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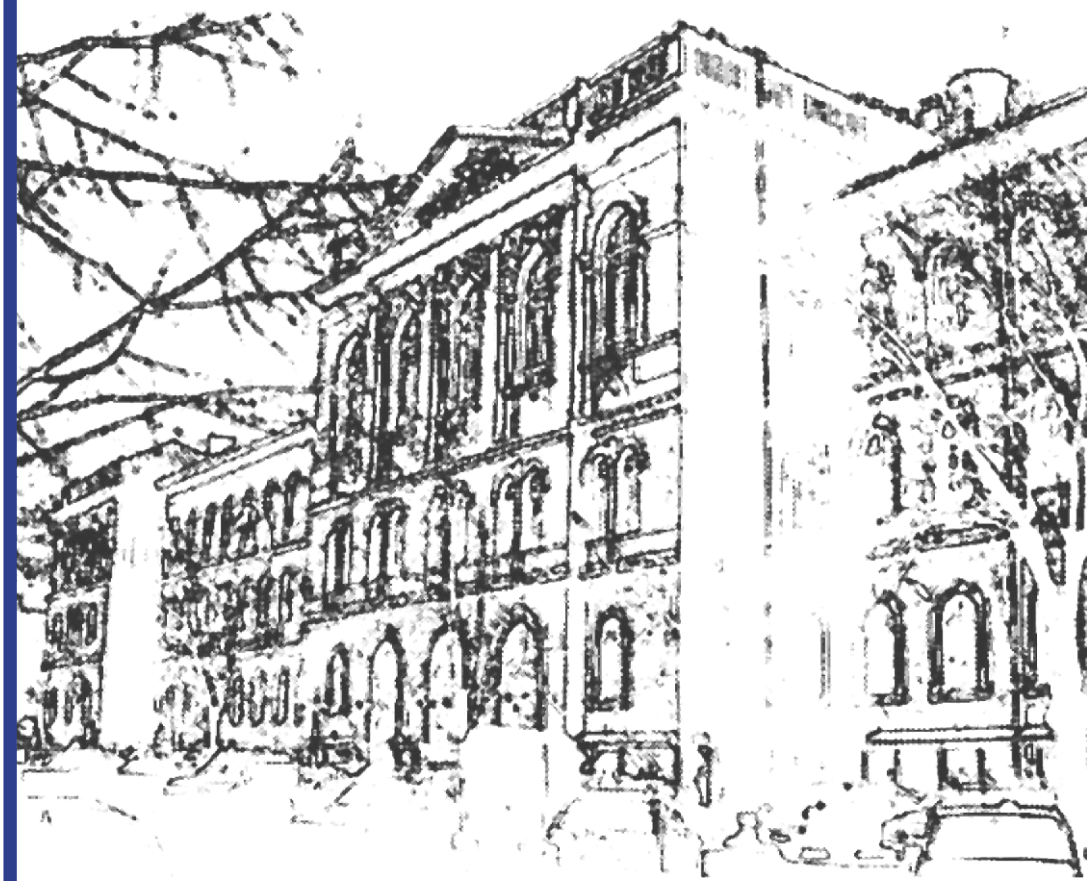

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ARTICLES SECTION

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THE EFFECTS OF PERCEIVED SOCIAL SUPPORT ON ACADEMIC BURNOUT OF COLLEGE STUDENTS: A MODERATED CHAIN MEDIATION MODEL

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Abstract

This study examined the mechanism by which perceived social support influences academic burnout among college students, with a focus on the chain mediating role of active coping strategies and academic buoyancy, as well as the moderating effect of mindfulness. A cross-sectional design was employed to survey 3,891 college students using questionnaires that included the Perceived Social Support Scale, the Mindful Attention Awareness Scale, the Active Coping Strategies Scale, the Academic Buoyancy Scale, and the Academic Burnout Scale. Data analysis was conducted using the PROCESS macro in SPSS, and the significance of mediation and moderation effects was tested with the Bootstrap method (5,000 resamples). The results showed that: (1) perceived social support negatively predicted academic burnout; (2) active coping strategies and academic buoyancy mediated this relationship separately, and also formed a significant chain mediation path; (3) mindfulness significantly moderated the relationship between perceived social support and active coping strategies. This study unveiled the complex pathways through which perceived social support alleviates academic burnout. In practice, emphasis should be placed on building student support systems, fostering their active coping ability and academic buoyancy, and incorporating mindfulness into university mental health intervention systems to effectively mitigate students' academic burnout.

Keywords: Perceived social support, Academic burnout, Active coping strategies, Academic buoyancy, Mindfulness, College students.

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Within the context of higher education, academic burnout has become increasingly prevalent (YU et al., 2020), emerging as a widespread and significant mental health issue among college students. It represents a negative academic mindset characterized by learning fatigue stemming from prolonged academic pressure or loss of interest, manifesting in three dimensions: emotional exhaustion, depersonalization, and reduced personal accomplishment (Lian et al., 2005). College students experiencing academic fatigue and burnout often lack motivation and interest, feeling bored, frustrated, or defeated (Paloș, et al., 2019), thereby increasing their mental health risks (Kaya, 2024). These negative emotions may lead to misconduct such as skipping classes or cheating, and may even result in course failure, academic probation, or withdrawal (Bask & Salmela-Aro, 2013). Seperak-Viera et al. (2021) found that approximately 31.4% of college students experience significant academic burnout, with 11.7% at extremely high risk. Evidently, academic burnout represents a critical issue demanding urgent psychological intervention in higher education.

Existing research has insufficiently explored how proactive psychological and social resources can preventively alleviate burnout. This study introduces the Resource Conservation Theory(COR), which emphasizes that individuals strive to acquire, maintain, and accumulate resources while preventing resource depletion during stressful situations (Hobfoll, 1989). Within this framework, external social support resources and individuals' internal psychological resources can synergistically help individuals effectively resist stress and reduce the risk of burnout (Lee & Ashforth, 1996; Lin & Huang, 2014).

Among external resources, social support refers to the emotional support and functional assistance provided by family, friends, teachers, or social networks. As an objectively existing social resource, it is considered a significant factor influencing academic burnout (Karimi et al., 2014). However, whether social support truly exerts its effects depends on the individual's subjective experience and cognition—that is, perceived social support. Perceived social support represents an individual's subjective feelings and evaluation of the social support received, embodying an emotional experience of being respected, understood, and supported (Barrera, 1986). The social support perceived by individuals yields greater benefits in alleviating stress and regulating emotions (Ye, 2006). In a cross-sectional study examining academic burnout among medical students, perceived social support was demonstrated as a protective factor against academic burnout (Layous & Nelson-Coffey, 2021). Furthermore, as a significant predictor of life satisfaction and well-being, perceived social support also contributes to individual mental health (Cobo-Rendón et al., 2020; Ioannou et al., 2019).

Therefore, as the subjective manifestation of social resources at the psychological level, perceived social support serves as a crucial buffering mechanism for resisting academic stress and preventing academic burnout. The

specific mechanisms through which students, after perceiving social support, further transform and reduce burnout by mobilizing internal psychological resources warrant further exploration. The COR theory emphasizes that external resources can generate resource gains by activating internal resources (Hobfoll et al., 2018). In this process, active coping strategies, as immediate internal psychological resources, enable students to adopt constructive approaches when facing academic challenges. These strategies help regulate emotions and enhance a sense of control, thereby effectively reducing burnout levels (Folkman & Moskowitz, 2004). Academic buoyancy, however, represents a relatively stable adaptive resource. Enhancing resilience and stress tolerance, it alleviates learning-related stress and anxiety, helping students maintain emotional stability and positive motivation during exams, thereby improving academic performance (Putwain et al., 2015). Thus, while their mechanisms of action are independent, they also exhibit a progressive relationship. Active coping represents students' immediate regulation in response to academic stress, while academic buoyancy manifests as long-term, stable adaptive capacity that continuously counters burnout. It can be inferred that active coping and academic buoyancy may jointly constitute a chain-mediated pathway through which perceived social support influences academic burnout. Perceived external support triggers immediate coping strategies, which gradually internalize into more stable academic buoyancy, thereby effectively alleviating burnout.

Concurrently, mindfulness, as a metacognitive psychological resource, may mediate the conversion of external support into internal resources. Mindfulness emphasizes present-moment awareness with acceptance and non-judgment. Students with higher mindfulness levels are more likely to recognize and actively utilize support from family, peers, and teachers, thereby amplifying social support's promotion of active coping. Conversely, those with lower mindfulness may overlook or underestimate supportive resources, diminishing their efficacy. Thus, mindfulness may exert a moderating effect, further amplifying the positive impact of external support in converting into internal resources. Grounded in COR, this study examines how perceived social support indirectly influences academic burnout through active coping and academic buoyancy, introducing mindfulness as a moderator. This aims to enrich our understanding of psychological adaptation mechanisms and intervention pathways for college students.

Perceived Social Support and Academic Burnout in College Students

In educational settings, college students need to establish and maintain relationships with parents, mentors, friends, and other partners, etc. Perceived social support in social interactions helps individuals cope with daily events, release negative emotions, and manage stress. Academic pressures such as heavy coursework, poor time management, excessively high expectations for grades, and

frequent exams often lead students to feel exhausted, adopt an indifferent and powerless attitude toward learning, and eventually result in academic burnout. Higher levels of awareness can significantly enhance psychological resilience and buffering ability (Cohen & Wills, 1985). Empirical research further indicates that perceived social support can enhance learning engagement and academic achievement (López-Angulo et al., 2020; Y. Wang et al., 2024). For instance, Kim and Lee (2022) found that social support alleviates student burnout by enhancing their resilience. Gebregergis and Csukonyi (2025) also noted that students' academic stress and fatigue levels significantly decrease when they perceive social support. Understanding and perceiving social support helps students alleviate stress and reduce negative emotional reactions.

The Mediating Role of Active Coping Strategies

Coping strategies are the cognitively assessed responses and behaviors of individuals when they experience frustration, stress, or emotional distress. These strategies can be categorized into active and passive types (Folkman & Lazarus, 1988). Active coping strategies refer to individuals' efforts to proactively seek out resources to construct solutions to problems, while passive coping strategies involve avoidance, denial, and other responses to handle problems (Liu et al., 2016). Individuals adopt different behavioral strategies based on their perceptions and assessments when faced with difficult situations. Social support influences their coping approach, with research showing that groups who experience greater social support tend to respond to various stresses more positively (Sun et al., 2020). Therefore, people with strong appreciative social support tend to employ constructive coping strategies and develop effective techniques, as they feel acknowledged and supported by their social environment.

Active coping not only alleviates stress but also exhibits a significant negative correlation with academic burnout. Shi et al. (2023) found that graduate students who frequently employed active coping strategies demonstrated greater adaptability in academic settings and lower levels of burnout. Other studies also indicate that active coping strategies are closely linked to perceived social support, which enhances students' resilience and persistence, thereby alleviating academic stress and reducing burnout risk (Andrade et al., 2023; Barratt & Duran, 2021). Thus, perceived social support may not only directly mitigate academic burnout but also exert an indirect effect by promoting active coping strategies.

The Mediating Role of Academic Buoyancy

Academic buoyancy refers to a student' ability to effectively cope with common pressures, challenges, and setbacks encountered in daily academic life, such

as course load, exam difficulty, and fluctuating grades (Martin & Marsh, 2008). Academic buoyancy represents students' resilience in everyday academic situations. It is associated with relatively mild negative outcomes, such as feelings of anxiety, perceived lack of control, and tendencies to avoid failure. In contrast, academic resilience typically refers to a student's ability to bounce back and recover when facing more severe or prolonged adversity, such as major academic setbacks, long-term learning difficulties, or family or health issues (Martin, 2013). The former is more commonly observed in the daily learning experiences of most students, while the latter is typically seen in a minority of students facing extreme pressure or significant challenges. For instance, a student who experiences a brief emotional downturn due to unsatisfactory exam results but quickly adjusts and resumes studying demonstrates academic buoyancy. Conversely, a student who persists in completing their studies despite prolonged academic setbacks or major life events exemplifies academic resilience. Students who have high academic buoyancy are better able to exhibit positive, constructive, and adaptive responses. They can adjust their emotions, attitudes, and behaviors to cope with changing academic situations. Academic buoyancy not only alleviates academic stress and enhances school satisfaction (Hoferichter et al., 2021) but also promotes academic adjustment and performance (Martin et al., 2017; Putwain et al., 2020). Furthermore, perceived social support is significantly positively correlated with academic buoyancy (Liao & Ahn, 2024). Students who feel cared for by family, peers, and teachers often exhibit higher levels of academic buoyancy, better withstand daily learning pressures, and experience significantly reduced burnout (Fu, 2024).

The Chain Mediation Effect of Active Coping Strategies and Academic Buoyancy

Empirical research has confirmed a significant association between active coping strategies and academic buoyancy. Students employing active coping strategies typically maintain adaptive responses under stressful conditions, gradually building confidence through proactive resource seeking and problem-solving experiences, thereby demonstrating greater academic buoyancy in daily studies (Putwain et al., 2012). Putwain et al. (2024) found that students' academic buoyancy positively correlates with adaptive coping strategies and indirectly influences academic achievement through coping approaches. Integrating social cognitive theory (Bandura, 1997), mastery experiences gained through practical actions serve as a crucial source for enhancing self-efficacy. Self-efficacy, in turn, is a key psychological predictor of academic buoyancy (Martin & Marsh, 2008). As students repeatedly succeed in overcoming challenges, they internalize the belief "I can do it," exhibiting greater confidence and persistence (Chemers et al., 2001). This self-efficacy further promotes emotional stability and positive expectations, thereby enhancing academic buoyancy.

Simultaneously, according to COR, individuals actively mobilize and integrate existing resources during stressful situations to prevent resource depletion while acquiring new resources through resource investment. Perceived social support, as a vital external resource, provides students with emotional comfort and problem-solving assistance, making them more likely to choose constructive coping strategies. This active coping not only buffers the negative effects of academic stress but also gradually cultivates flexibility and persistence in facing setbacks, thereby enhancing academic buoyancy. Thus, perceived social support, through its role in active coping strategies, guides individuals into a virtuous cycle of resource investment and feedback. This cycle continuously elevates their sense of efficacy and buoyancy levels, effectively reducing academic burnout.

The Moderating Effect of Mindfulness

Mindfulness, as a psychological protective resource, has garnered significant attention in the field of positive psychology in recent years. It involves purposeful, nonjudgmental awareness of present-moment experiences (Kabat-Zinn, 2015), emphasizing focus on the here and now and acceptance of internal and external experiences rather than reaction or judgment. The efficacy of mindfulness extends beyond theoretical frameworks, as it has been demonstrated in practice to serve as a vital component of psychological therapy. For instance, Mindfulness-Based Stress Reduction (MBSR) and Mindfulness-Based Cognitive Therapy (MBCT) have been extensively applied in interventions for anxiety, depression, and stress-related issues, yielding consistent therapeutic outcomes (Hue et al., 2025; Nandarathana & Ranjan, 2025).

Mindfulness positively influences the perception of social support. For example, mindfulness is related to an individual's empathy (Fuochi & Voci, 2020), and people exhibiting elevated levels of mindfulness tend to approach others with kindness and compassion, which enhances their chances of receiving support and respect from others. Moreover, mindfulness enhances awareness of internal emotions, external environments, and interpersonal interactions, promoting emotional expression and communication, thereby increasing perceptions of social support (Brown et al., 2007). As a conscious process, mindfulness also regulates cognition, enabling individuals to become more aware, cognitively regulate, and adopt positive coping strategies when facing stress (Folkman et al., 1986). Moreover, individuals with high mindfulness levels are more inclined to actively cope with stress (Hinterman et al., 2012). Those with elevated mindfulness are better at perceiving and utilizing external support resources, amplifying the promotion of active coping strategies, and further internalizing these into academic buoyancy. Thus, mindfulness may exert a crucial mediating effect in the process of transforming external support into internal resources.

In summary, this study aims to examine the relationship between perceived social support and academic burnout, as well as the mediating roles of active coping strategies, academic buoyancy, and mindfulness. We propose the following hypotheses: (1) Perceived social support may negatively predict academic burnout. (2) Active coping strategies may mediate the relationship between perceived social support and academic burnout. (3) Academic buoyancy may mediate the relationship between perceived social support and academic burnout. (4) Active coping strategies and academic buoyancy may jointly mediate the relationship between perceived social support and academic burnout. (5) Mindfulness may moderate the relationship between perceived social support and active coping strategies. The hypothetical model is illustrated in Figure 1.

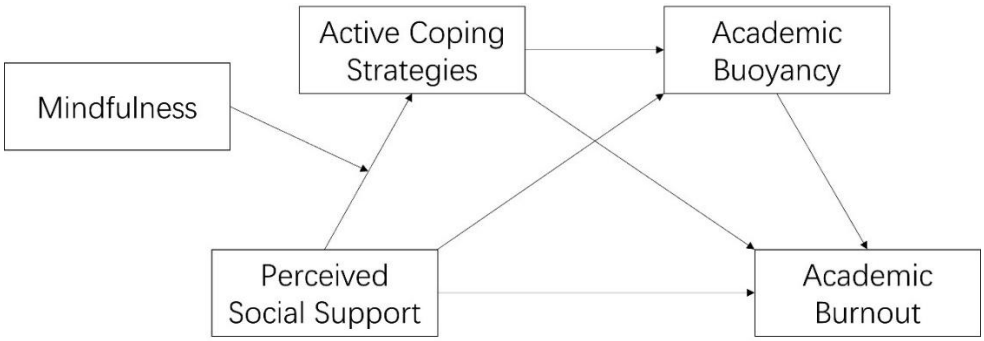

Figure 1. Diagram of the hypothetical model

Method

Participants

This study employed convenience sampling to recruit college students from seven universities in Anhui Province for questionnaire participation. A total of 3,891 questionnaires were distributed. After screening out invalid questionnaires that were not answered carefully and those that were answered for too short a period of time, 2,721 valid questionnaires were obtained. The validity rate of the questionnaires was 69.9%. Subjects were between the ages of 16-25 (M = 19.48, SD = 1.32). Every participant finished the questionnaire within the allocated time, which was roughly six minutes. This study was approved by the Ethics Review Committee of Anhui

Normal University (Ethics Approval Number: 2024-BBA190027), and all participants signed informed consent forms.

Although the sample was geographically limited to Anhui Province, the selected universities encompassed diverse types, including comprehensive, teacher-training, and science/engineering institutions. Participants represented a broad range of academic backgrounds spanning science and engineering, humanities, agriculture, medicine, arts, and sports disciplines, ensuring a degree of disciplinary and institutional diversity. This contributes to enhancing the representativeness of the research findings. The basic information of the subjects is shown in Table 1.

Table 1. Basic statistics of the subjects

Variables	Form	Quorum	Percent
Gender	man	1249	45.9%
	woman	1472	54.1%
Grade	freshman	984	36.2%
	sophomore	751	27.6%
	junior	579	21.3%
	senior	407	14.9%
Academic program	Science and Engineering	1196	43.9%
	Humanities and Social Sciences	780	28.7%
	Agriculture	308	11.3%
	Arts and Sports	437	16.1%
Only child	yes	688	25.3%
	no	2033	74.7%
Origin of students	urban	1062	39%
	rural	1659	61%

Research Instruments

Perceived Social Support Scale. The Perceived Social Support Scale was used (Dahlem et al., 1991). It includes three components: family support, friend support, and other support, each with four items, totaling 12 items. Participants respond using a 7-point Likert scale, where 1 represents "strongly disagree" and 7 represents "strongly agree." The total score is calculated by summing all item scores, with higher scores indicating greater perceived social support. The Cronbach's α coefficient in this study was 0.94.

Active Coping Strategies Scale. The Active Coping Strategies subscale from the Simplified Coping Strategies Inventory developed by Xie Yaning (1998) was used. The Positive Coping Styles Scale consists of 12 items rated on a 4-point scale:

0 (do not take), 1 (take occasionally), 2 (take sometimes), and 3 (take often). Higher total scores indicate that individuals are coping more positively. The Cronbach's α coefficient for the total scale in this study was 0.89.

Academic Buoyancy Scale. This study used the Academic Buoyancy Scale to assess the subjects' level of academic buoyancy (Martin & Marsh, 2008). The scale comprises 4 items rated on a 7-point scale, ranging from 1 (strongly disagree) to 7 (strongly agree). The scores for each topic were added together, with higher total scores indicating a higher level of academic buoyancy in the subjects. The Cronbach's α coefficient for the scale in this study was 0.84.

Mindful Attention Awareness Scale. This study used the Mindful Attention Awareness Scale (Brown & Ryan, 2003). The scale has 15 entries, each rated on a 6-point Likert scale. The response options range from 1 = "almost always" to 6 = "almost never." The total score is the sum of the individual items, with higher scores indicating higher levels of mindfulness, reflecting an individual's level of awareness and attention to the present moment in daily life. The Cronbach's α coefficient for the scale in this study was 0.91.

Academic Burnout Scale. This study used the Academic Burnout Scale (Lian et al., 2005). The scale consists of 20 items across three dimensions: emotional exhaustion, disengagement, and low sense of accomplishment. The items are scored on a 5-point scale ranging from 1 ("not at all applicable") to 5 ("totally applicable"), with 8 reverse-scored items, namely items 1, 3, 6, 8, 11, 13, 15, and 18. The total score is the sum of individual item scores, with higher scores indicating higher levels of academic burnout. The Cronbach's α coefficient for the total scale in this study was 0.90.

Data Analysis

This study employed SPSS 27.0 and its PROCESS macro version 4.2 for data analysis, primarily encompassing common method bias testing, descriptive statistical analysis, and correlation analysis. To examine the normality of data distribution, this study assessed skewness (Sk) and kurtosis (Ku) metrics, using |3| and |10| as thresholds for severe deviation from normality (Kline, 2016). Results indicated that all variables adhered to the normal distribution assumption. Visual assessments via P-P plots and scatterplots confirmed residual normality and data homogeneity for mediation effects. In examining mediation and moderation effects, this study employs the PROCESS macro procedure. Model 6 is used to test the chained mediating effect of active coping strategies on academic buoyancy.

Subsequently, Model 83 incorporated mindfulness as a moderator to further examine its moderated chained mediating effect. PROCESS was chosen because the study focused on testing conditional process effects and specific indirect effects and moderation paths, areas where PROCESS is particularly well-suited and widely applied in psychological research (Hayes, 2018). Furthermore, since variables in this study are measured by a single scale, PROCESS combines bias-corrected Bootstrap methods to provide robust inferences of mediation and moderation effects, aligning more closely with the analytical objectives of this research.

Results

Common Method Bias Test

To control for common method bias potentially arising from the use of self-report scales, this study implemented multiple procedural controls during data collection. These included administering anonymous questionnaires and emphasizing that responses were neither right nor wrong, but solely reflective of genuine feelings, thereby reducing social desirability bias. Additionally, reverse-coded items were incorporated into the questionnaire to minimize consistency bias. Building upon this foundation, the Harman single-factor test was employed to verify the presence of common method bias in this study (Wen & Tang, 2020). The results indicate that nine factors have characteristic roots greater than 1, with the maximum factor explaining 28.39% of the variance, below the 40% critical threshold. This suggests that no severe common method bias exists in this study.

Descriptive Statistics and Correlation Analysis of Variables

Perceived social support, mindfulness, active coping, and academic buoyancy were positively correlated with each other in pairs, as Table 2 illustrates. Additionally, all four variables were significantly negatively correlated with academic burnout. This indicates that students who perceive greater social support tend to exhibit higher levels of mindfulness and coping resources, thereby demonstrating better academic adjustment. Simultaneously, these positive psychological resources and behavioral tendencies help alleviate academic stress and reduce feelings of burnout.

Table 2. Descriptive Statistics and Correlations for Study Variables.

Variable	1	2	3	4	5	6	7	8
1.Perceived Social Support	1							
2.Mindfulness	0.44***	1						
3.Active Coping	0.63***	0.40***	1					
4.Academic Buoyancy	0.50***	0.46***	0.52***	1				
5.Academic Burnout	-0.46***	-0.56***	-0.44***	-0.52***	1			
6.Emotional Exhaustion	-0.35***	-0.44***	-0.33***	-0.41***	0.90***	1		
7. Depersonalization	-0.42***	-0.50***	-0.36***	-0.39***	0.89***	0.73***	1	
8. Reduced Personal Accomplishment	-0.45***	-0.50***	-0.47***	-0.55***	0.76***	0.48***	0.57***	1
M	5.07	4.32	2.92	4.87	2.81	2.85	2.83	2.72
SD	1.05	0.77	0.54	1.13	0.61	0.75	0.70	0.65

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Chain Mediation Effect of Active Coping and Academic Buoyancy

Age and gender were controlled in the analysis, as both were significantly associated with academic burnout. Using SPSS 27.0 and PROCESS Model 6, the study applied the bootstrap method with 5,000 resamples to evaluate the chain mediation effects of active coping strategies and academic buoyancy on the link between perceived social support and academic burnout. Table 3 displays the regression outcomes, while Figure 2 illustrates the mediation pathway.

