensitivity to perceived deficits. Therefore, even ordinary social events may be interpreted as indicators of exclusion or personal failure, increasing susceptibility to FoMO symptoms.

The present finding is also compatible with research showing that maladaptive perfectionism is associated with various forms of psychological maladjustment during adolescence (Bien et al., 2024). Adolescents characterized by perfectionistic concerns often experience chronic dissatisfaction because their expectations exceed realistic standards. This dissatisfaction may generate persistent vigilance toward social and academic experiences, increasing the desire to remain continuously informed about the activities and achievements of others. Similarly, recent investigations have demonstrated that perfectionism is strongly linked with mental health difficulties among adolescents and contributes to emotional vulnerability and reduced psychological well-being (Chęć et al., 2025). Therefore, FoMO may represent one manifestation of the broader psychological burden associated with maladaptive perfectionism.

Another important finding showed that emotional loneliness directly predicted FoMO symptoms. This finding is consistent with previous studies emphasizing the relationship between loneliness and FoMO (Piko et al., 2025; Zhang et al., 2025). Emotional loneliness reflects the perceived absence of close, meaningful, and emotionally supportive relationships. Adolescents who feel emotionally disconnected from family members, peers, or significant others may become more sensitive to cues indicating social inclusion or exclusion. As a result, they may frequently monitor social interactions and digital communication channels to reduce uncertainty regarding their social standing. The fear that others are participating in rewarding experiences without them may therefore become more intense among emotionally lonely adolescents.

The finding can also be interpreted in light of broader loneliness research. Studies have shown that loneliness is associated with numerous psychological difficulties and

often exhibits continuity over time (Buecker et al., 2024). Adolescents who experience chronic loneliness may develop heightened sensitivity to rejection, exclusion, and social comparison. Such sensitivity may increase the likelihood of interpreting ordinary social situations as evidence of being left out. Research examining risk factors for loneliness has similarly highlighted the importance of interpersonal deficits and unmet belongingness needs in the development of psychological distress (Hutten et al., 2021). Moreover, investigations among young adults have identified the lack of meaningful relationships and emotional connection as central contributors to loneliness experiences (Fardghassemi & Joffe, 2022). These findings support the idea that FoMO may emerge as a psychological response to unmet relational needs, particularly during adolescence when peer acceptance and emotional attachment become increasingly important developmental concerns.

A further finding revealed that maladaptive perfectionism positively predicted artificial intelligence dependency. Although this relationship has received limited direct empirical attention, it can be understood through existing evidence concerning perfectionism and technology-related dependence. Research has demonstrated that maladaptive perfectionism is associated with Internet addiction and problematic technology use (Yang et al., 2021). Perfectionistic individuals often seek certainty, precision, and reassurance in decision-making processes. Artificial intelligence systems provide rapid answers, personalized feedback, and continuous accessibility, making them particularly attractive to adolescents who fear making mistakes or failing to meet high standards. Consequently, perfectionistic adolescents may increasingly rely on AI tools for academic tasks, information seeking, and decision-making, thereby fostering dependency.

This interpretation is further supported by Iranian research demonstrating relationships among perfectionism, loneliness, and Internet addiction (Hassanzadeh Banakar & Nosrati, 2024). These findings suggest that perfectionistic vulnerabilities can facilitate excessive reliance on technological resources when individuals seek relief from internal pressures and emotional discomfort. Likewise, maladaptive perfectionism has been associated with interpersonal difficulties among adolescents (Hefazi Torqabeh et al., 2025). Because interpersonal difficulties may limit opportunities for obtaining reassurance from human relationships, perfectionistic adolescents may increasingly turn toward AI systems as alternative sources of support and guidance.

The results also indicated that emotional loneliness significantly predicted artificial intelligence dependency. This finding is theoretically meaningful because AI systems increasingly provide conversational interaction, emotional feedback, and personalized responses that may partially compensate for unmet interpersonal needs. Adolescents experiencing emotional loneliness may perceive AI-based technologies as accessible, nonjudgmental, and constantly available companions. Consequently, they may rely on these systems to fulfill emotional, communicative, and cognitive needs. Recent work on artificial intelligence dependence among adolescents suggests that motivations for AI use play a central role in understanding its psychological consequences (Huang et al., 2024). Adolescents who seek emotional support, understanding, or companionship through AI systems may gradually become dependent on these technologies when alternative sources of emotional connection are limited.

The present finding is also compatible with broader perspectives concerning the psychosocial implications of artificial intelligence. Ethical analyses have emphasized that excessive reliance on AI may affect human autonomy, interpersonal functioning, and psychological well-being (Ghavamipour Sershekeh & Mahmoudi, 2024). Furthermore, investigations into the social consequences of AI dependency have warned that excessive reliance on artificial intelligence may contribute to distortions in individual and social functioning (Ghorbani, 2025). Therefore, emotional loneliness may increase adolescents' vulnerability to AI dependency because AI systems provide immediate emotional gratification without requiring the complexities inherent in real-world relationships.