Results indicate that perceived social support significantly and positively predicted positive coping ($\beta = 0.63, p < 0.001$), suggesting that students who perceive greater social support are more likely to adopt positive coping strategies. When perceived social support and active coping strategies were simultaneously included in the regression equation, both perceived social support ($\beta = 0.29$, $p < 0.001$) and active coping strategies ($\beta = 0.34$, $p < 0.001$) significantly and positively predicted academic buoyancy. This suggests that both factors contribute to enhancing students'resilience in facing academic challenges. When perceived social support, active coping strategies, and academic buoyancy were simultaneously included in the regression equation, perceived social support ($\beta = -0.22, p < 0.001$), active coping strategies ($\beta = -0.12$, $p < 0.001$), and academic buoyancy ($\beta = -0.35$, $p < 0.001$) significantly and negatively predicted academic burnout, indicating that all three factors contribute to mitigating students' academic burnout.

Table 3. Regression analysis of variable relationships in the chained mediation model.

Variables	Active Coping Strategies		Academic Buoyancy		Academic Burnout	
	β	*t*	*β*	*t*	*β*	*t*
Age	0.02	1.09	-0.001	-0.07	-0.02	-1.20
Gender	-0.10	-3.24**	-0.40	-12.68***	0.03	-0.94
Perceived Social Support	0.63	42.02***	0.29	14.38***	-0.22	-10.35***
Active Coping Strategies			0.34	16.95***	-0.12	-5.65***
Academic Buoyancy					-0.35	-17.78***
R^2	0.40		0.36		0.34	
F	448.28***		301.19***		229.58***	

* $p< 0.05$, ** $p< 0.01$, *** $p < 0.001$.

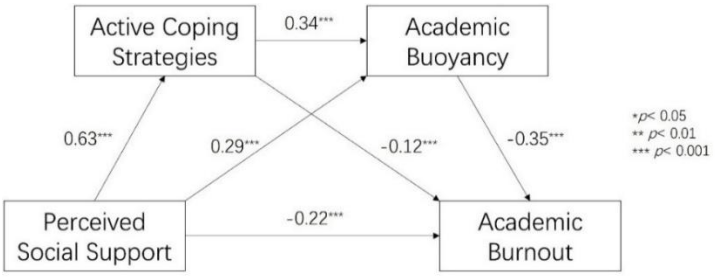

Figure 2. The chained mediating model for predicting academic burnout

Further mediation analysis results are presented in Table 4. After incorporating active coping strategies and academic buoyancy into the mediation model examining the impact of perceived social support on academic burnout, both the total effect and the 95% confidence interval for the total indirect effect did not include zero. This supports the significance of the proposed chain mediation model, while the direct effect of perceived social support on academic burnout was also significant. Specifically: (1) Perceived social support→active coping strategies→Academic burnout (mediation effect accounts for 16.22% of the total effect). This indicates that students with higher perceived social support are more likely to adopt active coping strategies, and these positive attitudes and methods help alleviate academic stress and emotional exhaustion. (2) Perceived social support→Academic buoyancy→Academic burnout (mediation effect accounts for 21.32% of the total effect). This path effect is the largest among the three, indicating that perceived social support significantly alleviates academic burnout by enhancing psychological resilience when facing academic challenges. (3) Perceived social support→Active coping strategies→Academic buoyancy→Academic burnout (mediation effect size accounted for 15.77% of the total effect size). This chained

mediation pathway indicates that students' perceived social support motivates them to actively cope with academic stress. Through this process, they accumulate experience that helps maintain confidence and persistence when facing academic challenges, ultimately reducing emotional exhaustion and negative attitudes during learning.

Table 4. Bootstrap test for chain mediation effects

Path	Effect size	BootSE	BootLLCI	BootULCI	Relative effect size (%)
Total Effect	-0.46	0.02	-0.50	-0.43	
Direct Effect	-0.22	0.02	-0.26	-0.18	46.69%
Total Indirect Effect	-0.25	0.02	-0.28	-0.22	53.33%
$X \rightarrow M_1 \rightarrow Y$	-0.08	0.01	-0.10	-0.05	16.22%
$X \rightarrow M_2 \rightarrow Y$	-0.10	0.01	-0.12	-0.08	21.32%
$X \rightarrow M_1 \rightarrow M_2 \rightarrow Y$	-0.08	0.01	-0.09	-0.06	15.77%

Note. M_1 = Active coping strategies, M_2 = Academic buoyancy

Following the moderation of mediation effect testing steps (Wen & Ye, 2014), with age and gender controlled, perceived social support was set as the independent variable, active coping and academic buoyancy as the mediators, academic burnout as the dependent variable, and mindfulness as the moderator. PROCESS model 83 of SPSS 27.0 was used to test the moderating effects in the chained mediation model.

After incorporating mindfulness into the chained mediation model, the interaction term between perceived social support and mindfulness significantly and positively predicted positive coping strategies ($\beta = 0.08$, $p < 0.001$), indicating that mindfulness enhances the positive influence of social support on positive coping behaviors. For students with higher levels of mindfulness, perceived support and care are more readily translated into actual positive behaviors. Detailed results are presented in Table 5.

Table 5. Test of the moderating effect of mindfulness.

Variables	Active Coping Strategies		Academic Buoyancy		Academic Burnout	
	β	t	β	t	β	t
Age	0.01	1.09	-0.001	-0.07	-0.02	-1.20
Gender	-0.05	-1.78	-0.40	-12.68^{***}	0.03	-0.94
Mindfulness	0.13	8.16^{***}				
Perceived Social Support	0.56	34.61^{***}	0.290	14.38^{***}	-0.22	-10.35^{***}
Mindfulness*Perceived Social Support	0.08	6.30^{***}				
Active Coping Strategies			0.34	16.95^{***}	-0.12	-5.65^{***}

Variables	Active Coping Strategies		Academic Buoyancy		Academic Burnout	
	β	*t*	*β*	*t*	*β*	*t*
Academic Buoyancy					-0.35	-17.78***
R^2	0.42		0.36		0.34	
F	329.66***		301.19***		229.58***	

* $p< 0.05$, ** $p< 0.01$, *** $p < 0.001$.

Further analysis reveals (see Table 6). When college students have low levels of mindfulness (M - 1SD), the chain mediation effect of perceived social support on academic burnout through active coping and academic buoyancy is -0.06, with a 95% confidence interval of [-0.07, -0.05]. When students have high levels of mindfulness (M + 1SD), the chain mediation effect of perceived social support on academic burnout through active coping and academic buoyancy strengthened to -0.08, with a 95% confidence interval of [-0.09, -0.06]. This indicates that mindfulness plays a significant moderating role throughout the chain mediation pathway. Higher levels of mindfulness increase the likelihood that perceived social support will further reduce academic burnout through positive coping and academic buoyancy.

Table 6. Moderated mediation effect of different levels of mindfulness in the chain mediation model

	Effect size	BootSE	BootLLCI	BootULCI
M-1SD	-0.06	0.01	-0.07	-0.05
M	-0.07	0.01	-0.08	-0.05
M+1SD	-0.08	0.01	-0.09	-0.06

To further investigate the substantive nature of the moderating effect of mindfulness, a simple slope analysis was conducted to explore the moderating effect of mindfulness at different levels on the relationship between perceived social support and active coping (see Table 7 and Figure 3).

The results indicate that, regardless of mindfulness levels, perceived social support significantly predicts active coping strategies. Moreover, this predictive effect is stronger among individuals with high mindfulness levels. This suggests that elevated mindfulness amplifies the positive impact of social support, enabling students to more effectively translate supportive resources into productive coping behaviors. This finding implies that interventions such as mindfulness training can help students better utilize social support resources, thereby mitigating the risk of academic burnout.

Table 7. Moderated mediation effect of different levels of mindfulness in the perception of social support and active coping

	BootSE	**BootLLCI**	**BootULCI**
M-1SD	0.48	0.02	0.44
M	0.56	0.02	0.53
M+1SD	0.64	0.02	0.60

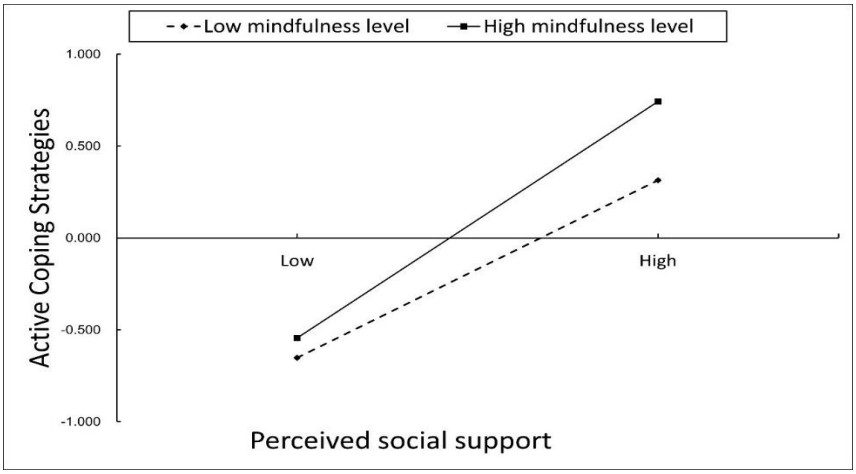

Figure 3. The moderating role of mindfulness between perceived social support and active coping strategies

Finally, the moderated chain mediation model effect diagram derived from this study is shown in Figure 4.

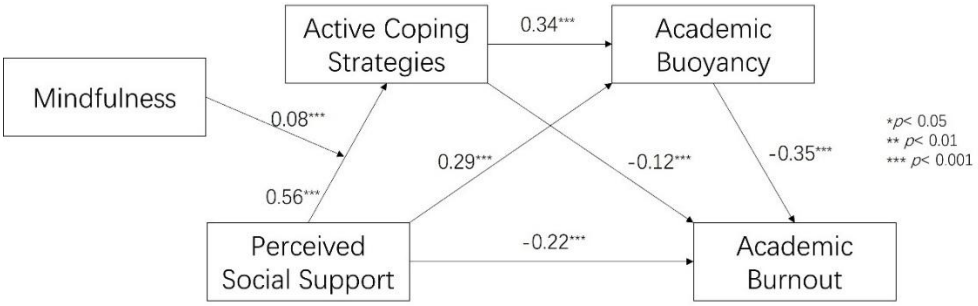

Figure 4. The chain mediating model with mindfulness as a moderating variable

The findings reveal that perceived social support not only directly influences academic burnout but also exerts indirect effects through positive coping and academic buoyancy, with mindfulness moderating this mechanism. The development of academic burnout involves the interaction between external support, individual coping resources, and psychological qualities. Social support alleviates burnout by activating students' positive psychological resources, while mindfulness enhances the efficacy of this transformative process. These findings provide more systematic evidence for understanding the mechanisms underlying academic burnout and point to intervention directions: simultaneously focusing on building social support networks, cultivating positive coping and buoyancy, and enhancing mindfulness levels to create multi-layered protective effects.

Discussion

The Impact of Perceived Social Support on Academic Burnout in College Students

This study found that perceived social support significantly negatively predicted academic burnout in college students, thus confirming H1. This finding aligns with previous research (Wang et al., 2022) and supports the social support buffering model (Cohen & Wills, 1985). This model posits that social support can buffer negative emotions triggered by external stressors, mitigating their adverse effects. This conclusion is also supported by recent research. For instance, Kim et al. (2021) found in their meta-analysis that within the demand-control-support framework, social support significantly reduces student burnout levels, particularly in alleviating emotional exhaustion. Furthermore, Messina et al. (2025) demonstrated in their longitudinal study that social support not only directly reduces academic burnout but also indirectly mitigates the negative effects of academic stress by enhancing individuals'emotional regulation abilities and positive coping behaviors. Thus, when students receive greater emotional comfort and practical assistance during their studies, they not only alleviate academic stress and emotional exhaustion but also maintain learning engagement and enthusiasm, thereby effectively preventing the onset of academic burnout.

The Mediating Roles of Active Coping and Academic Buoyancy

Our study found that perceived social support significantly mitigates academic burnout through active coping strategies, validating Hypothesis 2. This finding aligns with previous research (Bokszczanin, 2012; Seungju et al., 2022). From a resource conservation theory perspective, students perceiving higher social support are more likely to maintain positive emotional experiences and

psychological stability. They convert external resources into self-efficacy and confidence, thereby favoring constructive coping strategies to address academic stress. When encountering difficulties, they tend to rationally analyze problems and seek diverse solutions rather than resorting to avoidance or negative coping, thus reducing emotional exhaustion and cognitive load.

Furthermore, perceived social support positively influences academic buoyancy, which in turn significantly negatively predicts academic burnout. Perceived social support exerts an indirect effect through academic buoyancy, validating Hypothesis H3. Academic buoyancy serves as a vital resource for navigating daily academic challenges, enabling students to maintain positive regulation and resilience when facing difficulties. Previous research indicates that academic buoyancy not only alleviates anxiety but also enhances learning achievement by boosting self-efficacy and persistence, while improving students'motivation deficits (Rafsanjani et al., 2024). This suggests that when students perceive sufficient support within family, teacher-student relationships, and peer interactions, they are more likely to maintain confidence and resilience in learning, thereby reducing the physical and mental toll of academic stress.

The Chain Mediating Effect of Active Coping Strategies and Academic Buoyancy

The research findings indicate that active coping strategies and academic buoyancy mediate the relationship between perceived social support and academic burnout, validating Hypothesis H4. The key chained pathway identified—"perceived social support→active coping strategies→academic buoyancy→academic burnout"—reveals the critical mechanism through which perceived social support influences academic burnout. This finding strongly supports perspectives from Resource Conservation Theory and Social Cognitive Theory. Perceived social support, active coping strategies, and academic buoyancy function as critical resources that collectively influence academic burnout through sustained psychological resource conversion. Perceived social support, as a key external resource, enhances individuals' confidence in tackling academic challenges, prompting them to adopt more active coping strategies (e.g., actively seeking help, creating study plans), thereby generating resource gains. Each successful problem-solving through positive coping provides students with mastery experiences—the most effective pathway to strengthening self-efficacy. As self-efficacy constitutes a vital component of academic buoyancy, its continuous enhancement enables students to gradually develop academic buoyancy—a valuable internal psychological resource—to cope with daily academic setbacks and pressures. Students with high academic buoyancy maintain their autonomy, competence, and sense of belonging, forming a robust protective layer that effectively prevents excessive depletion of psychological resources. This significantly reduces

manifestations of academic burnout, such as emotional exhaustion, depersonalization, and restricted development. For instance, a student who perceives support from teachers and peers may proactively create study plans and build confidence through small learning achievements. This positive cycle ultimately enables them to demonstrate greater academic buoyancy in stressful situations.

According to Table 4 results, the effects of the three mediating paths differ: the indirect effect from perceived social support→academic buoyancy→academic burnout was the largest (accounting for 21.32% of the total effect), followed by perceived social support→active coping strategies→academic burnout (16.22%) and the chained mediating path (15.77%). This variation suggests that academic buoyancy plays a more critical role in mitigating academic burnout. This may stem from academic buoyancy more directly reflecting students' sustained motivation and adaptability in the face of setbacks. Within the resource conservation theory framework, academic buoyancy, as a core resource, exerts a stronger protective effect. In contrast, the role of active coping is slightly weaker, possibly because its effectiveness depends on the quality and implementation of coping strategies, which vary among students in practical application. Although the chained mediating effect was significant, its effect size gradually diminished due to multi-stage transmission, resulting in a weaker influence than the single pathway. Notably, uncontrolled latent variables (e.g., academic motivation, self-efficacy, personality traits) may also influence these effect differences. This suggests that future research should incorporate additional variables for examination to further elucidate the mechanisms underlying the strength of indirect effects.

The Moderating Role of Mindfulness

The association between active coping and perceived social support is moderated by mindfulness, according to this study. validating H5. Higher levels of mindfulness significantly enhance the promotional effect of perceived social support on active coping strategies. Conversely, this effect is markedly weakened at low mindfulness levels. Individuals with high mindfulness are more attuned to detecting and accepting supportive cues from their environment (such as encouragement from teachers and peer support), enabling them to regulate emotional responses more effectively, reduce negative cognitive appraisals of stress, and adopt a more positive attitude toward academic challenges. Mindfulness not only amplifies the direct influence of perceived social support on active coping but also modulates the entire chain of mediating mechanisms. This pathway becomes more pronounced at high mindfulness levels, indicating that mindfulness, as a cognitive-emotional regulator, enhances individuals' psychological efficacy in transforming external support into adaptive coping strategies. Previous research also indicates that mindfulness training not only enhances subjective well-being and adaptive behaviors (De Vibe et al.,

2018) but also improves students' academic buoyancy (Baumgartner, PhD & Schneider, PhD, 2023).

In real academic settings, the interaction between mindfulness and perceived social support manifests in specific coping processes for daily academic challenges. For instance, when tackling complex team projects, highly mindful students are better able to objectively perceive peers' suggestions rather than interpreting them as criticism. During exam preparation, they are more proactive in identifying and utilizing academic support resources provided by instructors, rather than becoming trapped in cycles of self-doubt. This immediate cognitive-emotional regulation transforms social support from a latent external resource into readily accessible psychological capital. By cultivating nonjudgmental awareness of present experiences, mindfulness heightens individuals' sensitivity to and utilization efficiency of social support signals when confronting academic pressures. This fosters a more positive resource adaptation cycle within high-stress learning environments. This mechanism demonstrates how mindfulness dynamically regulates resource transformation processes in real academic contexts, effectively converting supportive environments into capabilities for tackling academic challenges. During university years, students frequently encounter complex scenarios involving multitasking, time constraints, and end-of-term pressures. High mindfulness levels help students perceive social support as a stable psychological resource, enhancing their tolerance for setbacks and cognitive flexibility. This enables more effective academic stress relief and reduced burnout risk.

Based on these findings, future research and practice may consider integrating mindfulness-based interventions into college student academic support programs. Existing studies indicate that approaches such as Mindfulness-Based Stress Reduction (MBSR) and Mindfulness-Based Cognitive Therapy (MBCT) effectively enhance students' positive coping abilities, emotional regulation skills, and psychological resilience (da Silva et al., 2023; Yan et al., 2024). This study found that mindfulness amplified the role of perceived social support in promoting active coping strategies and academic buoyancy, suggesting that systematic mindfulness training can help students transform external support into internal psychological resources, thereby alleviating academic burnout. Thus, embedding evidence-based mindfulness practices within higher education holds potential value for promoting mental health and academic development.

Implications

The research findings also guide educational practice and psychological interventions. On the one hand, higher education institutions and educational administrators should prioritize creating supportive environments. This can be achieved through establishing academic guidance systems and peer support

platforms to enhance students' perception of social support, thereby helping them gain emotional comfort and resource assistance during their studies. On the other hand, mental health educators can consciously guide students in adopting positive coping strategies within curricula and counseling sessions. These include problem-solving training, emotion regulation techniques, and stress management methods. Integrating group counseling or experiential training to cultivate academic resilience can further enhance students' adaptability when facing academic pressures. Simultaneously, mindfulness—a psychological resource that can be developed through systematic training—should be promoted in university mental health education. For instance, offering mindfulness training courses or group programs can help students reduce negative emotional reactions through present-moment focus and acceptance of experiences, thereby strengthening positive coping and academic buoyancy while lowering academic burnout risk.

Research indicates that enhancing social support and positive coping contributes to alleviating academic burnout, aligning with cognitive restructuring and problem-solving training emphasized in cognitive behavioral therapy (CBT) (Beck, 2020). For instance, through group counseling or structured training, helping students identify and alter negative attribution patterns while cultivating more active coping strategies can partially buffer the detrimental effects of academic stress on mental health. The regulatory role of mindfulness suggests that mindfulness-based interventions can function as cognitive-emotional amplifiers, enabling individuals to better perceive and utilize interpersonal support resources, thereby enhancing academic buoyancy and psychological adaptability (De Vibe et al., 2013). Therefore, integrating social support enhancement, positive coping training, and mindfulness cultivation not only expands practical pathways for mental health education in higher education but also provides evidence-based guidance for counselors and psychotherapists intervening with college populations.

Limitations

This study has certain limitations.

(1) Cross-sectional data cannot establish causal relationships, and all variables were measured using self-report scales, potentially introducing social desirability effects and recall bias. Future research may employ longitudinal tracking, experimental, or qualitative methodologies, combined with diverse measurement approaches such as interviews or physiological indicators, to enhance the validity and reliability of findings. (2) The sample's origin from a single province may limit the external validity of the results. Future studies should expand the

geographical scope of sampling to improve the generalizability and applicability of conclusions. (3) While mindfulness demonstrated a moderating effect in this study, its efficacy can be significantly enhanced through systematic training. Future research should conduct mindfulness intervention experiments to examine dynamic changes in college students' active coping, academic buoyancy, and burnout levels before and after training, thereby more directly validating the intervention value of mindfulness.

Conclusion

This study reveals the mediating mechanisms through which perceived social support, mindfulness, active coping strategies, and academic buoyancy influence academic burnout among college students. Findings indicate that perceived social support not only directly reduces academic burnout but also indirectly exerts effects through a chain of mediations involving active coping strategies and academic buoyancy. Furthermore, mindfulness moderates both the relationship between perceived social support and active coping strategies and the entire chain of mediating pathways, further highlighting its protective effect in academic stress contexts. These findings enrich the application of resource conservation theory in academic settings, emphasizing the dynamic interaction between external support, coping strategies, and internal psychological resources. Practically, this study suggests that educational interventions should integrate social support network development, positive coping strategy training, and mindfulness cultivation to promote resource accumulation and transformation, thereby preventing and alleviating academic burnout among college students.

Author's note

Data Availability Statement: Data will be made available on request. The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Author Information: All authors contributed to the study conception and design. YQH designed the study, conducted data collection, and wrote and revised the paper. YTS primarily analyzed the data and wrote the manuscript. All authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Ethical Approval: The study was approved by the Ethics Review Committee of the Anhui Normal University (ethical approval number: 2024-BBA190027). All participants signed the informed consent in this study.

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DOES INTERPERSONAL EMOTION REGULATION REALLY HELP?! INTERPERSONAL EMOTION REGULATION AND AFFECT THROUGH THE LENSE OF A DAILY DIARY INVESTIGATION

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Abstract

The present work investigated the dynamic relations between affect, with both its positive and negative dimensions, and interpersonal emotion regulation. Drawing from a sample of 220 participants completing surveys on four consecutive days, we used the random intercept cross-lagged panel model (*RI-CLPM*) to investigate the associations between positive and negative affect and interpersonal emotion regulation. The results of RI-CLPM demonstrated a bidirectional association between positive affect and interpersonal emotion regulation. Interpersonal emotional regulation did not predict the next day's negative affect. However, negative affect predicted future deployment of interpersonal emotion regulation strategies. Use of interpersonal emotion regulation at one time point predicts its subsequent use. Our findings highlight the importance disentangling the within-person effects when examining the relationship between positive and negative affect and interpersonal emotion regulation.

Keywords: positive affect, negative affect, interpersonal emotion regulation, daily reciprocal associations, random-intercept cross-lagged panel model.

Emotion regulation (ER) was defined as the capacity to influence affective experience through up-regulating, down-regulating or maintaining certain emotions or moods (Gross, 1998; Niven et al., 2009). Understanding how people regulate their

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moods and affect, both positive and negative, has important theoretical and practical implications across many areas of applied psychology, impacting mental health and well-being across countries and cultures (Chen et al., 2025; Gross et al., 2019). In this study, we add to the ER literature by investigating the interplay between a relatively novel ER strategy, interpersonal emotion regulation (IER; Zaki & Williams, 2013), and affect through the lenses of a daily diary investigation.

IER refers to the processes by which individuals seek to influence others' emotional states (extrinsic IER) or rely on others to regulate their own emotions (intrinsic IER) within social contexts. Unlike intrapersonal emotion regulation, which focuses on self-directed strategies, IER emphasizes the relational and interactive aspects of managing emotions, often driven by goals such as enhancing social bonds, reducing distress, or increasing positive affect (Niven et al., 2009). Some empirical investigations reported that IER was more effective compared to intrapersonal ER in regulating emotions under certain specific contexts (Levy-Gigi & Shamay-Tsoory, 2017; Sahi et al., 2023). Various IER strategies, such as co-rumination and co-distraction, play a distinct role in shaping affective and physiological responses to stress, revealing that support from others can modulate stress recovery in ways that differ meaningfully from intrapersonal regulation approaches (Bataglini et al., 2025). Recent neuroimaging research shows evidence of IER effectiveness in down-regulating negative emotion and supporting relationship closeness through enhanced interpersonal brain synchronization (IBS) of the prefrontal and temporal areas among friends (Zhu et al., 2025). Extant research suggests that people engage in extrinsic IER more frequently than intrinsic IER, primarily aiming to increase positive emotions during social interactions (Mikkola et al., 2023), an effect that can be explained through a pro-hedonic tendency towards harmonious and shared positive affect (Gross & John, 2003; Zaki & Williams, 2013). Research also suggests that people often turn to others for help with regulating their emotions, highlighting the significance of social interactions in emotional processes (Tran et al., 2021). From a theoretical standpoint, the effectiveness of IER in regulating emotion is supported by the Social Baseline Model (Beckes and Coan, 2011), model arguing that when employing IER, individuals draw not only from their own resources, but also from those of their partners, assertion supported by empirical investigations (e.g., Sahi et al., 2023). While a lot of ink has been spilled to describe the pivotal role of ER in respect to various outcomes, ranging from well-being to psychopathologies or personality disorders, the potential implications of IER is a relatively novel territory of ER research. This relatively new area of investigation is characterized by conflicting findings.

For example, recent investigations show that supportive IER predicted lower depression and anxiety rates and higher quality of life in cancer survivors (Zeng et al., 2025). Moreover, IER contributed to enhancing the romantic relationship quality

(e.g., Lemay et al., 2025). Extant research suggests that IER has far reaching implications for outcomes such as physical health and psychological well-being (e.g., Debrot et al., 2013; Niven, 2017). Specific IER strategies were differentially linked to depressive symptoms in parent–adolescent dyads (Gadassi-Polack et al., 2025). At the same time, recent investigations relying on longitudinally intensive designs, such as experience-sampling, reveal strategy-specific and sometimes null effects on momentary mood—for example, partner-initiated distraction boosted positive affect, whereas advice-giving or encouraging suppression worsened it (Pauw et al., 2024). Moreover, suggest that IER might impact affect directly, but also via indirect pathways (Berkowitz et al., 2025). Intrinsic IER was found to predict subsequent emotional states and regulatory strategy selection in naturalistic contexts, such that IER engagement was associated with elevated negative affect and reduced positive affect (Berkowitz et al., 2025). Yet other investigations analyzing the IER in the parent-adolescent dyads reported that engagement in IER strategies was associated with increased depression in the regulator (Gadassi-Polack, et al., 2023).

These mixed findings matter because affect is both the primary target of emotion regulation (Gross & John, 2003) and the gateway through which broader influences unfold: successfully reducing negative affect can partly alleviate symptoms of depression and anxiety (Gross, 2015), enhance positive affect and promote life satisfaction and resilience (Fredrickson, 2001). Moreover, influential theories such as the binary model of distress (Ellis, 1994) distinguish functional negative emotions (e.g., sadness, concern) from dysfunctional ones (e.g., depression, anxiety), describing their role as key mechanisms for various disorders. Various empirical investigations confirming confirm that the two classes differ both in respect to their antecedents and consequences (David, et al., 2004; David, et al., 2005). Regulating emotions in social contexts can strengthen the relational bonds and buffer stress, thereby bolstering well-being (Niven et al., 2012). Consequently, we contribute to the literature by clarifying whether and how IER impacts positive and negative affect at the daily level. Addressing this gap will shed light onto one of the potential mechanisms linking IER with its distal psychological benefits (Williams et al., 2018; Zaki & Williams, 2013). We tackle this gap by modelling within-person associations between discrete IER and subsequent affect as captured in a daily diary investigation.

I(ER) Research and Longitudinal Designs

Much of the knowledge describing how ER strategies (including IER) relate to different consequential outcomes has been derived mostly from experimental, cross-sectional or longitudinal designs. However, as outlined by Becker et al. (2019),

understanding how these strategies unfold over shorter time frames (e.g., over the course of a day or a week) is instrumental to understand how the intertwining between ER and affect unfolds in everyday life, rendering ER research more relevant to various areas of applied psychology.

Therefore, in order to fully capture both the persistence of affective states and the dynamic and evolving nature of interpersonal emotional regulation, longitudinal designs are essential, and two methodological approaches have been prominent choices in studies: Ecological Momentary Assessment (ESM) and Daily Diary Studies (DDS). Both approaches share the goal of capturing emotional experiences as they unfold in naturalistic contexts, yet they differ in their temporal resolution, data collection processes, and focus.

ESM is a real-time data collection technique that captures emotions at multiple moments throughout the day, typically through smartphone apps or other digital devices. ESM is regarded as particularly effective for identifying short-term fluctuations in affective states and emotional inertia (e.g., Kuppens et al., 2010). It is also widely used to assess the effects of environmental or social interactions on emotional fluctuations (Trull & Ebner-Priemer, 2013). Recent experience-sampling evidence reflects the suitability of ecological momentary assessment (EMA) in uncovering within-person emotion-regulation dynamics. A multicultural EMA (United States and China) showed that greater ER-flexibility (context sensitivity & strategy repertoire) predicted lower momentary distress across cultures (Chen et al., 2024). An eight-day EMA with outpatients at early psychosis clinics found that higher ER-flexibility buffered negative-emotion volatility and accelerated affective recovery (Li et al., 2024). Pauw et al. (2024) researched IER combining six random prompts per day with end-of-day reports and highlighted the differential effectiveness of IER strategies in daily life. Methodologically, EMA minimizes recall bias and links psychological states to real-time contexts (Mengelkoch et al., 2024), yet typical compliance rates hover around 75 % and missing-data patterns require specialized modelling (Jain & McCabe, 2024). A recent systematic review of EMA resilience studies likewise highlights strong ecological validity alongside participant burden as the main limitation (Schwarz et al., 2025).

In contrast, daily diary methodologies collect data at the end of each day, with participants retrospectively summarizing their emotional experiences, significant events, and regulatory efforts (e.g., Bolger et al., 2003). This approach provides a broader view of day-level emotional patterns and can capture the cumulative effects of experiences stacked over longer timeframes (Nezlek, 2012). This approach has been used to examine how day-level fluctuations in affect and its regulation are related to mental health outcomes, relational or life satisfaction (e.g., Katan & Kelly, 2021; Svaldi et al., 2020).

While ESM provides real-time insights, DDS (daily diary surveys) are particularly suited for examining the cumulative and cross-day effects of ER strategies. DDS uniquely allow for capturing these temporal patterns, offering a structured yet ecologically valid method to examine the persistence of IER effects beyond immediate contexts, although they do face some limitations in that they can elicit reactivity altering the very experiences being tracked, and often suffer from non-random missing data. All of these may distort rapid emotion-regulation cycles and bias estimates, but they can be addressed by complimenting higher-frequency methods and rigorous data handling (Gochmann et al., 2022; Griffiths et al., 2022). To date, research has demonstrated that such designs effectively track how ER strategies interact with daily stressors, resilience, and affective outcomes (Braet et al., 2024, Svaldi et al., 2020). For instance, DDS has been used to show that the effectiveness of cognitive reappraisal and distraction depends on stressor intensity and controllability (Braet et al., 2024), that adaptive ER strategies weaken the relationship between negative affect and binge eating (Svaldi et al., 2020), that resilience moderates the relationship between emotion-focused coping strategies and negative affect (Lu & Shi, 2024), or that ER efforts shape next-day mood stability and stress levels, underscoring the importance of assessing emotional carryover effects (Tran et al., 2021; Nezlek & Kuppens, 2008). Various empirical investigations reported that the indirect consequences of IER, such as mood stability, coping strategies, or negative affect might be carried over to the next day (e.g., Lu & Shi, 2024; Nezlek & Kuppens, 2008; Tran et al., 2021). The present investigation contributes to this emergent area of research by examining whether and how intrinsic IER strategies extend beyond momentary regulation, i.e., if they are carried over to the next day or whether they are confined to the immediate context in which the regulation occurs, leaving open questions about the temporal persistence and broader implications of such emotional strategies on daily emotional trajectories and well-being.

The Present Study

The main assertion of IER theory is that positive/negative affect is an outcome of IER processes, i.e., that it follows downstream from ER. To advance our understanding on the interplay between IER and affect, we employed a daily diary investigation to analyze and disentangle the daily level associations between IER (Zaki & Williams, 2013) and positive/negative affect. We hypothesize that:

H1a: IER has a significant and negative association with next day negative affect.

H1b: IER has a significant and positive association with next day positive affect.

However, affect is not only a target of ER process, but also one of the triggers that sets in motion engagement in IER, i.e. it also precedes IER (upstream) in a spiral effect. Both positive and negative affect are key predictors of engagement in emotion regulation (ER) strategies, as individuals are motivated to regulate their emotions based on their current affective states. Functionalist theories hold that emotions are action-readiness signals that motivate behavior aimed at meeting adaptive goals (Frijda, 1986, 2007; Keltner & Gross, 1999). Thus, within the more general control-process model of self-regulation (Carver & Scheier, 1998), negative affect often triggers the use of regulation strategies aimed at alleviating distress, such as suppression or reappraisal (Gross & John, 2003), whereas positive affect can drive regulatory efforts to sustain or enhance positive emotional experiences, as demonstrated by research linking positive affect to savoring strategies (Bryant, 2003). Fluctuations in affect, regardless of valence, can prompt individuals to seek interpersonal regulation, especially in contexts requiring emotional support or co-regulation with others (Williams et al., 2018; Niven et al., 2012). These findings emphasize the bidirectional relationship between affective states and emotion regulation behaviors, underscoring the dynamic interplay between what individuals feel and how they manage those emotions.

To shed light on this potentially intricate affect-IER relationship, we examined the cross-lagged associations between IER and both positive and negative affect by deploying a Random-Intercept Cross-Lagged Panel Model (RI-CLPM) analysis (Hamaker et al., 2015). Employing RI-CLPM enabled us to estimate the associations between IER and next day affect (positive/negative) and vice versa, while controlling for the auto-regressive effects. We contribute to the general domain of emotion regulation by shedding light on the temporal day-level associations between IER and affective outcomes. We therefore further hypothesize that:

H2: Negative (and not positive) affect has a significant relationship with next day engagement in IER.

Method

Participants and Procedure

The sample consisted of a total number of 220 participants (56% females) aged between 23 and 64 (M = 42.01; SD = 11.12) of which 113 (51%) graduated university and 102 participants had secondary or lower secondary education. A call for participants was advertised on a number of Romanian community websites. Only the first 240 participants who met the inclusion criteria of being available to complete the

survey within the specified time frame were enrolled in the study. Participants were included if they were adults aged 18 or older, fluent in the study language, and reported at least one meaningful social interaction per day during the assessment period. After completing an initial survey that collected demographic information, the participants completed daily surveys for four consecutive days. The survey links were sent out via email every day at 7 p.m. and remained active for 4 hours.

Measures

Positive and negative affect. Daily functioning with regard to positive and negative affect was assessed with the International Positive and Negative Affect Schedule Short Form (I-PANAS-SF; Thompson, 2007). Participants indicated on a Likert scale ranging from 1 (never) to 5 (always) the extent to which they feel each of the 5 positive affect statements (e.g., "Determined") and of the 5 negative affect ones (e.g., "Upset"). The internal consistency across the four measurement occasions was .85 for Positive Affect and .81 for Negative Affect.

Interpersonal Emotion Regulation. Daily interpersonal emotion regulation was measured with a modified version of the 16 items Interpersonal Regulation Questionnaire (IRQ; Williams et al., 2018). The internal consistency for the IER across the four measurement occasions was .79. IRQ measures on a scale from 1 (strongly disagree) to 7 (strongly agree) the extent to which people recruit social resources to manage their emotions, on four dimensions: Negative Tendency (e.g. "When something bad happens, my first impulse is to seek out the company of others"), Negative Efficacy ("I appreciate having others' support through difficult times"), Positive-Tendency ("When things are going well, I just have to tell other people about it") and Positive Efficacy ("I really enjoy being around the people I know").

Analytical Approach

The daily associations between positive and negative affect and interpersonal emotion regulation were analyzed via the Random Intercepts Cross-Lagged Panel Model (RI-CLPM). RI-CLPM was developed to investigate dynamic processes and the interplays between two constructs as they unfold over several measurement occasions (Hamaker et al., 2015). A conceptual overview of the hypothesized associations that we employed were included in Figure 1.

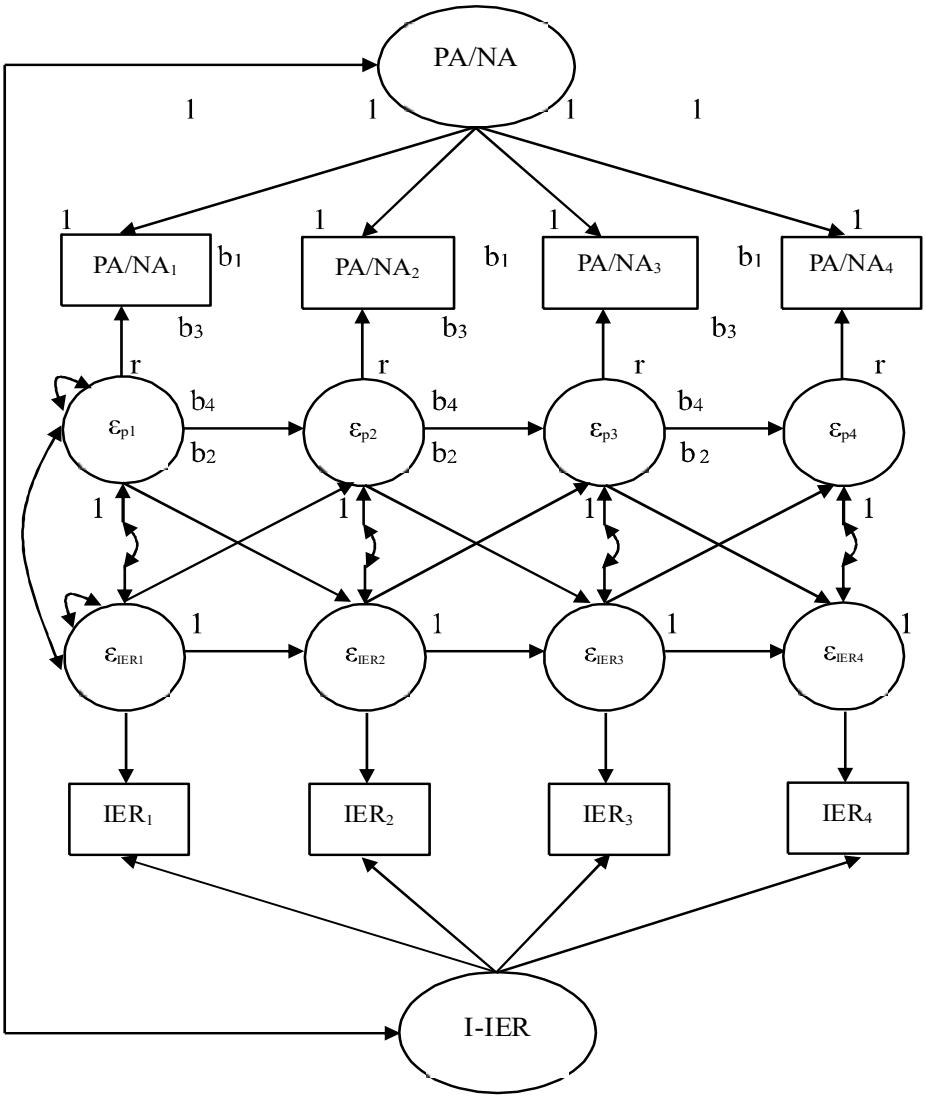

Figure 1. Conceptual representation of the random intercept cross-lagged panel model (RI-CLPM) of the daily associations between interpersonal emotion regulation, positive affect and negative affect

The latent random intercept component capturing the time-invariant component in interpersonal emotion regulation was labelled I-IER while the one capturing positive and negative affect, I-PA and I-NA, respectively. The temporal deviations from the individuals' general levels of interpersonal emotion regulation and both positive and negative affect were labelled ε_{IER}, $\varepsilon_{PA,}$ and $\varepsilon_{NA,}$ respectively.

The autoregressive paths (carry-over effects from the same construct domain) were named b1 and b2, while the cross-lagged effects (associations between interpersonal emotion regulation and both positive and negative affect) were named b3 and b4. Paths b3 and b4 indicate the extent to which the changes in one construct account for significant changes in the other construct on the next measurement occasion, while parceling out the autoregressive effects. All analyses were conducted using Mplus 8.5 (Muthen & Muthen, 2017).

Results

Table 1 displays the means, standard deviations, internal consistencies and correlations between interpersonal emotion regulation (IER), positive affect (PA) and negative affect (NA) across the four measurement occasions. Next, using RI-CLPM models, we examined the dynamics between affect and interpersonal emotion regulation over the four-day period. The goodness of fit indices suggested reasonable to good fit for both models.

Table 1. Means, standard deviations, and correlations between the focal variables.

	M	SD	α	PA				NA				IER			
				1	2	3	4	1	2	3	4	1	2	3	4
PA1	17.43	2.80		-											
PA2	17.33	3.27	.85	.50**	-										
PA3	17.15	3.55		.35**	.49**	-									
PA4	16.03	5.85		.34**	.30**	.30**	-								
NA1	9.19	3.61		-.18**	-.03	-.03	.10	-							
NA2	8.99	3.90	.81	-.17*	-.11	-.13*	.00	.57**	-						
NA3	8.97	3.85		.02	.03	.06	.03	.55**	-67**	-					
NA4	8.16	4.61		.10	.09	.03	.50**	.39**	.48**	.50**	-				
IER1	70.4	17.74		.18**	.26**	.06	.00	-.07	-.03	.08	.02	-			
IER2	69.64	18.15	.79	-.01	.20**	.08	.02	.02	.02	-.06	.06	.64**	-		
IER3	70.16	19.93		-.05	.05	.27**	.00	-.04	-.11	-.05	-.03	.52**	.62**	-	
IER4	65.46	26.58		.09	.08	.15*	.68**	.08	-.03	.01	.39**	.24**	.35**	.39**	-

Note. PA = positive affect; NA = negative affect; IER = interpersonal emotion regulation; α = internal consistency reliability. ** $p \leq .001$; *$p \leq .05$.

Cross-lagged and auto-regressive effects

To investigate the temporal dynamics between affect and IER, we estimated Random Intercept Cross-Lagged Panel Models (RI-CLPMs) separately for NA and PA. Model fit indices indicated acceptable to good fit for both models. For the NA

model, fit indices were: Comparative Fit Index (*CFI*) = .916, Root Mean Square Error of Approximation (*RMSEA*) = .159, and Standardized Root Mean Square Residual (*SRMR*) = .059. For the PA model, the *CFI* was .890, *RMSEA* = .174, and SRMR = .078. Standardized path coefficients and standard errors for all cross-lagged and autoregressive effects were presented in Table 2.

Table 2. Standardized path coefficients in the RI-CLPM for the within-person relations between affect and interpersonal emotion regulation.

	Predictor$_T$	**Outcomes$_{T+1}$**	***Est.***	***S.E.***	***CFI***	***RMSEA***	***SRMR***
T1		Negative Affect	.66*	.05			
	Negative Affect	Interpersonal Emotion Regulation	.37*	.26			
	Interpersonal Emotion Regulation	Negative Affect	.00	.01			
		Interpersonal Emotion Regulation	.62*	.06			
T2		Negative Affect	69*	.05			
	Negative Affect	Interpersonal Emotion Regulation	.56*	.25			
	Interpersonal Emotion Regulation	Negative Affect	.02	.01	.916	.159	.059
		Interpersonal Emotion Regulation	.67*	.05			
T3		Negative Affect	.71*	.04			
	Negative Affect	Interpersonal Emotion Regulation	.43*	.22			
	Interpersonal Emotion Regulation	Negative Affect	.02	.01			
		Interpersonal Emotion Regulation	.66*	.06			
T1		Positive Affect	.66*	.04			
	Positive Affect	Interpersonal Emotion Regulation	-.14*	.05			
	Interpersonal Emotion Regulation	Positive Affect	.18*	.06			
		Interpersonal Emotion Regulation	.45*	.05			
T2		Positive Affect	.66*	.04			
	Positive Affect	Interpersonal Emotion Regulation	-.09*	.05			
	Interpersonal Emotion Regulation	Positive Affect	-.01	.06	.890	.174	.078
		Interpersonal Emotion Regulation	.47*	.04			
T3		Positive Affect	.75*	.03			
	Positive Affect	Interpersonal Emotion Regulation	.04	.05			
	Interpersonal Emotion Regulation	Positive Affect	.03	.06			
		Interpersonal Emotion Regulation	.52*	.05			

Note. *$p \leq .05$.

Autoregressive effects. All constructs showed significant temporal stability across the four-day period. NA demonstrated strong autoregressive paths across all lags (T1→T2: β = .66, SE = .05, $p < .001$; T2→T3: β = .69, SE = .05, $p < .001$; T3→T4: β = .71, SE = .04, $p < .001$). PA also exhibited high autoregressive stability (T1→T2: β = .66, SE = .04, $p < .001$; T2→T3: β = .66, SE = .04, $p < .001$; T3→T4: β = .75, SE = .03, $p < .001$). IER showed moderate to strong autoregressive effects (T1→T2: β = .67, SE = .05, $p < .001$; T2→T3: β = .43, SE = .22, $p < .05$; T3→T4: β = .47, SE = .04, $p < .001$).

NA predicting IER. Supporting Hypothesis 3, NA significantly predicted higher next-day IER across all three lags. Specifically, NA at T1 predicted IER at T2 (β = .37, SE = .26, $p = .016$), NA at T2 predicted IER at T3 (β = .56, SE = .25, $p = .015$), and NA at T3 predicted IER at T4 (β = .43, SE = .22, $p = .022$). These were the strongest cross-lagged effects observed in the model.

PA predicting IER. Results provided only partial support for Hypothesis 2. PA negatively predicted IER across the first two lags, although the effects were small. PA at T1 predicted lower IER at T2 (β = –.14, SE = .05, $p = .004$), and PA at T2 predicted lower IER at T3 (β = –.09, SE = .05, $p = .041$). However, the T3→T4 path was not statistically significant (β = .04, SE = .05, $p = .381$), suggesting an inconsistent pattern.

IER predicting NA: Contrary to Hypothesis 1a, IER did not significantly predict next-day NA at any time point. The cross-lagged effects were near zero and non-significant (T1→T2: β = .00, SE = .01, $p = .842$; T2→T3: β = .02, SE = .01, $p = .087$; T3→T4: β = .02, SE = .01, $p = .082$).

IER predicting PA: Similarly, results did not support Hypothesis 1b. Although IER at T1 predicted a modest increase in PA at T2 (β = .18, SE = .06, $p = .003$), subsequent lags were not significant (T2→T3: β = –.01, SE = .06, $p = .846$; T3→T4: β = .03, SE = .06, $p = .612$). Overall, IER did not reliably enhance next-day positive affect.

Discussion

The present study analyzed the dynamic relations between interpersonal emotion regulation (IER) and affect, with both its positive and negative valence. Our findings revealed that the negative affect - next day IER was stronger than positive affect - next day IER or than IER and next day negative affect. Taken together, these findings suggest that negative affect is more likely to trigger next day involvement

in IER, albeit contrary to our hypothesis 1a, IER is not an efficient strategy for reducing next day negative affect or enhancing positive affect. From the perspective of the binary model of distress (Ellis, 1994), this pattern may indicate that the forms of negative affect most salient in daily life were functional (e.g., situational sadness) rather than dysfunctional (e.g., pervasive hopelessness). Functional negative emotions signal problems yet are compatible with adaptive coping, which might explain why they prompt IER (negative affect - next-day IER) but are not readily resolved by it. Future work should measure functional versus dysfunctional negative emotions explicitly to test this interpretation (e.g., David et al., 2004, 2005).

Our findings revealed several notable patterns. First, negative affect was a stronger predictor of next-day IER compared to positive affect, suggesting that individuals are more likely to engage in IER following experiences of distress. This pattern aligns with functionalist views of emotion - particularly, control-process theory (Carver & Scheier, 1998) and the laws of emotion proposed by Frijda (2007) - which posit that negative emotions serve as a motivational signal to seek external support or influence others' emotions as part of coping efforts (Barrera, 1986; Gross & John, 2003). However, we found no evidence that IER on a given day predicted subsequent reductions in negative affect, highlighting a potential limitation in the effectiveness of IER for alleviating distress within short temporal frames.

Second, the relationship between positive affect and IER demonstrated bidirectional within-person associations. Positive affect predicted higher engagement in IER the following day, suggesting that individuals may leverage positive emotions to sustain or enhance social connections. Conversely, IER also predicted increased positive affect the next day, effect potentially explained by the fact that IER strategies are deployed as means for increasing individual well-being and fostering shared positivity (e.g., Mikkola et al., 2023; Zaki & Williams, 2013). These findings reinforce the reciprocal nature of positive affect and IER, aligning with theories emphasizing the role of positive emotional exchanges in maintaining relational bonds and promoting psychological well-being (Fredrickson, 2001; Williams et al., 2018).

Third, significant autoregressive effects were observed for positive affect, negative affect, and IER, indicating that deviations from baseline levels persisted across measurement occasions. These results are consistent with prior studies demonstrating the temporal stability of affective experiences and regulatory behaviors (Nezlek & Kuppens, 2008; Tran et al., 2021). Our findings suggest that affective states not only serve as proximal outcomes of IER but also act as antecedents, influencing the likelihood of engaging in IER over time. This dynamic interplay underscores the bidirectional nature of the affect-IER relationship, highlighting the need for longitudinal methodologies to capture its evolving patterns.

From a theoretical perspective, our results support the effective support mobilization framework, which posits that individuals facing adversity are more inclined to affiliate and seek interpersonal support to regulate their emotions

(Aneshensel & Frerichs, 1982; Barrera, 1986). However, the lack of evidence for within-person reductions in negative affect following IER suggests that such strategies may not always achieve their intended outcomes, particularly in alleviating distress. These findings raise important questions about the factors moderating the efficacy of IER, such as individual differences in emotional intelligence, the quality of social relationships, and the specific strategies employed (Williams et al., 2018).