Another significant finding showed that artificial intelligence dependency directly predicted FoMO symptoms. This result extends previous research concerning the relationship between digital technology use and psychological distress. Earlier studies demonstrated that intensive engagement with digital technologies may contribute to various mental health problems among adolescents (Khan et al., 2019). AI-dependent adolescents may become increasingly immersed in digital environments, thereby increasing exposure to social information, comparisons, and notifications. Such continuous exposure may strengthen concerns about missing important experiences, opportunities, or social interactions.

This finding is also consistent with studies emphasizing the mediating role of technological factors in mental health outcomes. Research has shown that AI-related processes can

influence psychological functioning through complex mediating pathways (Huang et al., 2024; Wang & Wang, 2024). Adolescents who rely heavily on AI systems may become increasingly dependent on digital feedback and information updates, thereby strengthening their need for constant connectivity. As a consequence, FoMO symptoms may emerge or intensify because remaining disconnected becomes psychologically uncomfortable. Furthermore, validated measures developed within Iranian educational contexts indicate that AI-related attitudes and engagement have become increasingly relevant psychological phenomena among students (Shomali Ahmadabadi & Barkhordari Ahmadabadi, 2024). Thus, the relationship between AI dependency and FoMO appears theoretically and empirically plausible within contemporary adolescent populations.

Perhaps the most important contribution of the present study lies in demonstrating the mediating role of artificial intelligence dependency in the relationships between maladaptive perfectionism, emotional loneliness, and FoMO symptoms. The findings showed that both maladaptive perfectionism and emotional loneliness exerted significant indirect effects on FoMO through AI dependency. These results suggest that AI dependency serves as a psychological pathway through which personal and interpersonal vulnerabilities are translated into fears of social exclusion and missed experiences.

From a theoretical perspective, perfectionistic adolescents may initially turn to AI systems because they provide efficient, accurate, and low-risk assistance. Over time, increasing dependence on AI may reinforce constant engagement with digital environments, thereby heightening exposure to social comparison and information monitoring. This process may eventually increase FoMO symptoms. Similarly, emotionally lonely adolescents may use AI systems to compensate for unmet emotional needs. Although this strategy may temporarily reduce loneliness, excessive reliance on AI may reduce motivation to seek authentic interpersonal relationships and increase immersion in digital contexts where FoMO is more likely to develop. These findings are broadly consistent with the conceptual framework proposed by FoMO theory, which emphasizes unmet psychological needs as fundamental antecedents of fear of missing out (Przybylski et al., 2013).

The findings are additionally consistent with studies indicating that emotion dysregulation and problematic technology use are connected through FoMO-related processes (Arrivillaga et al., 2023). They also align with

evidence linking FoMO to digital anxiety and technology-related concerns among adolescents (Heydari & Izadi, 2023). Collectively, the present results suggest that the emergence of FoMO in contemporary adolescents cannot be fully understood without considering the growing role of artificial intelligence technologies in everyday life. As AI systems become increasingly integrated into educational, social, and emotional domains, their psychological consequences warrant greater attention from researchers, educators, and mental health professionals.

5. Conclusion

The findings showed that maladaptive perfectionism and emotional loneliness directly increase FoMO symptoms and also indirectly intensify them through artificial intelligence dependency. Therefore, AI dependency can be considered an important mediating mechanism in the relationship between adolescents' psychological vulnerabilities and FoMO symptoms. This highlights the need to address perfectionistic beliefs, emotional loneliness, and excessive reliance on AI tools in psychological and educational interventions for adolescent girls.

6. Limitations & Suggestions

Several limitations should be considered when interpreting the findings of the present study. First, the correlational and cross-sectional nature of the research design prevents causal inferences regarding the relationships among maladaptive perfectionism, emotional loneliness, artificial intelligence dependency, and FoMO symptoms. Second, the study relied exclusively on self-report questionnaires, which may be influenced by response biases such as social desirability and inaccurate self-perception. Third, the sample consisted solely of female secondary school students from one city, limiting the generalizability of the findings to male adolescents, other age groups, or different cultural contexts. Finally, other potentially influential variables, such as personality traits, family functioning, social support, academic stress, and social media use patterns, were not included in the proposed model.

Future studies are encouraged to employ longitudinal and experimental designs to clarify the causal mechanisms linking perfectionism, loneliness, AI dependency, and FoMO symptoms. Researchers may also investigate whether these relationships differ across gender, developmental stages, socioeconomic backgrounds, and cultural settings. Further research should examine additional mediating and

moderating variables, such as self-esteem, emotional regulation, attachment styles, resilience, social support, and digital literacy. Moreover, qualitative investigations could provide deeper insight into adolescents' subjective experiences of AI dependency and its role in shaping perceptions of social belonging and exclusion.

The findings highlight the importance of designing psychological and educational interventions that address maladaptive perfectionistic beliefs, emotional loneliness, and unhealthy patterns of AI use simultaneously. School counselors and mental health professionals should provide programs that promote realistic standards of achievement, self-compassion, and adaptive coping strategies. Interventions aimed at strengthening interpersonal relationships, enhancing emotional communication skills, and increasing opportunities for meaningful peer interaction may reduce feelings of loneliness and subsequent FoMO symptoms. Educational programs should also promote responsible and balanced use of artificial intelligence technologies by teaching adolescents how to use AI as a supportive tool rather than a substitute for human relationships, independent decision-making, and authentic social engagement.

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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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Authors' Contributions

All authors equally contributed to this article.

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