Practically, our findings emphasize the importance of understanding the situational and contextual factors that influence the efficacy of IER. While IER appears to facilitate positive affect and relational bonds, its limited impact on reducing negative affect suggests that interventions targeting interpersonal regulation should incorporate complementary strategies aimed at directly addressing distress (negative emotions). Additionally, the bidirectional association between positive affect and IER underscores the potential of leveraging positive emotional states to promote adaptive social regulation processes and enhance overall well-being.

Future research should explore the conditions under which IER is most effective, examining the roles of strategy selection, relational context, and individual differences. It would also be valuable to investigate the temporal persistence of IER effects beyond short time frames, as well as the interplay between intrinsic and extrinsic IER strategies. Expanding on these questions will help clarify the mechanisms underlying the affect-IER relationship and inform interventions aimed at optimizing emotion regulation in social contexts.

In conclusion, this study advances our understanding of the day-level associations between affect and IER, highlighting the nuanced interplay between these constructs. By capturing the dynamic and bidirectional nature of these processes, our findings contribute to the broader literature on emotion regulation, emphasizing the importance of both positive and negative affect in shaping regulatory behaviors and their outcomes.

Limitations

One limitation of the current design is the absence of assessments for participants' broader mental health status or their typical emotion regulation strategies, which may have influenced both their use of interpersonal emotion regulation and its affective consequences. Including such variables could have provided a more nuanced understanding of individual differences in emotion regulation dynamics. The design captures significant unidirectional effects from negative affect to IER, but not vice versa. This asymmetry may reflect the tendency for individuals to seek interpersonal regulation primarily in response to distress, yet the model cannot fully account for potential bidirectional or feedback processes that might occur in shorter time frames or more dynamic contexts. The use of a once-daily assessment schedule may have missed shorter-term fluctuations or immediate

emotional consequences of IER use. It is possible that the effects of IER on affect unfold more rapidly or decay quickly, and thus may not be detectable across 24-hour lags.

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AN EVIDENCE-BASED MULTIDIMENSIONAL SCALE FOR ASSESSING DIGITAL ADDICTIONS

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Abstract

The present study sets out the development and psychometric validation of the Multidimensional Digital Addiction Scale (MDDS), a novel instrument designed to assess digital addiction across eight distinct yet interrelated domains: social media, internet, gaming, phone, video, viewing, online shopping, and information-seeking anxiety. In response to the growing public health concern surrounding digital overuse, the MDDS offers a comprehensive and evidence-based approach to measuring problematic digital behaviour. The scale development process was meticulously executed through item generation, expert evaluation, and a three-phase empirical study. Exploratory and confirmatory factor analyses were conducted to confirm the scale's multidimensional structure (e.g., RMSEA = 0.075, CFI = 0.938). The reliability coefficients (Cronbach's α) exhibited a range from .904 to .958 across the subscales. Convergent and discriminant validity were supported by CR, AVE, and HTMT analyses. The scale demonstrated a substantial correlation with an established measure of mobile phone addiction, thereby substantiating its criterion-related validity. The MDDS has the capacity to facilitate the identification and classification of digital addiction patterns, to inform therapeutic interventions, and to support prevention programmes targeting technology-related behavioural issues.

Keywords: Digital Addiction, Multidimensional Scale, Social Media Addiction, Gaming Addiction, Scale Development.

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Introduction

It has been established through significant research findings that the majority of an individual's time is spent on digital platforms. Kemp (2020) posited that each individual with access to the internet spends approximately 2.5 hours daily on digital platforms, with an estimated 3.8 billion social media users worldwide. Indeed, a joint research project conducted in 57 countries revealed that the majority of individuals prefer digital platforms over traditional forms of media, such as television (Zenith Media, 2019). In a study conducted by Deloitte (2018) and Vox (2020), it was found that the average American checks their mobile phone between 50 and 80 times a day. The rapid proliferation of digital technologies has led to a significant increase in the prevalence of digital platform addiction, which has emerged as a prominent public health concern (Kuss & Griffiths, 2017). This situation demonstrates that humanity is becoming increasingly reliant on digital platforms. Concurrently, this circumstance gives rise to a phenomenon known as digital addiction. This phenomenon is perceived by many as being analogous to other forms of addiction, such as those associated with smoking, drugs, and gambling (Alter 2018; Newport 2019). In a similar vein, Allcott et al. (2022) cite the World Health Organisation's (2018) characterisation of digital addiction as a 'medical condition' at the point that it can be considered a disease state. It is to be expected that a medical condition will have a number of psychological effects. Digital addiction is a condition characterised by impairments in social, academic, occupational and psychological functioning resulting from excessive and uncontrolled use of digital devices and platforms (Young, 1998). The present study analyses this type of addiction in a number of different dimensions and classifies it in a variety of ways. It is acknowledged that the various forms of digital addiction are interrelated and that the underlying factors are of a complex nature (Andreassen et al., 2012). The Multidimensional Digital Addiction Scale (MDDS) developed in this study aims to examine digital addictions in eight different dimensions: Social Media Addiction, Internet Addiction, Gaming Addiction, Phone Addiction, Video Addiction, Streaming Addiction, Online Shopping Addiction and Information Seeking Anxiety.

In addition to the psychological and social outcomes previously mentioned, it is important to highlight that many individuals use digital platforms as a form of escape from real-life problems. This form of avoidance-oriented behaviour, frequently observed in cases of digital addiction, can function as a coping mechanism to alleviate underlying emotional distress, loneliness, or anxiety. Consequently, digital addiction can be regarded not only as a behavioural excess but also as a potential manifestation of underlying psychological needs ((Kardefelt-Winther, 2014; Elhai et al., 2017). The present study analyses this type of addiction in a number of different dimensions and classifies it in a variety of ways. It is acknowledged that the various forms of digital addiction are interrelated and that the

underlying factors are of a complex nature (Andreassen et al., 2012). The Multidimensional Digital Addiction Scale (MDDS), developed in this study, aims to examine digital addictions in eight different dimensions: The following phenomena are the subject of increasing concern: social media addiction, internet addiction, gaming addiction, phone addiction, video addiction, streaming addiction, online shopping addiction and information seeking anxiety.

Literature Review

Social Media Addiction

Social media offers a digital environment that allows individuals to spend time on online platforms and generally supports social interactions. Social media addiction is a condition in which individuals overuse these platforms, cannot control this use, and consequently experience impairments in their daily functioning (Griffiths, Kuss, & Demetrovics, 2014). Social media addiction has been found to be associated with psychological problems such as low self-esteem, depression, and anxiety (Andreassen et al., 2017: Khan et al., 2024). This situation provides important clues about the possible problems that young individuals may face.

Internet Addiction

Internet addiction is the impairment of social, academic or professional functioning as a result of excessive and uncontrolled use of the Internet (Young, 1998). This type of addiction is often associated with social isolation, poor academic performance and psychological disorders (Kuss & Griffiths, 2012). Internet addiction is also closely related to other types of digital addictions and therefore it is important to address digital addictions in a holistic manner (Dong, Lu, Zhou, & Zhao, 2011). Due to the holistic structure of the digital world, it is often possible for individuals to harbour different types of addiction together.

Game Addiction

Digital games are especially popular among the young population and excessive use of these games can lead to game addiction (Kuss & Griffiths, 2012). Game addiction is defined as individuals playing digital games uncontrollably, which negatively affects social and academic functioning (Lemmens, Valkenburg, & Peter, 2009). This type of addiction is associated with consequences such as low academic achievement, deterioration in social relationships, and sleep disorders (Pontes & Griffiths, 2015). The fact that there are many types of games, especially on digital platforms, pushes young individuals towards it.

Telephone Addiction

Phone addiction is the excessive and uncontrolled use of mobile phones by individuals, resulting in impairments in their daily functioning (Billieux, Maurage,

Lopez-Fernandez, Kuss, & Griffiths, 2015). This type of addiction is especially common among young people and can lead to various negative consequences such as distraction, social isolation, and sleep disorders (Elhai, Levine, Dvorak, & Hall, 2016). This situation causes the mobile phone to become an indispensable tool.

Video Addiction and Watching Addiction

Video addiction is a type of addiction that occurs when individuals consume online video content excessively (Balakrishnan & Griffiths, 2017). In a broader framework, viewing addiction can be defined as the situation in which individuals continuously watch videos, series or films on online platforms and cannot control these activities (Sung, Kang, & Lee, 2018). These addictions are associated with negative consequences such as time management problems and social isolation, especially in young people.

Online Shopping Addiction

Online shopping addiction is characterised by individuals' inability to control their online shopping behaviour, which leads to financial and psychological problems (Rose & Dhandayudham, 2014; Maraz, & Yi, 2022). This type of addiction is closely related to impulse control disorders and low self-control (LaRose, Lin, & Eastin, 2003). Of course, it is likely that many different factors play a role in the background of online shopping addiction.

Information Seeking Anxiety

Information seeking anxiety is a condition in which individuals experience intense anxiety and stress in the process of searching for information over the internet (Rothbaum, Weisz, & Johnson, 2012). This situation is related to the fact that individuals feel the need to constantly search for up-to-date information in the digital environment and cannot control this process (Case & Given, 2016). Information seeking anxiety becomes more evident in situations that require intensive access to information, especially in academic and professional fields.

Present Study

This study aims to evaluate the validity and reliability of the Multidimensional Digital Addiction Scale (MDDS), which was developed to examine the multidimensional structure of digital addiction. Multidimensional Digital Addiction Scale (MDDS) consists of eight sub-dimensions that comprehensively address different aspects of digital addiction: Social Media Addiction, Internet Addiction, Gaming Addiction, Phone Addiction, Video Addiction, Streaming Addiction, Online Shopping Addiction, and Information Seeking Anxiety. The primary goal of the research is to validate the psychometric

properties of this scale and to better understand the effects of digital addictive behaviours on individuals.

In this study, a three-stage data collection process was carried out. In the first stage, the factor structure of the scale was determined by exploratory factor analysis (EFA). In the second stage, confirmatory factor analysis (CFA) was used to test the accuracy of the factor structure of the scale. In the third stage, criterion validity was evaluated. For criterion validity, additional data were collected using the "Telephone Addiction Scale" developed by Yılmaz and Okan (2021), and its relationship with the relevant sub-dimensions of the MDDS was examined.

Method

Research Model

This study is a scale development study conducted to develop the "Multidimensional Digital Addiction Scale" (MDDS). The scale was designed as a tool aiming to measure different dimensions of digital addictions. The study includes exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) processes. The research was approved by Fırat University, Social and Human Sciences, Research Ethics Committee: 20.06.2023-16907. Written informed consent was obtained from all participants.

Participants

The sample of the study consists of individuals in emerging adulthood (18-28 years old). Three stages were carried out in the data collection process. In the first stage, data were collected from 218 participants (169 females and 49 males) for exploratory factor analysis. In the second stage, data were collected from a total of 258 participants (198 females and 60 males) for confirmatory factor analysis. In addition, data were collected from 74 participants for criterion validity. The age distribution of the participants ranged between 18 and 28, and the highest density was observed in the 21 age group. In the initial phase of the study, data were collected from 218 participants (M = 21.4, SD = 2.4); in the subsequent phase, from 258 participants (M = 21.6, SD = 2.3). The participants were predominantly undergraduate university students enrolled in various faculties across urban and semi-urban universities in Türkiye. The sample displayed moderate diversity in terms of socio-economic background, ranging from lower-middle to upper-middle class. However, the homogeneity of the sample, which is predominantly drawn from academic settings, represents a limitation in terms of generalizability to the broader population.

Scale Development Process

Creating the Item Pool: At the beginning of the scale development process, a large item pool was created by utilising the relevant literature and qualitative data. The item pool included 10 items for each sub-dimension, totalling 80 items.

Expert Opinions: The item pool was analysed by 7 experts in their fields. The experts evaluated the content validity of the items and made suggestions. In addition, two Turkish language experts gave their opinions on the conformity of the items with grammar rules. Using Lawshe (1975) technique, the items were eliminated according to the content validity ratios and a total of 72 items were made ready for the application.

Data Collection

The data collection process was carried out in three stages. In the first stage, data were collected for exploratory factor analysis and a preliminary form with 72 items was applied. In the second stage, data were collected from the same sample for confirmatory factor analysis. In the third stage, the reliability and validity of the scale were evaluated. In addition, additional data were collected from 74 participants for criterion validity assessment.

Measurement Tools Used

In this study, two different measurement tools, "Multidimensional Digital Addiction Scale" (MDDS) and "Telephone Addiction Scale", were used for the purpose of the research.

Multidimensional Digital Addiction Scale (MDDS): Multidimensional Digital Addiction Scale (MDDS) developed within the scope of the research is a scale designed to measure various dimensions of digital addiction. The scale consists of eight sub-dimensions, namely Social Media Addiction, Internet Addiction, Game Addiction, Phone Addiction, Video Addiction, Watching Addiction, Online Shopping Addiction and Information Seeking Anxiety. Each sub-dimension was measured with a series of questions consisting of 44 items in total, which were prepared to evaluate the addictive behaviours exhibited by individuals on digital platforms. In the scale development process, content validity was ensured based on expert opinions and then the factor structure was determined by exploratory factor analysis.

Telephone Addiction Scale: The "Telephone Addiction Scale" developed by Yılmaz and Okan (2021) was used for criterion validity assessment. This scale aims to measure the addiction levels that individuals develop due to the use of mobile phones. In particular, this scale, which evaluates the difficulties faced by individuals in their lives related to phone use, frequency of use, loss of control, and psychological effects related to phone use, was selected with the idea that it may be related to the "Phone Addiction" sub-dimension of the MDDS. The scale has

undergone various psychometric tests and has been included in the literature as a valid and reliable tool. In this study, the data collected with the Phone Addiction Scale were analysed in order to evaluate the validity of the MDDS and its relationship with different digital addiction dimensions.

Analyses

Exploratory Factor Analysis (EFA): EFA was conducted to reveal the factor structure of the scale. In this analysis, principal component analysis and varimax rotation method were used. As a result of the analyses, 8 sub-dimensions and 44 items were determined. These sub-dimensions were named as "Social Media Addiction", "Internet Addiction", "Game Addiction", "Phone Addiction", "Video Addiction", "Watching Addiction", "Online Shopping Addiction" and "Information Search Anxiety".

Confirmatory Factor Analysis (CFA): CFA was applied to test the accuracy of the factor structure of the scale. The analyses were conducted with structural equation modelling (SEM) and the model fit indices (CFI, TLI, RMSEA, SRMR) were evaluated. The results showed that the eight-factor structure of the scale was valid and reliable. The confirmatory factor analysis (CFA) was conducted using IBM AMOS (version 24) with the Maximum Likelihood (ML) estimation method. Prior to the analysis, the assumptions of normality, linearity, and absence of multicollinearity were verified and found to be satisfied. The measurement model comprised eight latent constructs and 44 observed variables. A power analysis was conducted to ensure sufficient sample size for structural equation modeling. According to the guidelines by Kline (2011) and Wolf et al. (2013), a minimum of 200 participants is recommended when estimating models with moderate complexity using the ML method. Given that the CFA sample consisted of 258 participants, the study exceeded this threshold, indicating adequate statistical power for model estimation and validation.

Validity and Reliability

Validity: The construct validity of the scale was confirmed by EFA and CFA. Content validity was evaluated with the Lawshe technique based on expert opinions. In addition, criterion validity was assessed by examining the correlations of the scale with different digital addiction measures in the analyses conducted with the data collected from 74 participants.

Reliability: The internal consistency of the scale was evaluated with Cronbach's alpha coefficient. Cronbach's alpha values for all sub-dimensions were above 0.70, which indicates that the scale is reliable.

In addition to exploratory and confirmatory factor analyses, further validity tests were performed in order to evaluate the internal consistency and construct distinctiveness of the MDDS. Construct reliability (CR) and average variance

extracted (AVE) were calculated for each of the eight latent dimensions. All CR values exceeded or approached the 0.70 threshold, while AVE values ranged between 0.50 and 0.76, indicating satisfactory convergent validity. Discriminant validity was assessed using the Heterotrait-Monotrait Ratio (HTMT), a robust method recommended in recent SEM literature (Cheung et al., 2023). The HTMT values for all factor pairs were below the conservative threshold of 0.85, with the exception of Social Media and Viewing Addiction (HTMT = 0.871), a finding that was theoretically justified due to the conceptual and behavioural overlap in content consumption patterns. The findings of this study demonstrate that the MDDS evinces robust reliability, convergent validity, and satisfactory discriminant validity across its eight dimensions (See Table 1).

Table 1. Construct Reliability (CR) and Average Variance Extracted (AVE) Values for Each Dimension of the MDDS

Factor	Number of Items	Construct Reliability (CR)	Average Variance Extracted (AVE)
Social Media Addiction	6	0.594	0.510
Internet Addiction	6	0.788	0.522
Gaming Addiction	5	0.709	0.541
Phone Addiction	6	0.696	0.505
Video Addiction	6	0.734	0.516
Viewing Addiction	5	0.705	0.517
Online Shopping Addiction	5	0.718	0.505
Information-Seeking Anxiety	5	0.754	0.571

Findings

In this section, the development process of the Multidimensional Digital Addiction Scale developed within the scope of the research is discussed. The procedures and statistical information for the development of the scale are presented in a certain order.

Validity

Undoubtedly, conducting validity and reliability studies while developing a scale will not only make that scale reliable, but also help to look at it from a scientific perspective. In this context, the validity results of the adapted scale are presented under this title.

Structure Validity

Both exploratory factor analysis and confirmatory factor analysis were used for the construct validity of the adapted scale. In this context, firstly, Exploratory Factor Analysis (EFA) was used to test the construct validity of the scale.

Table 2. Explained Variance of Multidimensional Digital Addiction as a Result of EFA

Factor	***Total Explained Variance (%)***	***Cronbach's α***
Social Media Addiction	12.21%	.921
Internet Addiction	11.93%	.920
Gaming Addiction	10.70%	.927
Phone Addiction	9.52%	.942
Video Addiction	9.14%	.922
Viewing Addiction	8.29%	.904
Online Shopping Addiction	8.24%	.958
Information Search Anxiety	7.89%	.939
Total	77.91%	.968

According to the data in Table 2, eight factors explain 77.912% of the total variance in the explanatory factor analysis (EFA) of digital addiction. The first factor explained the highest variance with 12.212%, followed by factors explaining 11.932%, 10.699%, 9.520%, 9.136%, 8.288%, 8.235% and 7.889% variance respectively. These results show that digital addiction has a multidimensional structure and these eight factors explain a large part of the overall structure by representing different aspects of addiction. The fact that 77.912% variance was explained in total indicates that the model reveals important information about digital addiction and has a strong structure. For social sciences, the variance explained between 40% and 60% is considered sufficient (Şahin and Okan, 2024). According to Cronbach's Alpha values, the internal consistency coefficients of the subscales are as follows: .921 for Social Media Addiction, .920 for Internet Addiction, .927 for Gaming Addiction, .942 for Phone Addiction, .922 for Video Addiction, .904 for Viewing Addiction, .958 for Online Shopping Addiction and .939 for Information Search Anxiety. The total Cronbach's Alpha value of the scale is .968. These high internal consistency coefficients indicate that each sub-dimension and the overall structure of the scale are reliable and can consistently measure the multidimensional structure of digital addiction. These findings support the usability and validity of the scale in research. The generally accepted value in Social Sciences is expected to be .70 and above (Büyüköztürk, 2015). This shows a good result in terms of the reliability of the items of the Multidimensional Digital Addiction scale.

According to the analysis, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was found to be 0.933, indicating that the data set is very suitable for factor analysis. As the KMO value approaches 1, it is considered perfect, and if

it is below 0.50, it is considered unacceptable (Tavşancıl, 2010). The chi-square value of Bartlett's Test of Sphericity was reported as 11808.659, the degree of freedom was 990 and the p value was 0.000. These results indicate that there is sufficient correlation between the variables and that factor analysis is appropriate. In short, both KMO value and Bartlett's test indicate that the data form a strong basis for factor analysis and the results of the analysis are reliable.

Table 3. Load Values of Multidimensional Digital Addiction Scale Items

Items	*1.*	*2.*	*3.*	*4.*	*5.*	*6.*	*7.*	*8.*
m40	.827							
m41	.812							
m43	.791							
m39	.764							
m45	.750							
m44	.740							
m42	.732							
m37		.877						
m36		.872						
m35		.872						
m34		.869						
m38		.869						
m33		.759						
m16			.882					
m14			.878					
m12			.860					
m13			.812					
m11			.811					
m15			.764					
m21				.788				
m17				.787				
m19				.770				
m18				.748				
m20				.632				
m23					.786			
m26					.763			
m22					.713			
m25					.665			

Items	*1.*	*2.*	*3.*	*4.*	*5.*	*6.*	*7.*	*8.*
m24					.636			
m3						.787		
m5						.741		
m4						.736		
m2						.696		
m1						.693		
m10							.748	
m8							.716	
m6							.692	
m7							.637	
m9							.597	
m31								.806
m30								.753
m29								.721
m32								.654
m28								.515

Table 3 shows the loading values of the items of the Multidimensional Digital Addiction Scale with an eight-factor structure. In the first factor, the highest load value belongs to item m40 with 0.827 and the lowest load value belongs to item m42 with 0.732. In the second factor, items m37 and m36 have the highest loading values with 0.877 and 0.872, while item m33 has the lowest loading value with 0.759. In the third factor, the highest load value belongs to item m16 with 0.882 and the lowest load value belongs to item m15 with 0.764. In the fourth factor, item m21 has the highest load value with 0.788 and item m20 has the lowest load value with 0,632. In the fifth factor, the highest load value belongs to item m23 with 0.786 and the lowest load value belongs to item m24 with 0.636. In the sixth factor, item m3 has the highest load value with 0.787 and item m1 has the lowest load value with 0.693. In the seventh factor, the highest load value belongs to item m10 with 0.748 and the lowest load value belongs to item m9 with 0.597. Finally, in the eighth factor, item m31 has the highest loading value with 0.806 and item m28 has the lowest loading value with 0.515. The total score can be used in the scale or each sub-dimension can be calculated separately. These results reveal that each factor represents different dimensions of digital addiction and the loading values of the items in each dimension vary. Subsequently, a confirmatory factor analysis (CFA) was conducted to assess the construct validity of the scale. The results of the CFA are presented in Figure 1.

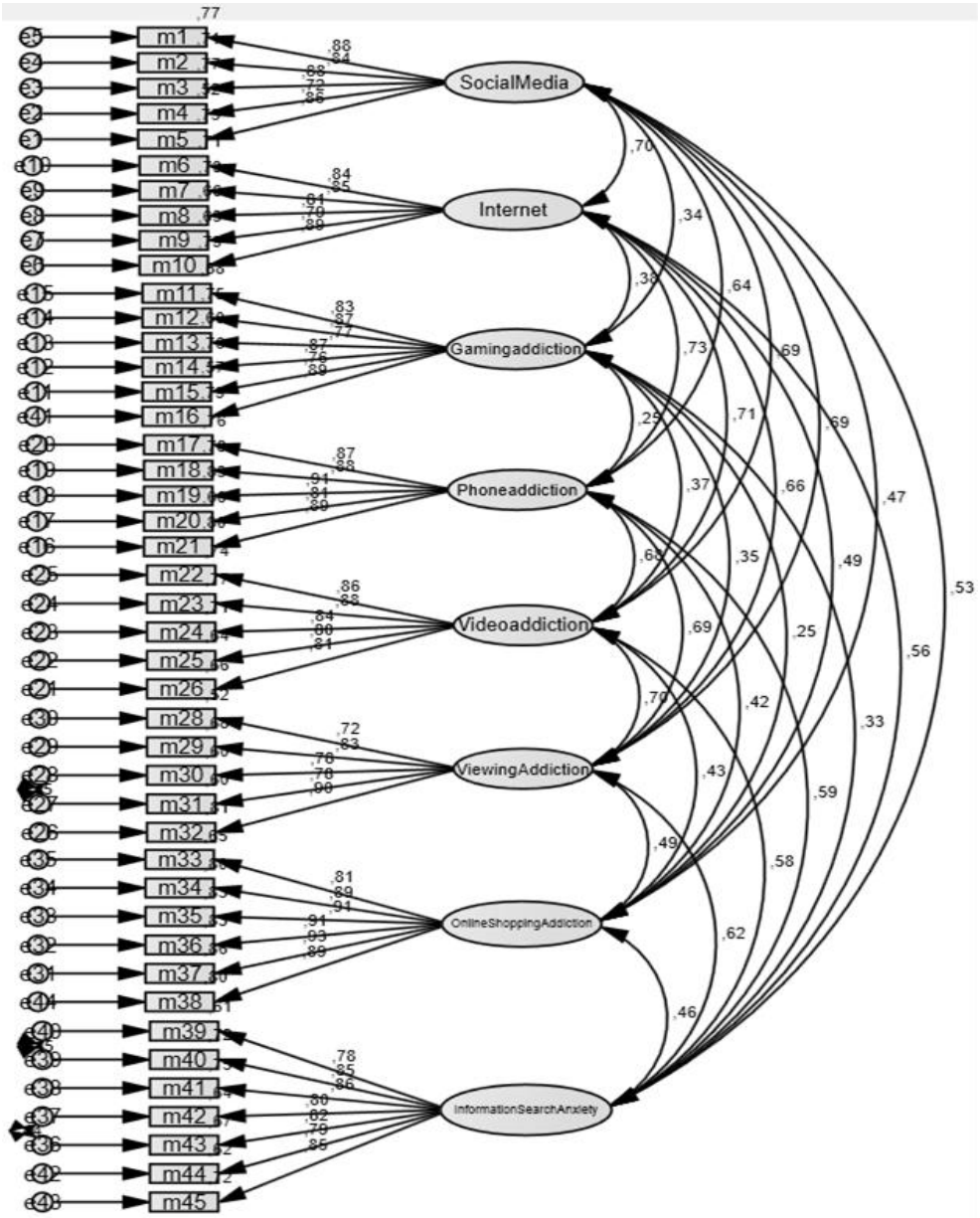

Figure 1. Confirmatory Factor Analysis Path Diagram
of Multidimensional Digital Addiction Scale (Şahin and Okan, 2024)

The Confirmatory Factor Analysis (CFA) path diagram of the multidimensional digital addiction scale above shows that digital addiction has an

eight-factor structure. Each factor is represented by specific items, and the factor loadings strongly reveal their relationship with these items. For example, the "Social Media" factor has high loadings with items m1, m2, m3, m4 and m5 (between 0.77 and 0.88), while the "Internet" factor has similarly high loadings with items m6, m7, m8, m9 and m10 (between 0.72 and 0.86). The other factors similarly have strong loading values with their own items: "Gaming Addiction" (m11-m16), "Phone Addiction" (m17-m21), "Video Addiction" (m22-m26), "Viewing Addiction" (m27-m32), "Online Shopping Addiction" (m33-m38) and "Information Search Anxiety" (m39-m45). Moreover, the correlations between the factors show that different dimensions of digital addiction are interrelated. These results reveal that the scale offers a valid and reliable structure and that digital addiction should be considered in a multidimensional structure.

Table 4. Comparison of Standard Goodness of Fit Criteria and Research Results (Schermelleh-Engel, 2003; Şahin and Okan, 2024).

Fit Dimensions	Good Fit	Acceptable Compliance	Concordance Values Obtained in the Study
c2/df	$0 \leq c2/df \leq 2$	$2 \leq c2/df \leq 3$	2.453
RMSEA	$0 \leq RMSEA \leq 0.05$	$0.05 \leq RMSEA \leq 0.08$	0.075
SRMR	$0 \leq SRMR \leq 0.05$	$0.05 \leq SRMR \leq 0.10$	0.092
NFI	$0.95 \leq NFI \leq 1.00$	$0.90 \leq NFI \leq 0.95$	0.925
CFI	$0.95 \leq CFI \leq 1.00$	$0.90 \leq CFI \leq 0.95$	0.938
GFI	$0.90 \leq GFI \leq 1.00$	$0.85 \leq GFI \leq 0.90$	0.889
RFI	$0.90 < RFI < 1.00$	$0.85 < RFI < 0.90$	0.915

The eight-dimensional and 44-item structure of the Multidimensional Digital Addiction Scale was subjected to a Confirmatory Factor Analysis (CFA), the results of which are presented in Table 4. The obtained fit indices were deemed to be acceptable (X2/*sd*=2.453; $p<.001$; RMSEA=0.075; SRMR=0.092; NFI=0.925; CFI=0.938; GFI=0.889; RFI=0.915). The values considered appropriate by Schermelleh-Engel et al. (2003) and the fit indices of the study are listed in the table above. According to these results, the fit indices obtained in the study are within acceptable limits. The X2/*sd* value is within acceptable limits of fit with 2.453. The RMSEA value of 0.075 is within the acceptable fit range and indicates that the model shows excellent fit. SRMR value is within the acceptable limits with 0.092. NFI (0.925), CFI (0.938) and RFI (0.915) values are also in the acceptable fit range and indicate that the model shows a good fit. The GFI value of 0.889 is within the acceptable fit limit and supports the general fit of the model. These fit indices indicate that the eight-dimensional structure of the Multidimensional Digital Addiction Scale is valid and reliable. Several error terms were allowed to correlate based on both modification indices and theoretical rationale, such as shared item

wording or content overlap. For instance, items addressing passive content consumption (e.g., watching videos, browsing feeds) may reflect common method variance and therefore justified correlated residuals.

Criterion Validity of the Scale

Table 5 shows the correlations between the sub-dimensions of the Multidimensional Digital Addiction Scale (MDDS) and Mobile Phone Addiction Scale (Mobile Phone Addiction Scale). The results reveal that the sub-dimensions of the Multidimensional Digital Addiction Scale show significant positive correlations with the Mobile Phone Addiction Scale. In particular, there are strong relationships between Social Media Addiction and Phone Addiction (r = .874, p < .05) and between Internet Addiction and Phone Addiction (r = .510, p < .05). Other sub-dimensions, such as Video Addiction (r = .767, p < .05) and Viewing Addiction (r = .705, p < .05), also showed significant relationships with the Phone Addiction Scale. These findings support that the MDDS is appropriate in terms of criterion validity and that different dimensions of digital addictions are related to phone addiction. This is an important indicator that strengthens the validity of the scale.

Table 5. The Relationship Between Multidimensional Digital Addiction and Mobile Phone Addiction Scale Subscales

Variables	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***
Mobile Phone Addiction	1	,494*	,510*	,292*	,874*	,350*	,510*	,322*	,293*
Social Media Addiction		1	,807*	,341*	,510*	,788*	,871*	,658*	,648*
Internet Addiction			1	,244*	,394*	,725*	,768*	,561*	,568*
Gaming Addiction				1	,343*	,324*	,347*	,366*	,322*
Phone Addiction					1	,400*	,528*	,311*	,276*
Video Addiction						1	,767*	,545*	,561*
Viewing Addiction							1	,576*	,705*
Online Shopping Addiction								1	,517*
Information Search Anxiety									1

*P<,001

Reliability

Cronbach Alpha (α) internal consistency coefficients were analysed to calculate scale reliability. The findings related to these are presented in Table 1.

Conclusion, Discussion and Suggestions

Discussion

This study evaluated the validity and reliability of the "Multidimensional Digital Addiction Scale" (MDDS) developed to understand the multidimensional structure of digital addictions. Multidimensional Digital Addiction Scale (MDDS) is a comprehensive measurement tool covering eight sub-dimensions of digital addiction (Social Media Addiction, Internet Addiction, Gaming Addiction, Phone Addiction, Video Addiction, Tracking Addiction, Online Shopping Addiction and Information Seeking Anxiety). The findings of the study showed that this scale is a valid and reliable measurement tool.

Multidimensional Structure of Digital Addiction

The results of the research show that digital addiction is not limited to a single dimension, on the contrary, it can occur in many different types of digital platforms and behaviours. This finding coincides with other studies in the literature that digital addictions cannot be handled in a single category (Eriksen et al., 2023; Kessling et al., 2023; Kuss & Griffiths, 2017; Montag et al., 2015). For example, different types of digital addictions, such as social media addiction and gaming addiction, are each associated with different psychosocial outcomes and risk factors (Andreassen et al., 2013; Griffiths, Kuss, & Demetrovics, 2014). Therefore, taking a holistic approach to digital addictions and comprehensively assessing the different aspects of these addictions is critical for developing effective intervention strategies.

Social Media and Internet Addiction

Social media and internet addiction are the most common and most studied dimensions of digital addictions. Social media addiction is defined as individuals' uncontrolled use of social media platforms, which has negative effects on psychological and social functioning (Andreassen et al., 2017). Internet addiction, on the other hand, is associated with problems such as social isolation and low academic performance resulting from excessive and uncontrolled use of the Internet (Kuss & Griffiths, 2012; Young, 1998). In our study, it was observed that these dimensions could be measured in a valid and reliable way, which emphasises the critical role of these dimensions in digital addiction research.

Game and Telephone Addiction

Gaming addiction is a common and growing concern, especially among young people. It is known that gaming addiction has serious consequences such as low academic achievement, sleep disorders, and deterioration in social relationships (Green et al., 2021; Lemmens, Valkenburg, & Peter, 2009; Pontes & Griffiths, 2015).

Phone addiction has become an important problem, especially with the widespread use of smartphones. Studies show that phone addiction is associated with psychological problems such as distraction, social isolation, and increased anxiety levels (Elhai et al., 2016; Billieux et al., 2015). In this study, both dimensions were measured in a valid and reliable way and provided important data in understanding the relationships between different dimensions of digital addictions.

Video and Viewing Addiction

Video and viewing addiction has attracted more attention with the increasing consumption of online content. These types of addictions cause individuals to experience impairments in social, academic, or occupational functioning as a result of excessive consumption of online videos or series (Sung, Kang, & Lee, 2018). This study shows that video and viewing addictions also have an important place in the digital addiction spectrum and that these addictions can also be validly measured with the MDDS.

Online Shopping Addiction and Information Search Anxiety

Online shopping addiction is characterised by individuals' inability to control their online shopping behaviour, which leads to financial and psychological problems (Rose & Dhandayudham, 2014). Information seeking anxiety, on the other hand, is defined as a state in which individuals experience intense anxiety and stress during the process of searching for information over the internet (Case & Given, 2016). In this study, both types of addictions were measured validly and reliably, and the diverse and multidimensional nature of digital addictions was underlined.

The results of the MDDS can be interpreted at both the overall scale level and the subscale level. It is evident that elevated scores on each subdimension are indicative of a propensity towards particular digital addictive behaviours. For instance, an elevated score on the Online Shopping Addiction Scale may be indicative of compulsive and uncontrolled online purchasing as a coping strategy. Practitioners can utilise individual subscale scores to customise specific interventions based on a client's most salient risk areas. While gender was not a focal variable in the present study, preliminary comparisons revealed no statistically significant gender differences across subscales. However, further exploration is warranted in future studies, with a view to investigating gender-based patterns in digital addiction.

The present study makes a theoretical contribution to the existing literature by conceptualising digital addiction as a multidimensional construct, thus extending the scope of traditional unidimensional approaches. In practice, the MDDS can function as a diagnostic and psychoeducational instrument for clinicians, school counsellors, and mental health professionals. To illustrate this point, consider a counsellor working with adolescents who exhibit high scores in the Social Media and Information Seeking Anxiety subscales. In such a case, the counsellor would be

able to focus on the establishment of digital boundaries and the identification and addressing of underlying cognitive distortions related to constant connectivity. Furthermore, educational institutions can utilise the MDDS to screen for high-risk behaviours and implement preventative interventions tailored to specific digital domains.

Limitations of the Study

This study has some limitations. Firstly, the sample consisted only of individuals in emerging adulthood, so the findings cannot be generalised to other age groups. Secondly, the study is based on self-reported data, which means that factors such as social desirability bias may influence the results (Podsakoff et al., 2003). Finally, since the study was conducted with participants from Turkey only, the effects of cultural differences on digital addiction were not fully assessed. Despite the inclusion of participants from multiple universities in the sample, the data were predominantly gathered from undergraduate students in Turkey, which may limit the generalizability of the results. The socio-economic distribution was concentrated within middle to upper-middle-class groups, and the geographical representation was primarily urban or semi-urban. It is recommended that future studies encompass a more extensive sample of the population, including individuals from diverse geographical locations, various age groups, and a range of socio-economic backgrounds. Furthermore, while gender-based and cultural comparisons were not the primary focus of the present study, they are recommended for future research to further validate the multidimensional structure of the MDDS.

Conclusion

In conclusion, the Multidimensional Digital Addiction Scale (MDDS) demonstrates strong psychometric properties and provides a robust, evidence-based tool for assessing digital addiction across eight domains. By capturing the distinct forms of digital dependency, the scale enables practitioners and researchers to understand and address the complexity of technology-related behavioural issues. Its practical utility lies in identifying individuals' risk areas and guiding targeted interventions, particularly in clinical, educational, and preventive settings. Future studies are encouraged to expand the scale's application across cultures and demographic groups to further refine its predictive and diagnostic value.

Recommendations

1. **Suggestions for Future Research:** Considering the multidimensional nature of digital addiction, more research should be conducted in different age groups and cultural contexts. In addition, longitudinal studies may be

useful to examine the developmental processes of digital addiction and the long-term effects of these processes on individuals.

2. **Recommendations for Implementation:** Educators, psychologists and professionals struggling with digital addiction should develop customised intervention and training programmes for individuals, taking into account the different dimensions of digital addictions. Awareness programmes and trainings aimed at preventing digital addictions, especially among young people, should be expanded.
3. **Recommendations for Policymakers:** In order to reduce the impact of digital addictions on society, policy makers should develop legal frameworks to regulate the use of digital platforms and conduct campaigns to raise public awareness on this issue.

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THE IMPACT OF AI-MEDIATED THERAPY ON TREATMENT OUTCOMES IN AUTISM SPECTRUM DISORDER: A SYSTEMATIC REVIEW

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Abstract

Autism Spectrum Disorder (ASD) is a neurodevelopmental condition characterized by deficits in communication, cognition, and social behavior. This review evaluates the effectiveness of AI-mediated therapies in improving treatment outcomes for individuals with ASD.

A systematic search was conducted in Google Scholar and PubMed for studies published between 2015 and 2025, following PRISMA guidelines. Twenty-two studies met the inclusion criteria. Data screening, quality assessment using the Joanna Briggs Institute checklist, and statistical evaluation were performed.

AI-based interventions showed positive impacts on social interaction, adaptive behavior, and learning in individuals with ASD. Humanoid robots such as NAO and MARIA T21 improved emotional recognition, imitation skills, and motor coordination. AI-enabled mobile apps like Superpower Glass enhanced facial recognition and social engagement. IoT-integrated ABA therapy facilitated personalized interventions by tracking physiological and environmental parameters.

AI-mediated therapies significantly enhance treatment outcomes in ASD, particularly in social, cognitive, and behavioral domains. These technologies provide scalable, individualized approaches that may complement traditional therapy and support long-term development.

Keywords: Autism Spectrum Disorder, Artificial Intelligence, Social Interaction, Applied Behavior Analysis, Treatment outcomes, Motor Skills Disorder, Cognitive Skills, Robotics.

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Autism spectrum disorder (ASD), accounting for almost 1 in 54 children globally, is a neurodevelopmental condition that manifests as ineffective communication, lack of cognition and restricted social behaviors (Chowdhury et al., 2024; Zhang et al., 2022). The variation in clinical manifestations of the disease makes its diagnosis challenging (Klaiman et al., 2024). Traditionally, ASD was diagnosed by observing patients' behaviors and using subjective observational tools which led to diagnostic delays (Qin et al., 2024). Moreover, the treatment of ASD requires a comprehensive approach that targets patients' behaviors, learning skills, education as well as disease pathophysiology (Shi et al., 2021). The need for a comprehensive treatment plan for ASD creates difficulties for psychiatrists in developing personalized treatment plans for autistic children, negatively impacting the effectiveness of therapy and reducing the productivity of treatment in terms of behavioral outcomes (Shi et al., 2021).

Since the advent of artificial intelligence (AI) globally, the field of neurosciences has been revolutionized through the widespread use of AI in the diagnosis and treatment of neurodevelopmental disorders such as ASD (Moridian et al., 2022). Artificial intelligence-based diagnostic instruments have transformed early identification through examination of multimodal information, such as neuroimaging (fMRI, EEG), behavioral routines, and genetic signs. Machine learning algorithms attain a 90% success rate in differentiating ASD from neurotypical development by identifying biomarkers in patterns of brain connectivity and eye tracking (Jia et al., 2023; Wankhede et al., 2024). For example, deep learning algorithms used with functional MRI scans may identify unusual neural signatures in infants as early as 6 months, allowing interventions within key windows of neuroplasticity (Chowdhury et al., 2024; Jia et al., 2023). Such technologies bypass subjectivity and timeliness of traditional diagnosis tests like the Autism Diagnostic Observation Schedule (ADOS) (Chowdhury et al., 2024).

Clinical uses of AI are most promising in social skills development. Humanoid robots like Kaspar have been shown to be effective in enhancing communication and emotion detection by utilizing interactive scenarios that promote social reciprocity (Wankhede et al., 2024; Zhang et al., 2022). Augmented reality (AR) devices combined with AI algorithms feedback in real time while facilitating social interactions decreases anxiety and increase adaptive responses in clinical trials (Doulah et al., 2023; Zhang et al., 2022). Physiological sensor wearables and machine learning classifiers are now enabling real-time monitoring of stress

indicators such that caregivers may foresee meltdowns through predictive modeling (Vignapiano et al., 2024; Zhang et al., 2022). New studies highlight how AI-powered virtual reality environments advance theory of mind skill by 40% above conventional therapy in adolescents with ASD (Doulah et al., 2023; Wankhede et al., 2024).

AI has made customizable treatment planning possible by the capability of AI to combine heterogeneous data streams. Master Data Plan (MDP) architecture integrates genomic profiles, sensor readings from IoT, clinical histories and develops dynamic intervention models which continuously update themselves based on the personalized symptom severity of a patient as well as learning styles of choice (Vignapiano et al., 2024). This method has minimized treatment outcome variability in multicenter trials, especially among nonverbal participants who are helped by visual communication systems created by AI (Chowdhury et al., 2024; Vignapiano et al., 2024). Neuro-GPT EEG and other multimodal interfaces now integrate neural data with behavioral outputs to tailor therapy timing and content presentation (Vignapiano et al., 2024).

International research collaboration has hastened such innovations, with the United States (164 studies), China (90 studies), and India (65 studies) being top producers of AI-ASD research (Chowdhury et al., 2024). Stanford University and McGill University have been at the forefront of machine learning techniques for use in finding biomarkers for ASD, while new technologies such as brain-computer interfaces have exhibited promising potential in improving cognitive flexibility (Chowdhury et al., 2024; Jia et al., 2023). Yet, challenges still exist around algorithmic bias against diverse populations as well as clinician translation of research prototypes (Jia et al., 2023; Wankhede et al., 2024). AI diagnostic models remain prospectively validated in real-world environments only by 12%, highlighting the lack of strong multiethnic datasets as well as frameworks for clinician-AI collaboration (Jia et al., 2023; Vignapiano et al., 2024).

Multiple AI technologies have been developed and utilized till now which have shown effectiveness in early diagnosis of disease, predicting the disease course and affecting the treatment outcomes of autism with variable results targeting variety of personal skills in children with autism. This systematic review aimed to summarize the literature describing use of AI technology in improving treatment outcomes in ASD in recent decade.

Methodology

Study Registration

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were followed in reporting this systematic review and meta-analysis, which was carried out in accordance with a protocol created in advance and registered with the Prospective Register of Systematic Reviews (PROSPERO) (http://www.crd.york.ac.uk/PROSPERO/) under registration number: CRD42025644815.

Search Strategy

The literature was searched from January 2015 to January 2025 by using Google Scholar and Pubmed as search engines. “Artificial intelligence”, “machine learning”, “deep learning”, “autism spectrum disorder” and “treatment outcomes” were used as keywords while using MeSh terms and Boolean operators (AND/OR). All the articles describing effect of AI technology on treatment outcomes in autism and published in English language were included in this study. Studies describing the role of AI in diagnosing autism or predicting treatment outcomes were not included in this review. Moreover, we excluded animal studies, all types of reviews, documentaries, editorials, letter to editors, non-English language literature and studies without free access. Duplicates from search literature were removed manually. Snowballing method was applied to references of recruited articles to expand our research.

Data Screening

The screening of recruited data was done in accordance to PRISMA (Institute, 2020). A total of 2774 searches were obtained by using defined search strategy. After removal of duplicates, 2706 studies were included in data screening. Search strategy is summarized in Figure 1.

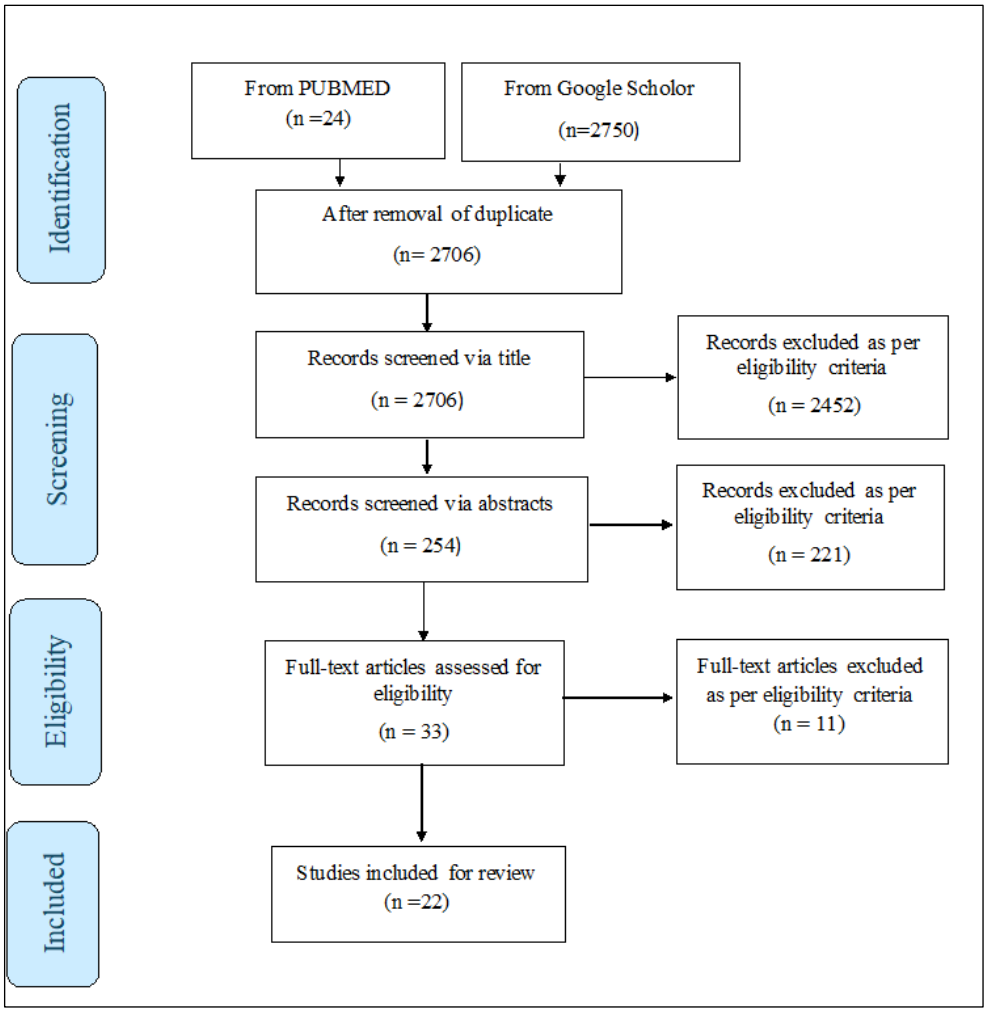

Figure 1. Schematic Presentation of Search Strategy

Quality Assessment

The quality assessment of the articles included was done using Joanna Briggs Institute (JBI) checklist of critical appraisal. The results of critical appraisal were classified as selection bias, performance bias, attrition bias, detection bias and reporting bias. The overall risk of bias was low in majority of the studies included. The results of critical appraisal of included studies are shown in Figure 2.

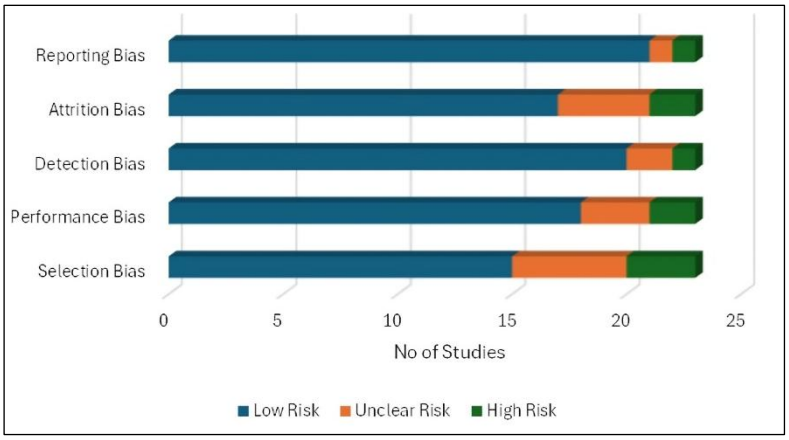

Figure 2. Quality Assessment of Included Studies

To ensure a more robust evaluation, we further examined each study's methodological rigor, noting that randomized controlled trials (RCTs) comprised 41% of included studies, providing stronger internal validity. However, several studies utilized mixed-method or qualitative designs, which, while valuable for contextual insights, lacked blinding or standardized outcome metrics, potentially introducing bias.

Additionally, we performed a cross-sectional comparative analysis of the methodologies applied across different AI modalities. Robotics-based interventions, particularly those using humanoid robots like NAO, generally incorporated structured protocols and objective behavioral measures. In contrast, mobile app-based interventions such as Superpower Glass employed digital tracking and wearable sensors, offering real-time quantitative data but were often conducted over shorter durations. IoT-enhanced ABA therapies, although innovative in integrating physiological monitoring, relied heavily on environmental variables and lacked uniformity in intervention duration and intensity.

Data Extraction and Analysis

A total of 22 articles were included in our systematic review after data screening. The cumulative sample size was 487. Most of the study participants were males accounting for almost 52% of sample size whereas gender was not discussed in almost 32% of included studies. The gender distribution of study participants is provided below in figure 3.

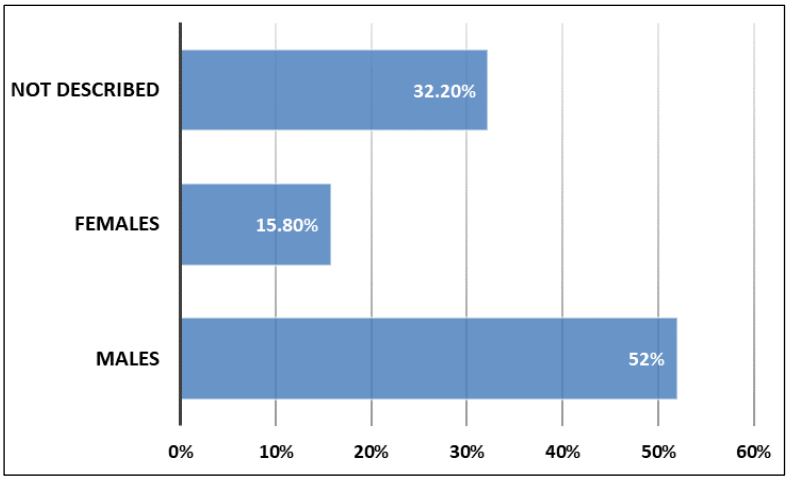

Figure 3. Gender Distribution of Study Participants

The author's name, year of publication, type of research, sample size, age (mean/ranges), type of intervention done and duration of intervention was recorded in Table 1. Additionally, study outcomes, assessment tools, and findings were recorded in Table 2.

Table 1. Summary of Included Studies

Author	Year	Type of study	Sample Size	Mean Age/ Range	Intervention	Duration of Intervention
(So et al., 2018)	2018	RCT	45	4-6	Robot-based gestural training sessions (NAO)	9 weeks
(Yun et al., 2017)	2017	RCT	15	4-7 5.75±0.89 (TG) 6.32±1.23 (CG)	Robotic behavioral intervention programs (iRobiQ and CARO)	8 session, 30-40 min each
(Conti et al., 2021)	2018	Mixed-method	6 Only males	104.3±18.6 months	Robot-assisted imitation training (NAO)	3 months
(Srinivasan et al., 2015)	2016	Pilot RCT	36 32 females 4 males	5-12	Rhythm and Robotic Interventions (NAO and Rovio)	8 weeks (4 session/week)
(Costescu et al., 2017)	2017	RCT	27 20 males 9 females	6-12 8.7±1.8	Robot-Enhanced Cognitive behavior therapy (Keepon)	6 weeks (2-hourly session)
(Lyu et al., 2024)	2024	Pilot Mixed-method	24 21 males 3 females	6.0±2.3	social-emotional game (EMooly)	40 mins

Author	Year	Type of study	Sample Size	Mean Age/ Range	Intervention	Duration of Intervention
(Wong et al., 2021)	2021	User Study with IoT-Enhanced ABA	15 11 males 4 females	7-16	ABA therapy via 3i learning system	10 week
(Clabaugh et al., 2019)	2019	Single-case study model	17 15 males 2 females	3-8	Socially Assistive Robots (SPRITE)	30 days
(Chung, 2021)	2020	Quasi-experimental time-series design	15	5-11	Robotic educational programme (NAO)	12 weeks
(Voss et al., 2019)	2019	RCT	71 63 males 8 females	8.38±2.46	Superpower Glass intervention	6 weeks
(Herrero-Martín et al., 2024)	2024	Mixed-method pilot study	11	5-13	Interactive Robotic intervention (NAO)	-
(Ali et al., 2020)	2020	Preliminary longitudinal study	8	3-10	Standardized multi-robot therapy (NAO)	10 Weeks
(Telisheva et al., 2022)	2022	Case-by-case analysis	34 32 males 2 females	3-12	Robot-Assisted Therapy (NAO)	10 Days
(Ilijoski et al., 2022)	2022	Quantitative Evaluation	20	23-76 M	Robot-Assisted therapy (Kaspar) robot, complemented by a web and mobile application	-
(Fachantidis et al., 2020)	2020	robot-mediated intervention study	22 14 males 8 females	9.9	3D LEGO robot bicycle model	5 Months
(Urdanivia Alarcon et al., 2021)	2021	**qualitative study**	3	9-13	Robot-Assisted Therapy (NAO)	**3–4 sessions**, with each session lasting **2–5 minutes**.
(Feng et al., 2022)	2022	Pilot Study	16	11.73 & 10.22	Robot-Assisted Therapy (NAO).	8 Months

Author	Year	Type of study	Sample Size	Mean Age/ Range	Intervention	Duration of Intervention
(Silva et al., 2019)	2019	Preliminary comparative study	23 21 males 2 females	5-10 >20	Robotic dog (Zoomer dog from SpinaMaster)	three test sessions) one per experimental condition) separated by a one-week "wash-out" period
(Alnafjan et al., 2024)	2025	Experimental study	7 6 males 1 female	5 to 9	Deep learning-based imitation detection system (NAO robot)	3 weeks (30 sessions)
(Panceri et al., 2021)	2021	Pilot study	6 5 males 1 female	4 to 12	social robot integrated with the concept of Serious Games (MARIA T21)	-
(Zhang et al., 2019)	2019	RCT	40 5 females 35 males	ASD:5.08-8.83 (6.79±0.93) CG: 5.24–7.32 (6.35±0.56)	Robot-Assisted Therapy (Distrust and deception games played by NAO)	25 min
(Bharatharaj et al., 2017)	2017	RCT	24	6-16 9.71±3.24	Robot-Assisted therapy (KiliRo)	49 days

Table 2. Treatment Outcomes in Included Studies

References	Outcomes	Assessment Tool	Findings
(So et al., 2018)	Accuracy of gestural production Verbal imitation	Gesture recognition tests	Improved Gestural production and verbal imitation
(Yun et al., 2017)	Eye contact, Facial emotional recognition	Eye contact tracker	Improved eye contact; similar facial emotion recognition
(Conti et al., 2021)	Gross motor skills	TEACCH assessment	Improved Gross Motor Imitation skills
(Srinivasan et al., 2015)	Gross motor skills, imitation, praxis, interpersonal synchrony	BOT-2 (Bruininks-Oseretsky Test of Motor Proficiency), imitation error score, custom-developed test activities	Enhanced body coordination and facilitated interpersonal synchrony. Fine motor skills showed improvement within the control group.
(Costescu et al., 2017)	Social knowledge, Beliefs (Rational, Irrational), Emotional intensity, Adaptive behaviors	frequency of correct strategies to be used in a social situation, frequency of used	Enhancements in rational beliefs and a decrease in emotional intensity; however, no notable differences in adaptive

References	Outcomes	Assessment Tool	Findings
		rational beliefs or irrational beliefs, emotional intensity rating scale, frequency of using adaptive and dezadaptive behaviors	behavior or social knowledge
(Lyu et al., 2024)	Social emotional involvement	Self-structured questionnaire and interview	Improved social-emotional involvement
(Wong et al., 2021)	Task mastery, Teacher reception	Behavior Interventions Rating Scale (BIRS)	IoT-ABA system is effective in improving task mastery and have good teacher reception.
(Clabaugh et al., 2019)	Participant engagement, numerical operations, mathematical learning	Wechsler Individual Achievement Test (WIAT II)	Significant cognitive gains in intervention group
(Chung, 2021)	Eye contact, verbal initiation	Eye contact during communication, verbal initiation frequency	Improved eye contact (in frequency and duration) and verbal initiation
(Voss et al., 2019)	Adaptive functioning, facial engagement, emotional recognition	Vineland Adaptive Behaviours Scale socialization subscale, Developmental Neuropsychological Assessment, Second edition (NEPSY-II), Emotion Guessing Game (EGG)	improve social behavior, facial engagement and emotion engagement
(Herrero-Martín et al., 2024)	Language, social skills	Educator's assessment	Improved motivation level, social interaction and engagement
(Ali et al., 2020)	Improvement in multi-human interaction skills	human-human interaction (HHI),Childhood Autism Rating Scale (CARS)	Improved in social communication
(Telisheva et al., 2022)	Engagement, valence, smiling, affection, curiosity, aggression, stereotyped behaviors, and word count.	ELAN software for behavior coding. Likert scale for engagement and valence.	Improved engagement and socio-emotional outcomes.
(Ilijoski et al., 2022)	Personification of therapy and patient improvement	Multiple self-structured questionnaires	developmental evaluation showed positive changes in children's behavior and skills in less than half of included patients.

References	Outcomes	Assessment Tool	Findings
(Fachantidis et al., 2020)	Development of social, communicational, and emotional skills, along with a reduction in challenging behaviors	Sociometric tests	Improved social and communication skills, Reduced challenging behaviours
(Urdanivia Alarcon et al., 2021)	Improvement in motor control, turn-taking skills, and emotional arousal detection, Expressivity reactions	instrument designed to evaluate facial, verbal, and body expressions, scored on a Likert scale (0–4).	Facilitated emotional expressiveness and imitation skills. However, the level of progress varied among participants, depending on their emotional state and familiarity with the robot.
(Feng et al., 2022)	Social interaction, Social communication	EDA signal analysis, video annotations, and a custom scoring system	Improved motor control and turn-taking skills, Results in Emotional arousal
(Silva et al., 2019)	Social communication behavior, parasympathetic activity	percentage of appropriate responses, emotional ratings, Time domains, frequency domains	Living dogs are particularly effective in promoting suitable social interactions and improving emotional regulation. robotic dogs do not provide the autonomic advantages.
(Alnafjan et al., 2024)	Imitation skills	Verbal Behavior Milestones Assessment and Placement Program (VB-MAPP) assessment tool	Enhanced imitation skills
(Panceri et al., 2021)	Social interaction	Goal Attainment Scale	Enhanced the interaction between the mind and body, thereby fostering improved adherence to therapy
(Zhang et al., 2019)	Distrust, deception, Anthropomorphic thinking, social learning	Performance scores, anthropomorphic thinking questions	Facilitated learning of social rules and showed that children's perception of the robot plays an important role in their social learning,
(Bharatharaj et al., 2017)	Social interaction, learning, physiological effects	Social network density, letter and number recognition score, Mean protein and amylase levels, blood pressure, Heart rate, and SPO2	improved learning and social interaction abilities, and reduced stress levels, no physiological change

To better understand relative effectiveness, we compared the three major categories of AI tools used:

- **Humanoid Robots (e.g., NAO, MARIA T21):** These demonstrated strong improvements in imitation, emotional expression, and motor coordination across diverse cultural settings. Most robot-based studies had medium-to-high quality scores and employed standardized assessments such as BOT-2 and Vineland Scales.
- **Mobile Applications (e.g., Superpower Glass, Emooly):** These interventions were more accessible and cost-effective but often showed variability in adherence and limited long-term follow-up. Their strengths lay in portability and personalization, although some studies lacked control groups.
- **IoT-based ABA Systems (e.g., 3i Learning System):** These integrated real-time monitoring with behavioral feedback, enhancing ecological validity. However, they were constrained by the need for technical infrastructure and showed mixed methodological consistency across studies.

In addition to categorizing the AI modalities, we noted that several robotic interventions particularly those involving the NAO robot (Ali et al., 2020; Conti et al., 2021; So et al., 2018) utilized Wizard-of-Oz (WoZ) technology. In these setups, human operators controlled the robot behind the scenes to simulate autonomy, which may influence the intervention's perceived effectiveness and ecological validity. Differentiating WoZ-based designs from fully autonomous systems is important for interpreting outcomes and scalability.

Results

The AI interventions utilized in included studies is categorized into IOT-Enhanced Applied Behavioral Analysis (3i-Learning system, AI-mediated smartphone based therapy and robotics-assisted interventions). The distribution of type of AI-mediated autism therapy used and percentage of studies is provided in Figure 4.

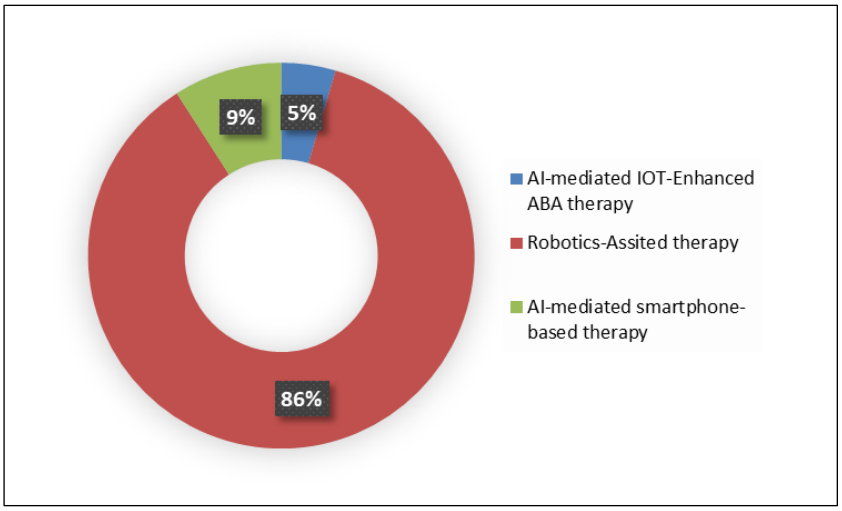

Figure 4. Types of AI-mediated Autism Therapy in Included Studies

Social and communication development was the most commonly observed treatment outcome in included studies followed by motor and physiological development, cognitive and behavioral adaptations and learning or academic performance as shown in Figure 5.

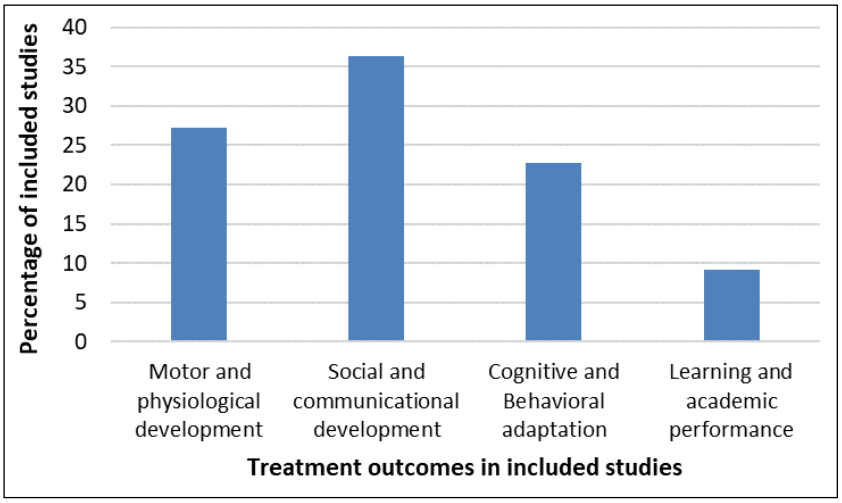

Figure 5. Distribution of Treatment Outcomes in Included Studies

IOT-Enhanced Applied Behavioral Analysis (3i-Learning system)

The integrated Intelligent Intervention- learning system (3i-learning system) is developed through synchronization of traditional Applied Behavioral therapy (ABA therapy) with the AI technology. It comprises of two-level integration with the first level targeting integration of parents and caregivers to the personalized educational plans for their children followed by second level integration focusing over AI and Internet-Of things (IoT) measurements (Clabaugh et al., 2019). It enables the parents and caregivers of children with ASD to monitor the progress of IOT-Enhanced ABA therapy in terms of task performance, environmental factors and physiological factors that may impact child learning performance. Moreover, it serves as an effective assistant of parents and caregivers with regards to developing personalized therapy plans to improve development and progress of system (Clabaugh et al., 2019). The 3i-learning system comprises of three core functional components including student-centered learning environment (SCLE) (Contexts, Tools, Resources and Scaffolds). Modularized learning object (physical or digital) and an emotion recognizer (IoT-based data collection device and an AI-device to detect emotions by detecting physiological factors) (Clabaugh et al., 2019).

A summary of the main studies evaluating IoT-Enhanced ABA interventions, their samples, tools used, and effect sizes is presented in Table 3.

Table 3. Summary of IoT-Enhanced ABA studies

Study	Sample	Tool Used	Effect Size / Outcome
(Wong et al., 2021).	15 students (7–16 yrs)	IoT-based sensors, task mastery assessments	86.7% task mastery; ~2 hrs per task; mean gain +5 points per session
(Clabaugh et al., 2019).	17 children (3–8 yrs)	Emotion recognizer (IoT, AI)	Personalized therapy; improved engagement and cognitive performance

In a study conducted with 15 students by Wong et al. (2021), it was found that 86.7% achieved mastery in at least one training task, while 59.6% of the tasks fulfilled the mastery criteria after an average of 3.86 sessions, equating to approximately 2 hours per task (Wong et al., 2021). The interventions resulted in stable gains in learning, with tasks showing a mean increase of 5 points per session. Additionally, AI-driven IoT-sensors monitored physiological and environmental variables, uncovering findings such as the detrimental effects of CO_2 levels on learning performance, as well as correlations between classroom temperature, Galvanic Skin Response (GSR), and skin temperature. This monitoring facilitated customized interventions, enhancing the learning environment for improved results. Even the teachers highlighted that the AI-enhanced therapy is effective in enhancing students' attention and ability to follow directions (Wong et al., 2021).

Robotics-assisted Interventions

Children with ASD often have difficulty interpreting nonverbal cues, making eye contact, expressing their emotions, and understanding others' feelings. They also struggle with imitation skills, using these behaviours less frequently than their typically developing peers. Imitation includes body movements, whispering, and facial expressions, which are essential for interaction with parents. Robots have played a supportive role in numerous human activities, including the rehabilitation of individuals with ASD. The integration of social or interactive robots into clinical settings shows potential for enhancing the social abilities of children diagnosed with ASD (Alnafjan et al., 2024; Bharatharaj et al., 2017; Feng et al., 2022; Zhang et al., 2019). A total of 11 types of robots have been used in included studies for robot-assisted therapy with NAO being the most frequently utilized humanoid robot i.e., used in approximately 52% of included studies. The percentage distribution of types of robots in included studies is provided below in Figure 6, and a structured summary of the main findings is presented in Table 4.

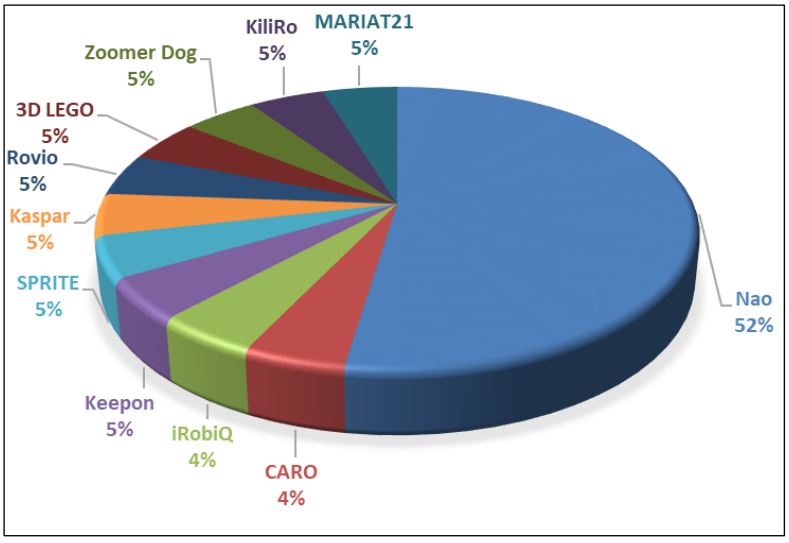

Figure 6. Percentage Distribution of Robots Used in Included Studies

Alnafjan et al. assessed the efficacy of robot-assisted intervention by NAO in improving imitation skills among children with ASD in relation to conventional therapy methods (Alnafjan et al., 2024). The Softbank Robotics NAO is a humanoid robot from SoftBank Group Corporation, featuring 25 degrees of freedom for diverse human-like movements. Its microphones have a sensitivity of 20 mV/Pa ± 3 dB at 1 kHz, with an input frequency range of 150 Hz to 12 kHz. The group that underwent robot-assisted therapy demonstrated an average enhancement in imitation skills of

17.14%, in contrast to the non-robotic group, which achieved a mere 2.86% improvement, despite numerous children encountering difficulties. The results for the robot-assisted group were consistently more favorable, as children in this cohort demonstrated greater accuracy in tasks such as imitating clapping. In addition, experts gave feedback that the children showed increased excitement, interest, and concentration in the robot-mediated sessions. The feedback included statements such as "the children look excited and cannot wait to see the robot following each session" and "we have not seen such enjoyment during previous sessions" (Alnafjan et al., 2024).

Various researches covered by this review have examined the influence of a humanoid robot, NAO, a robotic assisted treatment in ASD and reported high flexibility in terms of meeting needs of children with ASD (Ali et al., 2020; Bharatharaj et al., 2017; Costescu et al., 2017; Feng et al., 2022; Ilijoski et al., 2022; Panceri et al., 2021; Silva et al., 2019; Srinivasan et al., 2015; Telisheva et al., 2022; Voss et al., 2019; Yun et al., 2017). NAO, with the size-weight measurement of about 58 cm and 5 kg and 25 degrees of freedom, is a humanoid robot that ensures stability and nimble movements through the utilization of inertial navigation system. In addition, it can detect and navigate obstacles in the surrounding environment accurately (Bharatharaj et al., 2017).

Feng et al. (2022) stable turn-taking skills and motor task accuracy in almost 67% and 70% of study participants in 50 sessions respectively by using NAO-based music therapy as well as a significant improvement in emotional arousal when detected by electrodermal activity signals (Feng et al., 2022). Similarly, Alarcon et al. have put emphasis over the impact of NAO-assisted video-based interventions on enhancing the expressiveness of children (body, verbal and facial) while using pre-recorded video sessions (Urdanivia Alarcon et al., 2021). Zhang et al. (2019) assessed the mechanism of acquiring complex social skills by using robot-assisted game therapy designed on the principles of distrust and deception in children with ASD and found that autistic children skills to distrust and deceive social robots in comparison to control group yet these children exhibited exceptional performance in learning to distrust a robot compared to a real person, especially during the initial stages of the distrust task. These finding support the nuances in acquiring social skills among children with and without autism (Zhang et al., 2019). Similarly, So et al. (2018) noted a significant improvement in gesture performance score in children suffering from ASD while using robot-assisted therapy by NAO i.e., 41% improvement with $p < 0.001$ (So et al., 2018).

MARIA T21 is a socially assistive robot, with a height of about 1.40 m, widely recognized in research due to the capabilities it carries in assisting effective adaptation to the needs of an autistic child. Its capacity for customization based on the therapeutic attitude allows it to function as a friend or a mentor. In addition, it is able to project visual stimuli on several surfaces while at the same time interacting with children and providing instructions and motivation to children with ASD

through music therapy and pre-recorded audio messages (Zhang et al., 2019). Panceri et al. tested the efficiency of the MARIA T21-based game therapy in enhancing therapeutic results for ASD children with Goal Attainment Scaling (GAS) of 8 to 10 with outstanding scores in some activities such as clapping verbal response. In addition, it enhanced therapists-children interaction by inducing a dynamic mind-body (Panceri et al., 2021).

The findings from Silva et al. (2019) reported that live dogs outperformed robotic dogs and no-stimulus condition in eliciting social communication behavior and cardiac autonomic activity among children (Silva et al., 2019). On the other hand, robotic dogs were as effective as live dogs in adults. Remarkably, children demonstrated a significantly higher percentage of correct responses when there were live dogs (68.65 ± 11.26) than when there were robotic dogs (48.00 ± 16.21; $p = 0.011$) or when there were no stimuli (34.38 ± 12.73; $p < 0.001$). In adults, the live dog (54.69 ± 13.94) and robotic dog (63.56 ± 13.19) conditions each elicited significantly better responses than the no-stimulus condition (32.38 ± 7.50; $p < 0.003$), and no significant difference was found between the live dog and robotic dog conditions (Silva et al., 2019). In terms of heart rate variability (HRV), the condition involving dogs demonstrated a greater level of parasympathetic activity, evidenced by notable enhancements in LnRR (dog: -0.47 compared to no stimulus: 0.16; $p = 0.043$), LnSDNN (dog: 0.228 versus no stimulus: -0.91; $p = 0.030$), and LnRMSSD (dog: 0.372 against robot: -0.099; $p < 0.001$). Additionally, there were significant increases in LnHFnu within the dog condition (5.668), which markedly surpassed the robot condition (-10.372; $p < 0.001$) and the no-stimulus condition (-7.824; $p = 0.005$). These results highlight the enhanced therapeutic advantages of live dogs in fostering social interaction and emotional regulation, especially among children, while robotic dogs present a viable, though less effective alternative (Silva et al., 2019).

Bharatraj et al. (2017) researched the benefit of KiliRo in improving learning and social interaction abilities, reducing levels of stress, and enhancing the physiological status in a group of 24 children with autism for a period of 49 days (Bharatharaj et al., 2017). KiliRo is a two degree of freedom social interactive robot divided into three segments classified as upper (head, eyes), middle (body, wings and tail), and lower (legs). KiliRo has two wireless cameras and a USB camera that provide a practically 270-degree field of vision, real time video streaming, and letter/number recognition utilizing QR codes.

Srinivasan et al. (2015) examined the effects of robotic and rhythmic interventions on ASD children's motor ability, imitation, and interpersonal synchrony. An 8-week randomized controlled trial was performed where a humanoid robot supported the robotic group in performing gross and fine motor imitation training (Srinivasan et al., 2015). The robot group performed significantly better than the standard-of-care group in both praxis skill ($p < 0.01$) and imitation ($p < 0.05$) based on outcomes, improved their gross motor coordination by 18.3%, and

interpersonal synchrony by 21.7%. Based on therapists' assessments, 86% of children showed sustained attention and enthusiasm when participating in the activities, where the children are shown to have been excited about the robotic training (Srinivasan et al., 2015).

The effectiveness of Robot-Enhanced Cognitive Behavioral Therapy (RET) in the treatment of children with ASD with dysfunctional emotional responses was measured by Costescu et al. through the use of Keepon (Costescu et al., 2017). Keepon is a rubber body snow-man like robot that sits on a dark cylinder containing motors and circuit boards. It allows four degrees of freedom of movement and assists in teaching adaptive behaviors in emotionally demanding social interactions and modifying irrational beliefs. There was an improvement in 78% of RET group children for better emotion regulation, and a statistically significant reduction in emotional intensity was seen (p = 0.02). Further, there was an appreciable enhancement in rational beliefs of RET group during Keepon use i.e., 13.46±8.88 vs 4.33±8.49, p=0.007).

To enhance social skills, a robotic behavioral intervention system that places priority on facial emotion recognition and eye contact was developed by Yun et al. (2017). 15 children aged 4 to 7 took part (Yun et al., 2017). Eye contact and facial emotion recognition were significantly improved in both groups; the robotic group's eye contact frequency increased by 32% ($p < 0.01$). Better social communication results were made possible using humanoid robots, which offered regular, predictable interactions that suited the children's preferences. To overcome accessibility and resource availability constraints, Ilijoski et al. (2022) extended robot therapy via web and mobile applications (Ilijoski et al., 2022). Their hybrid approach improved social skills and engagement by enabling remote, individualized therapy sessions for kids with ASD. The study found that when these digital tools were added to therapy, 92% of children demonstrated improved interaction, and therapists reported a significant decrease in scheduling conflicts.

Table 4: Summary of Robotics-assisted intervention studies

Study	Sample	Tool Used	Effect Size / Outcome
(Alnafjan et al., 2024).	7 children (5–9 yrs)	NAO humanoid robot	17.14% improvement in imitation vs 2.86% in controls
(Feng et al., 2022).	16 children	NAO robot (music therapy)	67% turn-taking, 70% motor accuracy, improved emotional arousal
(So et al., 2018).	45 preschoolers	NAO robot	41% improvement in gesture performance ($p < 0.001$)
(Panceri et al., 2021)	6 children (4–12 yrs)	MARIA T21	Goal Attainment Scale: 8–10 (high performance)

AI-mediated Mobile Device-based Therapies

Superpower Glass intervention is one effective AI-mediated mobile device-based autism therapy which improved facial recognition and facial engagement (Voss et al., 2019). In this therapy, smart glasses are synced with a smartphone application capable of classifying emotion via machine learning. According to Voss et al. there is a significant improvement in Vineland Adaptive Behaviours Scale socialization subscale score i.e., mean treatment impact of 4.58±1.62, $p = 0.005$ (Voss et al., 2019). Similarly, Lyu et al. (2024) utilized, a tablet based game, titled as Emooly (an integrated setup of GenAI and augmented reality) in autism therapy and observed significant improvement in social-emotional development of autistic children (Lyu et al., 2024). The details of these mobile device-based interventions are summarized in Table 5.

Table 5. Summary of Mobile Device-based intervention studies

Study	Sample	Tool Used	Effect Size / Outcome
(Voss et al., 2019)	71 children (8.4 ± 2.5 yrs)	Superpower Glass + Smartphone ML app	+4.58 ± 1.62 improvement in Vineland socialization (p = 0.005)
(Lyu et al., 2024)	24 children (6.0 ± 2.3 yrs)	Emooly (GenAI + AR) tablet game	Significant improvement in social-emotional development

Discussion

This systematic review demonstrates that AI technology can effectively enhance ASD treatment results for social interaction while also boosting learning behaviors and stress management together with motor coordination and enhancing cognitive skills. Implementation of AI in learning settings for children with Autism provides better personalized learning opportunities to students through individualized learning strategies. The programming capability based on algorithms of AI creates individualized learning programs which enhances children's engagement and understanding. Smith et al (2023) explained how implementation of AI technology in therapy sessions offers individualized therapeutic strategies which gets adjusted automatically as students exhibit varying learning styles (Smith et al., 2023).

Four of these studies in this systematic review proved that AI-based interventions were able to improve motor coordination and imitation skills in autism. This is supported in literature by Anum et al. (2024) who observed a significant improvement in motor skills learning outcomes of Elementary School Teacher Education (PGSD) by using AI (Anam et al., 2024).

One study in this review demonstrated the role of an AI-driven wearable digital intervention for improving social skills in children suffering from autism in

terms of facial engagement and emotion recognition. These findings are consistent to that of a study conducted by Özcan et al (2016) who proposed the effectiveness of transitional wearable companions in improving social skills in children with ASD. While explaining the logical reasoning behind this effectiveness, he stated that robots are controlled by an on-board computer (such as an Arduino board, which responds to the child's actions by emitting lights, sounds, and vibrations when the child acts on its touch or interactive sensors (Özcan et al., 2016).

However, a persistent gap in the current literature is the limited evidence supporting long-term effectiveness of AI-mediated interventions. While many studies demonstrate short-term gains (typically ≤ 12 weeks), few assess whether these improvements persist. For instance, Rakhymbayeva et al. (2021) conducted a month-long, in-home study with 11 children, demonstrating sustained engagement and maintained behavioral improvements over four weeks, but did not include follow-up assessments beyond the intervention period (Rakhymbayeva et al., 2021).

Complementing this, the work by Pakkar et al. (2020) and Clabaugh et al. (2019) involved month-long in-home engagements, revealing that robotic systems could personalize interactions and sustain attention across multiple weeks, yet both concluded with no long-term post-intervention follow-up (Clabaugh et al., 2019; Pakkar et al., 2019).

In addition to clinical efficacy and short-term feasibility, it is vital to assess the cost-effectiveness and accessibility of AI-based therapies for broader clinical adoption. AI-driven therapies have shown promising cost-effectiveness across various domains of healthcare. For example, AI-based mental health chatbots and digital therapeutics reduce costs by automating screening, triage, and support, enabling broader outreach with lower marginal expenditure per patient compared to conventional methods (Fulmer et al., 2018; Rollwage et al., 2022; Sapanel et al., 2023; Yadav, 2021). Economic evaluations demonstrate that AI-supported interventions in mental health, dermatology, dentistry, ophthalmology, and primary care generally outperform standard care or are at least cost-comparable, largely by optimizing resource utilization, minimizing unnecessary interventions, and streamlining workflows (Chang et al., 2021; Gomez Rossi et al., 2022; Khanna et al., 2022; Olawade et al., 2024). Decision-analytic studies in China show that hierarchical, AI-driven screening for cataracts is more cost-effective than both telescreening and conventional approaches in both urban and rural settings (Wu et al., 2024). Similar models in tuberculosis screening, cancer diagnostics, and clinical decision support consistently report improved outcomes and reduced per-patient costs, especially at scale (Olugbami & Ogundeko, 2025; Rao et al., 2025; Zhao & Yuan, 2025).

Scaling AI-driven therapies in resource-limited settings presents both promising opportunities and significant challenges. Notable success stories, such as AI-based tuberculosis detection in rural India and telemedicine initiatives in sub-Saharan Africa, demonstrate that cost-effective deployment is achievable when

cloud infrastructure, mobile technology, and community involvement are emphasized (Murrillo, 2024; Olugbami & Ogundeko, 2025). Key enablers of scalability include the use of cloud-based platforms that minimize local computing demands (Olugbami & Ogundeko, 2025), task-shifting and automation to reduce dependency on scarce specialized personnel (Wang et al., 2024), and targeted training programs that empower local healthcare workers to effectively use and interpret AI tools (Hafeez et al., 2024; Pillai, 2023). Nevertheless, barriers such as inadequate infrastructure, workforce shortages, inconsistent data quality, diverse regulatory frameworks, and the need for upfront investment persist (Chomutare et al., 2022; Pillai, 2023; Zhao & Yuan, 2025). To address these challenges, collaborative funding efforts from international donors and government bodies are essential to support initial implementation and ensure long-term sustainability (Murrillo, 2024; Olugbami & Ogundeko, 2025).

AI technologies can be adapted and implemented across diverse healthcare systems, but this process requires careful integration with local clinical workflows and electronic health record systems (Chomutare et al., 2022). Successful implementation depends on the clear identification of clinical objectives to ensure measurable outcomes, active engagement of stakeholders including clinicians, IT teams, and policymakers to address resistance and maintain relevance (Ahluwalia et al., 2025; Olugbami & Ogundeko, 2025), and continuous monitoring and validation to assess real-world performance and detect potential biases (Ahluwalia et al., 2025; Elvidge & Dawoud, 2024). Additionally, variations in legal frameworks, technology adoption rates, and standards of care can influence the speed and scope of AI integration across different healthcare settings (Pillai, 2023; Zhao & Yuan, 2025).

AI-driven therapy solutions offer promising opportunities to enhance healthcare equity and improve access for diverse populations; however, they may also risk reinforcing existing disparities if inclusivity is not intentionally embedded into their design. Key challenges include algorithmic bias, where systems trained on non-representative datasets may perform inequitably for underrepresented groups (Ahluwalia et al., 2025; Ferebee, 2025); the digital divide, which limits access for marginalized communities due to insufficient internet connectivity or device availability (Pillai, 2023; Zhao & Yuan, 2025); and the lack of cultural and linguistic sensitivity, which can hinder effectiveness if interventions are not adapted to local beliefs, languages, and health literacy levels (Ahluwalia et al., 2025; Olugbami & Ogundeko, 2025). To mitigate these issues, best practices recommend strategies such as diverse data collection, federated learning, culturally-aware design, and continuous algorithmic auditing (Ahluwalia et al., 2025; Ferebee, 2025). When such approaches are implemented, AI can play a transformative role in improving accessibility for individuals with disabilities and traditionally underserved communities (Atturu & Naraganti, 2024; Ferebee, 2025). Ultimately, while AI-driven therapies can reduce costs and offer scalable interventions, ensuring equitable access particularly in resource-limited or culturally varied contexts requires careful

and inclusive planning (Ahluwalia et al., 2025; Murrillo, 2024; Olugbami & Ogundeko, 2025; Wu et al., 2024).

However, ethical considerations surrounding AI use in ASD therapy warrant critical reflection. Given that the target population children with autism is especially vulnerable, issues like emotional impact, data privacy, and the risk of replacing human therapists must be carefully evaluated. Children with ASD may form attachments to robots or AI tools, leading to possible confusion between real human emotions and programmed responses (Sharkey, 2016). Such emotional dependence could hinder natural social development if not guided appropriately by human clinicians.

Another significant limitation observed in the reviewed studies is the lack of ethnic and cultural diversity among the participant samples. Most of the included studies did not specify the racial or ethnic composition of their cohorts, making it difficult to generalize findings across diverse populations. This homogeneity raises concerns about the cultural applicability of AI interventions, as effectiveness may vary due to sociocultural norms, linguistic differences, or varying levels of technological accessibility. Future research should prioritize the inclusion of multi-ethnic and cross-cultural populations to ensure that AI-mediated therapies are both effective and equitable across demographic boundaries.

Additionally, the use of AI requires extensive data collection, often including sensitive biometric, behavioral, and psychological information. Inadequate data protection practices pose significant privacy risks (Floridi et al., 2018). Many AI systems lack transparency and explainability, making it difficult for caregivers to understand how decisions are made. This black-box nature of AI increases the chances of algorithmic bias, which could exacerbate disparities in therapy access or outcomes across different socioeconomic or ethnic groups (Challen et al., 2019; Char et al., 2018).

Moreover, concerns have been raised about the potential overreliance on AI replacing qualified therapists. Critics emphasize that, although AI may simulate empathic responses, it "lacks the emotional depth and empathy necessary for effective psychotherapy", which are foundational to the therapeutic alliance (Salil et al., 2024). While AI can assist with screening or augmenting treatments, it cannot fully replicate genuine human empathy, intuition, and emotional responsiveness, and thus should be viewed as a support tool rather than a substitute for clinicians.

Consequently, ethical guidelines recommend human-AI collaboration, where AI enhances therapist efficiency but final decisions and emotional care remain under clinician oversight. Moreover, frameworks such as the Belmont Report and contemporary scoping reviews assert the necessity of informed consent protocols, ongoing clinician training, and robust regulatory structures to ensure data privacy, patient agency, and safety in AI-assisted mental health interventions (Cilar Budler & Stiglic, 2025).

The robot-assisted interventions in ASD by NAO, a humanoid robot, have been discussed in four studies included in this review. The findings of these studies confirm previous assessments by Kouroupa et al. (2022) who established that NAO-like robots produce better language development and interaction enhancements along with increased participation than traditional practices for autistic children (Kouroupa et al., 2022). NAO demonstrates its ability to teach children social skills using avatars according to Batool et al. (2024) through instruction in emotional understanding and sharing and eye contact. The system operates as a therapeutic device since its adaptable design lets therapists conduct developmental-supportive sessions for children with individualized targets (Batool et al., 2024)

Another study in this review found that real dogs delivered better results than robotic dogs when it came to boosting the parasympathetic system and emotional management in children. It is evident from literature that AI-driven interventions supply helpful resources to humans yet they do not replicate all advantages which occur when individuals interact with animals directly (Thakkar et al., 2024). According to Haladjian and Montemayor (2016) AI imitates attention processes yet fails to replicate both human emotional capacity and empathetic abilities (Haladjian & Montemayor, 2016). The utilization of physiological markers as stress evaluation tools represented a new approach in two studies performed included in this review. They proved robot-aided therapy generated important α-amylase enzyme activity reductions in saliva of children confirming their decreased state of stress. Moreover, they investigated external influences on the execution of a task such as CO_2 conditions within their study and proposed enhancements for therapy. The present findings augment those found previously by Thakkar et al. demonstrating how AI neurofeedback and biofeedback systems form individual abilities in order to control and observe biological reaction. By providing instantaneous feedback of heart rate and brain activity as well as other physiological signs, such systems allow a person to acquire self-regulatory skills for stress response control (Thakkar et al., 2024).

Conclusion

This systematic review presents the evidence of AI-supported interventions to improve therapy outcomes in ASD children, particularly motor skills, social communication, cognition, and tolerance to stress. AI-mediated interventions such as robotics-assisted therapy, Internet of Things-enhanced ABA, and AI-assisted mobile applications have reflected noteworthy improvements in social interaction, motor skills, and emotional interpretation. The application of tailored approaches facilitated by AI has the potential to personalize therapies to suit the particular needs of the individual, ultimately giving rise to improved motivation and learning. Though

challenges exist with standardization and validation, the potential for benefit through AI-facilitated interventions points toward a positive direction for future implementation and research in ASD treatment.

Limitations and Future Implications

Limitation exists within this research review method. Studied methodologies varied within the selected research including randomized controlled trials as well as case studies. The various experimental methods make it difficult to make direct comparisons and conduct meaningful statistical analyses which in turn lowers the findings' applicability to other situations. Future studies should emphasize on large-scale, longitudinal designs to confirm AI-mediated therapies for ASD. Future research must also emphasize on developing standardized protocols and sampling participants from diverse backgrounds at longer intervention lengths to monitor AI-based therapy development success. Moreover, the current body of literature reviewed suffers from a notable lack of demographic diversity, particularly in terms of ethnicity and cultural background. This limitation restricts the generalizability of findings across diverse populations. To enhance the inclusivity and relevance of AI-based interventions in ASD therapy, future studies must incorporate participants from varied ethnic, cultural, and socio-economic backgrounds. Ensuring demographic diversity is essential for understanding how AI tools perform in real-world, multicultural settings. Furthermore, incorporating real-time monitoring and feedback mechanisms could also further tailor treatment, enhancing outcomes. Moreover, ethical considerations, algorithmic bias, and accessibility is also important to ensure the equitable utilization of AI in ASD therapy.

Authors' Notes

Data Availability: The data presented in this study is available upon request from the corresponding author.

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CHILDHOOD MALTREATMENT, PSYCHOPATHOLOGY SYMPTOMS AND LIFE SATISFACTION: EXPLORING THE MEDIATING ROLES OF PRIORITIZING POSITIVITY AND POSITIVE AFFECT

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Abstract

Childhood maltreatment (CM) is a robust predictor of adverse mental-health outcomes. The psychological mechanisms underlying this relationship represent a crucial area of research that has received great support in recent years. However, few studies have explored the potential mechanisms pertaining to positive psychology. In this study, we investigated two potential candidates: prioritizing positivity (PP) and positive affect (PA). More specifically, we sought (1) to investigate the associations between CM, PP, PA, and two mental health outcomes (i.e., psychopathology symptoms and life satisfaction), and (2) to test the mediating roles of PP and PA in the association between CM and the two mental health outcomes. Participants (268; *M* age= 31.9; *SD*= 10.6) completed self-report measures on all variables. Findings indicated that CM was positively associated with psychopathology symptoms and negatively associated with PP, PA, and life satisfaction. Moreover, PP partially mediated the relationship between CM and both mental health outcomes. The mediating effect on both outcomes was partially explained by PA. These findings provide novel contributions by bringing support to the mechanistic involvement of PP in the relationship between CM and mental health. Future studies could explore specific interventions that may target PP.

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Childhood maltreatment (CM) is a prevalent and severe form of adversity that occurs during childhood and adolescence or while growing up. It includes both abuse (physical, emotional, and sexual) and neglect (physical and emotional), inflicted by an adult in the household, such as a parent, caregiver, or a person older than the child (Bernstein et al., 2003; Felitti et al., 1998). Over the years, research has indicated that different types of CM co-occur frequently, with the prevalence of multi-type maltreatment reported to range between 24% and 95% (Debowska et al., 2017; Herrenkohl & Herrenkohl, 2009). Some researchers propose that the concurrent experience of both abuse and neglect may exert a distinct qualitative influence on clinical outcomes, differing from the effects observed when these forms of maltreatment occur in isolation or accumulate independently (Witt et al., 2016). Epidemiological studies show that CM is a global issue, with worldwide prevalence rates ranging between 12.7% and 36.3%, accounting for different types of maltreatment (for a review see Stoltenborgh et al., 2015). CM is linked to serious economic and health burdens across all income levels and across different cultures (Fang et al., 2012, 2015; R. Gilbert et al., 2009; Petruccelli et al., 2019).

Extensive research has consistently shown that CM is associated with increased lifelong and transdiagnostic risk for developing psychiatric disorders (Green et al., 2010; Jaffee, 2017; Keyes et al., 2012). Considerable attention has been paid to the relationship between CM and depression, as a number of reviews and meta-analyses have established a strong and robust association between the two (e.g., Infurna et al., 2016; M. Li et al., 2016; Muzi Li et al., 2023). Individuals with a history of CM are more likely to experience an early onset, a greater severity, and a more chronic and treatment-resistant course of depression (Nanni et al., 2012; Nelson et al., 2017). Similarly, meta-analytic data have also confirmed that CM significantly increases the overall risk for anxiety disorders (e.g., Gardner et al., 2019; M. Li et al., 2016), with some reviews specifically examining its impact on distinct disorders, such as social anxiety (J. Liu et al., 2023) and panic disorder (Zhang et al., 2023). Notably, experiencing multiple types of CM increases risk of depressive and anxiety disorders to a greater degree than experiencing a single type of CM (Debowska et al., 2017; Moore et al., 2015).

While the relationship between CM and psychopathology is well documented, its associations with positive mental health indicators, such as life satisfaction, remain less explored. As a key component of psychological well-being, life satisfaction reflects its cognitive dimension (i.e., judgements about one's life) (Kesebir & Diener, 2008). In a recent meta- analysis, CM was moderately associated with lower life satisfaction across developmental stages, gender, and culture (Yeo et al., 2024). This association has also been confirmed in studies employing clinical

samples, regardless of symptom severity (Kolar et al., 2024; Monteleone et al., 2023).

Expanding beyond the negative consequences of CM on mental health, recent efforts have focused on uncovering the psychological mechanisms underlying the impact of CM on mental health (McCrory et al., 2017; McLaughlin et al., 2020). Progress in this area holds important implications for refining preventive and therapeutic interventions targeted for this vulnerable population (Gee, 2022; Kirlic et al., 2020). Several mechanisms have received extensive support, such as emotion regulation (Miu et al., 2022), reward processing (Oltean et al., 2022), and maladaptive schemas (Pilkington et al., 2021), and more recent work has started to examine mechanisms pertaining to positive psychology (e.g., self-compassion, gratitude) (for a review see Stevenson, 2024). However, other positive psychological factors remain largely underexplored, warranting further investigation to better understand their role as potential mechanisms in the CM-related literature. Given the limited and heterogeneous literature, prioritizing positivity and positive affect[1] may serve as candidate mechanisms explaining the link between CM and mental health.

Prioritizing positivity (PP) is a behavioral tendency in which individuals intentionally structure their daily activities and environments to facilitate the experience of naturally occurring positive emotions (Catalino et al., 2014). For instance, when planning their schedules, individuals who prioritize positivity may choose to end their weekdays by engaging in a favorite hobby or spending time with loved ones. The common denominator of these behaviors is the inclination to pursue happiness in everyday life, despite significant individual variation (e.g., some people enjoy yoga, while others do not). PP has emerged as an alternative to the excessive pursuit of happiness, which tends to have counterproductive effects, leading to fewer positive emotions (Mauss et al., 2011) and more depressive symptoms (Ford et al., 2014). PP entails strategically planning one's day or week to incorporate pleasant activities, while maintaining a balance with responsibilities and daily obligations (Catalino et al., 2014). According to Gross's extended process model of emotion regulation (2015) and Quoidbach et al.'s (2015) application of the model to positive emotions, PP can be considered a positive emotion regulation strategy of situation-selection driven, by a hedonic emotion regulation goal. In simpler terms, individuals who employ PP actively and deliberately select contexts and actions that are likely to give rise to positive emotions, thus upregulating them. Drawing upon the situation selection process as a whole, PP could be considered a future-oriented, proactive strategy that incorporates elements of behavioral activation (i.e., seeking situations that might prove rewarding) (Webb et al., 2018). In line with these claims, one study showed that hedonic motivation (i.e., employing pleasure-seeking motives for

[1] From this point forward, the terms 'positive affect' and 'positive emotions' will be used interchangeably, as positive affect encompasses the experience of positive emotions, with the latter representing a more discrete form of affective experience (Russell et at., 2003).

various activities) indeed predicts PP (Passmore et al., 2018). One plausible link between CM and PP could stem from the reward processing field. A recent meta-analysis revealed that CM is associated with disruptions in reward learning (i.e., the capacity to discriminate situations that predict rewards) and reward valuation processes (i.e., the capacity to estimate the probability and benefits of potential rewards based on prior experience) (Oltean et al., 2022). Thus, individuals with a history of CM might have greater difficulties in employing PP because: (1) they would find it hard to identify and select activities that can elicit positive emotions, and (2) they would struggle with anticipating and valuing the positive emotions that an activity could bring. Another link between these two variables lends support from the executive functioning field. Specifically, CM is associated with executive functioning impairments (e.g., reduced cognitive flexibility and inhibitory control), which might negatively influence the planning and problem-solving processes needed to successfully prioritize positivity in daily life without neglecting other responsibilities (Rahapsari & Levita, 2024).

Previous cross-sectional studies have shown that PP predicts lower depressive symptoms (Catalino et al., 2014; Humphrey et al., 2022; Russo-Netzer, 2019). A similar association was found between PP and neuroticism (Catalino & Boulton, 2021), which is considered a risk factor for psychopathology (Kotov et al., 2010). The relationship between PP and psychopathology remains an underexplored area within the current body of research, necessitating further investigation. Conversely, numerous studies have demonstrated a positive association between PP and life satisfaction among community (Catalino et al., 2014; Russo-Netzer, 2019), student (Datu & King, 2016), and adolescent (Russo-Netzer & Shoshani, 2020) samples.

Positive affect (PA) can be described as the experience of a set of emotional states reflecting pleasant engagement with the environment. PA reflects neither a lack of negative affect (NA) nor the opposite of NA, but is a separate, independent dimension of mood (Watson & Tellegen, 1985). A growing body of evidence suggests that CM increases the risk of experiencing blunted PA in both childhood and adulthood. For instance, a recent meta-analysis revealed that maltreated children exhibit significantly lower levels of PA compared to non- maltreated children (Lavi et al., 2019). In studies focused on adults, CM predicts lower PA in both healthy (Arslan & Yıldırım, 2022) and clinical samples (Etter et al., 2013). This association remains significant across both Western (Somers et al., 2017) and Eastern (Xiang et al., 2021) cultures. Extensive findings indicate that diminished PA is a significant correlate of various forms of psychopathology (for a review see Watson & Naragon-Gainey, 2010). Aggregated evidence from review studies reveals that diminished PA is a robust predictor for both depression and anxiety, even after controlling for baseline values (Khazanov & Ruscio, 2016) and independent of NA (Naragon-Gainey et al., 2018). A similar link has also been found in adolescent samples (for a review see K. E. Gilbert, 2012). This particular PA dysfunction has been associated

with an early onset, increased chronicity, and poorer treatment responses for depressive and anxiety disorders, underscoring its clinical significance (Craske et al., 2024). In contrast, individuals who experience frequent and high PA report greater life satisfaction irrespective of the absence of NA (Cohn et al., 2009). According to the broaden-and-build theory developed by Fredrickson (1998, 2013), PA contributes to life satisfaction by broadening cognitive and behavioral repertoires and building resources for adapting to life's challenges, which in turn makes life more satisfying (Le Nguyen & Fredrickson, 2017). Nevertheless, a recent study has shown that lower PA has a mediating role in the relationship between CM and life satisfaction, suggesting that blunted PA might be an underlying mechanism through which CM hinders one's life satisfaction in adulthood (Xiang et al., 2021). The authors also indicated a chain mediating pathway between CM and life satisfaction, which included emotional intelligence as the first mediator and PA as the second.

Extant research has indicated an association between PP and PA, supporting the claim that higher levels of PP are indeed correlated with increased PA in both community and student samples (Catalino et al., 2014; Datu & King, 2016). Similar associations have also been found in the case of more discrete positive affective experiences (i.e., cheerfulness and gratitude) (Burzynska-Tatjewska et al., 2022; Chiesi et al., 2023). PP is also a correlate of subjective-happiness, measured as global self-evaluations of one's happiness relative to others (Machlah & Zięba, 2021; Russo-Netzer, 2019). This suggests that PP may influence more stable affective factors connected to PA. One study found that PP was associated with a greater increase in PA in older adults than in younger adults (Littman-Ovadia & Russo-Netzer, 2019), bringing more nuance to the relationship between the two variables. Despite this data, there are still significant gaps in the literature that could be addressed. For instance, no studies so far have investigated early life predictors of PP.

Building on the literature presented, the current study aims to (1) investigate the associations between CM, PP, PA, psychopathology symptoms, and life satisfaction, and (2) test the mediating role of PP and PA for associations of CM and two mental health indicators (i.e., psychopathology symptoms and life satisfaction).

Methods

Participants

A total of 268 participants were recruited from the community through announcements posted on various social media platforms (e.g., Facebook, Instagram). Participants ranged in age from 18 to 66 years (M = 31.9, SD = 10.6), with women representing the majority (88.81%).

Regarding educational attainment, a minority (15.7%) reported their highest level of education as high school or lower, while the remainder held a bachelor's

degree (44%), a master's degree (38.8%), or a doctoral or postdoctoral degree (1.5%). After providing informed consent, participants were asked to complete a sociodemographic form followed by measures assessing the variables of interest. Finally, in return for their involvement, participants were entered into an online drawing for a chance to win a voucher for popular retail stores or an online counseling session.

Instruments

Childhood Trauma Questionnaire-Short Form (CTQ-SF; Bernstein et al., 2003) was used to assess five domains of maltreatment occurring before the age of 18 years (emotional and physical neglect along with emotional, physical, and sexual abuse). This instrument consists of 28 items (rated on a 5-point Likert scale ranging from *1 = never true* to *5 = very often true*) divided across five subscales pertaining to each maltreatment domain. A total CM score was calculated by summing the scores of the five subscales. Examples of items include: "I felt that someone in my family hated me", "People in my family hit me so hard that it left me with bruises or marks', and 'I didn't have enough to eat". The scale demonstrated excellent reliability in the present sample (Cronbach's alpha = 0.90).

Prioritizing positivity scale (PPS; Catalino et al., 2014) was utilized to measure the extent to which participants prioritized implementing positive emotional experiences in their daily lives. A recent psychometric study conducted by the author of the scale recommended the use of the revised five-item version of PPS, as one of the items was found to be problematic (low factor loading, conceptually distinct from other items) (Catalino & Boulton, 2021). The revised scale has demonstrated satisfactory reliability, construct validity, and measurement invariance.

Participants rated their agreement on a 9-point scale (*1 = strongly disagree* to *9 = strongly agree*). A sample item in the scale is: "I structure my day to maximize my happiness". A total PP score was calculated by averaging the five items. The scale showed a very good reliability in the present sample (Cronbach's alpha = 0.88).

Positive and Negative Affect Schedule-PA subscale (PANAS-PA; Watson et al., 1988) was used to evaluate PA (e.g., joy, enthusiasm, pride). The PA subscale consists of 10 items rated on a *1 (very slight or not at all)* to *5-point (extremely)* Likert scale. Items are summed up into a total score, where higher scores represent higher PA levels. Participants had to report the PA experienced over the last week. Cronbach's alpha coefficients indicated good reliability ($\alpha = 0.83$).

Symptom Checklist-90-Revised (SCL-90-R; Derogatis, 1992) is a 90-item self-report questionnaire that assesses psychological distress. This instrument consists of nine subscales; however, the present study focused only on the depression (e.g., feeling sad, feeling no interest in things) and anxiety (e.g., being restless,

worrying excessively) subscales. The extent to which each item had distressed participants during the past seven days was rated on a 5-point scale (*0 = not at all* to *4= extremely*). A total psychopathology score was computed by averaging the two subscales. This decision was made due to: (1) the high comorbidity between depression and anxiety (Lamers et al., 2011), (2) the aforementioned evidence that demonstrates similar relationships for both disorders and the other variables, and (3) the ability of the scale to capture global psychological distress. Cronbach's alpha coefficients indicated excellent reliability for both subscales, with values of 0.91 for the anxiety subscale and 0.88 for the depression subscale.

Satisfaction with Life Scale (SWLS; Diener et al., 1985) was used to measure overall life satisfaction. The Romanian version was utilized (Stevens et al., 2012), demonstrating satisfactory reliability. The scale consists of five items that reflect cognitive judgment of overall life satisfaction. Participants provided answers to show the extent to which they agree with statements concerning evaluations of their lives, ranging from *1 (don't agree at all)* to *5 (very much agree)*. Responses were averaged, with higher scores indicating higher levels of life satisfaction. An example item is: "In most ways my life is close to my ideal". Cronbach's alpha coefficient indicated very good reliability ($\alpha = 0.88$).

Data Analysis

All statistical analyses were performed in SPSS. Descriptive statistics were computed for sociodemographic and other variables of interest. We performed Pearson correlations to test the associations between CM, PP, PA, psychopathology symptoms, and life satisfaction. Afterwards, serial mediation models were employed (Hayes, 2017) using bootstrapping procedures (5000 bootstrap samples) in order to test the potential mediating role of PP and PA in the relationship between CM and psychopathology, on one hand, and life satisfaction, on the other.

Results

Pearson Correlations

Significant correlations were observed between all the variables (see Table 1). As expected, CM was negatively correlated with PP, PA, and life satisfaction and positively correlated with psychopathology symptoms. We also found positive associations among PP, PA, and life satisfaction.

Table 2. Correlation matrix

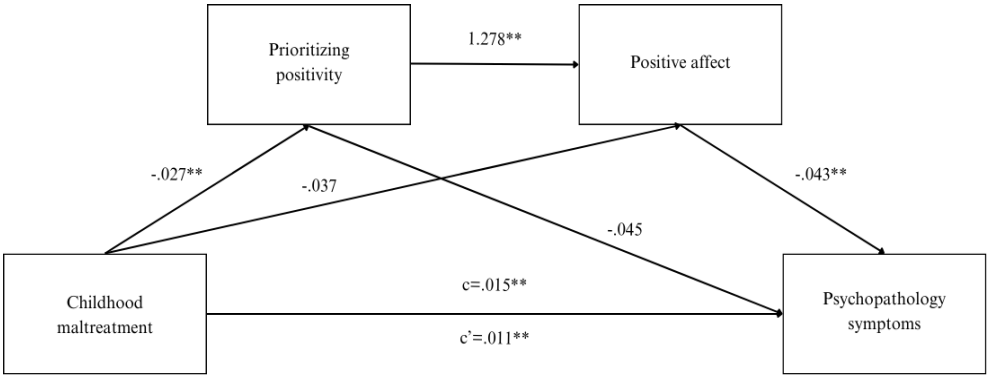
	Variable	*M*	*SD*	1	2	3	4	5
1.	Childhood maltreatment	43.55	16.47	–				
2.	Prioritizing positivity	6.43	1.76	–.253**	–			
3.	Positive affect	35.44	6.55	–.181**	.368**	–		
4.	Psychopathology	1.28	0.81	.301**	–.277**	–.418**	–	
5.	Life satisfaction	24.41	6.88	–.376**	.513**	.500**	–.534**	–

Note. **$p < .01$.

Mediation Models

The mediation model for the association between CM and psychopathology is presented in **Figure 1** along with the unstandardized regression coefficients for each specific relationship. As shown, CM significantly predicted psychopathology symptoms ($b = .015$, SE = .003, 95% CI [.009; .021], $p < .001$) and PP ($b = –.027$, SE = .006, 95% CI [–.040; –.015], $p < .001$), but it did not significantly predict PA ($b = –.037$, SE = .023, 95% CI [–.083; .009], $p = .112$). When PP and PA were included as mediators, the direct effect of CM on psychopathology remained significant but reduced ($b = .011$, SE = .003, 95% CI [.005; .016], $p < .001$), suggesting partial mediation.

Together, CM and both mediators predicted 23.5% of the variance in psychopathology ($F(3,264) = 26.96$, $p < .001$).

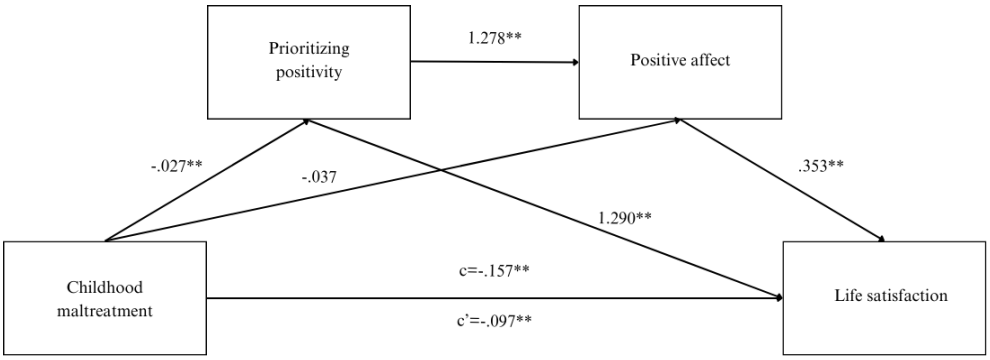


Note. Unstandardized regression coefficients are shown
**$p < .01$; c = Total effect; c' = Direct effect

Figure 1. Serial Mediation Model between CM and Psychopathology

Figure 2 presents the mediation model for the association between CM and life satisfaction along with the specific unstandardized regression coefficients. As

shown, CM significantly predicted life satisfaction (b = –.157, SE = .024, 95% CI [–.204; –.111], p < .001) and PP (b = –.027, SE = .006, 95% CI [–.040; –.015], p < .001), but did not significantly predict PA (b= –.037, SE = .023, 95% CI [–.083; .009], p = .112). When PP and PA were included as mediators, the direct effects of CM on life satisfaction remained significant but reduced (b = −.097, SE = .020, 95% CI [–.137; –.057], p < .001), suggesting partial mediation. Together, CM and both mediators accounted for 42.5% of the variance in life satisfaction (F(3,264) = 65.04, p <.001).



Note. Unstandardized regression coefficients are shown
**p < .01; c = Total effect; c' = Direct effect

Figure 2. Serial Mediation Model between CM and Life Satisfaction

In terms of indirect effects (see Table 2), the results revealed that PP and PA sequentially mediated the relationships between CM and both psychopathology symptoms and life satisfaction. The total indirect effect was stronger for life satisfaction than for psychopathology, suggesting that these mediators explain a greater portion of the variance in life satisfaction compared to psychopathology symptoms. Amongst the specific pathways, the indirect effect through PP alone was significant for both outcomes, but larger for life satisfaction than for psychopathology. In contrast, PA alone did not significantly mediate either relationship, indicating the role of PP as the preceding mediator in this sequence. Most notably, the serial mediation pathway (CM→PP→PA→mental health outcomes) was significant in both models, yet again stronger for life satisfaction than for psychopathology. In other words, the impact of CM on both outcomes is at least partially explained by its effect on PP, which subsequently influences PA.

Table 2. Summary of indirect effects (IE) in serial mediation models

Pathway	IE	SE	95% BCI[a]	
			Lower	*Upper*
Total IE[b]	.004	.001	.002	.007
CM→PP→Psychopathology	.001	.001	.0001	.003
CM→PA→Psychopathology	.002	.001	–.001	.004
CM→PP→PA→Psychopathology	.001	.001	.001	.003
Total IE	–.060	.017	–.097	–.030
CM→PP→Life satisfaction	–.035	.011	–.061	–.016
CM→PA→Life satisfaction	–.013	.009	–.032	.005
CM→PP→PA→Life satisfaction	–.012	.005	–.024	–.005

Note. [a]BCI = 95% Confidence Interval of the indirect effect derived from 5000 bootstrapped samples; [b]Total IE = Total indirect effect of the two mediator variables included in each model (PP and PA)

Discussion

The current study investigated the mediating role of PP and PA between CM and two mental health indicators (i.e., psychopathology symptoms and life satisfaction). In line with previous research, we found an association between CM and psychopathology symptoms (i.e., concurrent depressive and anxiety symptoms) (Chen, 2024). Adding to the growing body of evidence, we also found a negative relationship between CM and life satisfaction (Mosley-Johnson et al., 2019). As anticipated, our results showed a significant association between CM and PP. This finding suggests that alterations in the reward system associated with CM may negatively influence the selection of pleasant activities to integrate into daily life and the anticipation of the benefits (i.e., positive emotions) fostered by said activities, thereby potentially hindering the implementation of PP (Novick et al., 2018). Moreover, individuals with a history of CM are more likely to face difficulties in planning and problem solving, thus creating potential challenges for practicing PP (Letkiewicz et al., 2021). The negative correlation between CM and PA aligns with findings suggesting that CM is associated with blunted PA in adulthood (Turiano et al., 2017). Prior research has only linked PP to depressive symptoms (Machlah & Zięba, 2021). Our results indicated a negative relationship between PP and psychological distress due to both depressive and anxiety symptoms, thus adding to the literature. The associations observed between PP, PA, and life satisfaction are consistent with the existing data (Busseri, 2018; Catalino & Boulton, 2021; Littman-Ovadia & Russo-Netzer, 2019). Associations between psychopathology symptoms and life satisfaction are aligned with previous research (Mahmoud et al., 2012).

PP partially mediated the relationship between CM and psychopathology symptoms, as anticipated. The alterations that PP may have undergone as a consequence of CM could potentially contribute to increased susceptibility to

psychopathology. This finding is promising and provides preliminary evidence supporting the mechanistic involvement of PP in the relationship between CM and psychopathology, emphasizing the significance of incorporating positive experiences in daily life as a potential protective factor against psychopathology symptoms. Contrary to our expectations, PA did not mediate the relationship between CM and psychopathology symptoms. One possible explanation is that the attempts to regulate one's positive emotional experiences may have greater explanatory power in understanding the effects of CM on psychopathology, than hyporeactivity to PA. Recent efforts have shown that positive emotion dysregulation mediates the relationship between CM and psychopathology (Goncharenko et al., 2021), mirroring the more extensive research on the emotional regulation of negative emotions (Miu et al., 2022).

Consistent with our expectations, the serial mediation model was supported by the data. More specifically, the effect of PP on psychopathology symptoms as predicted by CM is partially explained by the lower levels of PA. This finding implies that CM may hinder the capacity of PP to upregulate PA, thus increasing vulnerability to mental health issues. There is robust evidence that CM undermines the development of adaptive emotion regulation (Kim & Cicchetti, 2010). Regulatory capacities may be overloaded due to early maltreatment, making it difficult to go through the PP process and consequently attenuating PA (Cloitre et al., 2005).

Blunted PA has long been documented as a risk factor for developing mental health issues, especially depression and anxiety (Stanton et al., 2016). Alternatively, this pattern of results may suggest that individuals with a history of CM might not consider PP a beneficial or feasible way of fostering PA due to reward processing and executive function disruptions. As a result, they would consistently limit their opportunities to experience positive emotions in ecological settings. On one hand, they would not benefit from the *undoing* effect of PA on NA, which could lead to affective symptoms over time (Garland et al., 2010). On the other hand, they would narrow their cognitive and behavioral repertoires which would inhibit building resilience and personal resources (e.g., healthy coping strategies) that could protect against psychopathology (Tugade & Fredrickson, 2004).

Mirroring the results concerning psychopathology symptoms, we found that PP mediated the link between CM and life satisfaction. This result suggests that the alterations in PP also relate to poorer life satisfaction. Reduced access to positive environments throughout the day may leave individuals less satisfied with the current state of their lives, as the basis for their evaluations may be tied mainly to daily struggles or a lack of meaningful experiences. Similar to the previous model, PA was not a significant mediator for this relationship. It is possible that the implementation of positive emotion regulation strategies would better predict life satisfaction in the context of early life exposure to maltreatment than blunted PA. Recent studies have shown that mindfulness and self-compassion, which some scholars consider emotion

regulation strategies, mediate the relationship between CM and well-being (Julian et al., 2025).

According to our expectations, the data offers support for the proposed serial mediation model involving PP and PA as mediators between CM and life satisfaction. Thus, the pathway between low PP and low PA may partially explain the relationship between CM and life satisfaction. This finding adds an important contribution, suggesting that the potential disruption of the regulatory capacity of PP to enhance PA could have a detrimental effect on life satisfaction beyond psychopathology symptoms. Drawing upon the broaden-and-build theory, diminished PA resulting from insufficient prioritization of positive experiences on a daily basis may hamper the positive resource-building processes known to generate and maintain life satisfaction (Fredrickson & Joiner, 2002). This suggests that individuals exposed to CM are particularly disadvantaged when it comes to benefiting from these positive cascading effects. In addition, positive affective experience is a relevant indicator of people's satisfaction with life, as posited by affect-as-information theory (Clore et al., 2001). Thus, if positive experiences are not prioritized, resulting in less or infrequent PA, individuals would lack positive input in regard to their life satisfaction. Indirectly, less prioritization of positive experiences could imply more negative or unfulfilling experiences that may not necessarily lead to psychopathology symptoms, but that may diminish PA and, in turn, life satisfaction. This coincides with one of the fundamental principles of positive psychology, which posits that the mere absence of psychopathology does not inherently equate to the presence of well-being (Seligman, 2008). Finally, it is noteworthy that the mediation effects were stronger for life satisfaction compared to psychopathology symptoms, making PP a greater predictor for the former. This aligns with previous studies that revealed weaker associations between PP and psychopathology symptoms than between PP and life satisfaction (Catalino et al., 2014).

Limitations and future directions

Despite the novel findings and explorative endeavor of this study, several limitations should be taken into consideration. First, this study utilized a cross-sectional design which precludes the establishment of causal relationships and temporal precedence. For example, prior research has suggested the existence of a reciprocal relationship between PP and PA (Datu & King, 2016). Future studies could test these reciprocal links in relation to early life predictors, such as childhood adversities or benevolent childhood experiences (Narayan et al., 2018).

Moreover, by employing more sophisticated and complex designs, future research may facilitate a more comprehensive understanding of the relationships among CM, PP, PA, and mental health. Second, we relied on a convenience sampling

procedure, which restricted the sociodemographic diversity of our sample. Specifically, our sample predominantly comprised young, highly educated women. Previous research has indicated that individual factors such as age, gender, culture, and educational status can influence both psychopathology symptoms and life satisfaction (Diener et al., 2018; Levin-Aspenson & Watson, 2018). Therefore, future studies should aim to replicate our findings in more diverse populations to enhance generalizability.

Third, the current study did not include an a priori power analysis and sample size estimation for the serial mediation models tested. Given that the observed indirect effects were small, the statistical power to detect these effects may have been limited. Prior research suggests that detecting small indirect effects, particularly in complex models involving multiple mediators, often requires larger sample sizes than are commonly reported in psychological mediation studies (Fritz & MacKinnon, 2007; Sim et al., 2022). Additionally, simulation-based approaches for sample size and power estimation emphasize the importance of aligning power analysis with the structure of the statistical model and the expected effect sizes. These methods enable researchers to estimate the sample size needed to achieve sufficient power by accounting for factors such as multiple model parameters, missing data, and the complexity of mediation designs (Schoemann et al., 2017). Although the use of bootstrapping enhances the accuracy of indirect effect estimates in smaller samples (Fritz & MacKinnon, 2007), the absence of a priori sample size and power planning warrants cautious interpretation of the current findings. Future research should adopt simulation-based methods (e.g., Monte Carlo simulations) to determine appropriate sample sizes that can provide adequate statistical power for detecting indirect effects in sequential mediation models (X. Liu & Wang, 2019; Muthén & Muthén, 2002; Thoemmes et al., 2010). Finally, we used self-report measures exclusively, which are subject to biases, such as recall inaccuracies or social desirability (e.g., Thabrew et al., 2011).

Conclusion

In spite of these limitations, this study presents several meaningful contributions. To our knowledge, this is the first study to investigate the association between CM and PP. Furthermore, this study provides preliminary evidence that PP may have a mechanistic role in explaining the relationship between CM and both psychopathology and life satisfaction. Additionally, our findings offer preliminary support for the relationship between PP and PA as an underlying mechanism between CM and both mental health indicators. Thus, our study supports the protective role of PP in adults with a history of CM, while also highlighting its function as a positive emotion regulation strategy. Moreover, our findings add to the

limited research exploring the potential mental health benefits of situation selection-focused emotion regulation strategies (Webb et al., 2018). The current study may also have practical implications, paving the way for future endeavors to test PP as an upregulating strategy for PA, and thus potentially add to the existing interventions that target PA (Craske et al., 2019).

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PSYCHOLOGICAL STRESS PERCEPTION IN PATIENTS SUFFERING FROM CROHN DISEASE ACCORDING TO SAMPLING CHARACTERISTICS: A COHORT OBSERVATIONAL STUDY

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Abstract

The present study aimed to investigate how patients suffering from Crohn disease felt themselves as psychological supported and if psychological stress perception could vary according demographic characteristic.

An on-line, observational, cross sectional study was carried out by publicizing the questionnaire created through social networks from October 2021 to February 2022.

A total of 785 participants were enrolled in the present study. Of these, no significant differences were reported between subjects who felt themselves as psychologically supported and subjects who did not feel as psychologically supported. By considering all the sampling characteristics collected and the stress perceived levels, only with reference to sex, significant association was found (p=.021).

The present study revealed compromised aspects of the quality of life in patients suffered from Crohn disease and its related psycho-physical sequelae, which allowed to lay the foundations for further studies, studying the comorbidity of this disease with other factors, too.

Keywords*:* Age; Crohn Disease; Educational Level; Inflammatory Bowel Disease; Marital status; Patient; Occupational level; Stress perception; Sex.

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1. Introduction

Crohn Disease (CD) is a chronic disease that causes inflammation and irritation of the digestive system, by particularly affecting the small intestine and the beginning of the large intestine, by also affecting any portion of the digestive system, too. It is one of the Chronic inflammatory bowel diseases (IBD), which also includes ulcerative colitis and microscopic colitis, gradually arising and tending to worsen over time with periods of remission involving organs and extra intestinal tissues, such as: musculoskeletal and dermatological systems, renal, hepato-pancreatic-biliary, pulmonary and ocular (Annese, 2019), in 25-40% of cases (Hoilat & Rentea, 2021). Symptoms could suddenly appear and the cause of the disease is still unknown today (Dulai et al., 2020): from genetic to environmental, immunological, dietary and lifestyle factors have been proposed. The most accepted hypothesis is that the IBD is an autoimmune disease that is linked to an abnormal immunological reaction on the part of the intestine of genetically predisposed subjects towards certain stimuli normally present in the intestine. In fact, under normal conditions, the immune response of the intestine is characterized by a balance between pro-inflammatory and anti-inflammatory factors. Recent estimates show that over 5 million people worldwide are affected by Chronic IBD, of which approximately 1.6 million in North America and nearly 3 million in Europe. In Italy the estimated incidence is around 3.7-4.2 / 1,000,000 / year, without gender differences, the prevalence is 50-54 / 100,000 (Biancone & Vernia, 2018). Diet and lifestyle modifications could help control the symptoms of inflammatory bowel disease including CD, too. An established risk factor linked to lifestyle is smoking (Kaplan & Ng, 2017; Piovani et al., 2019). In particular, it has been shown how cigarette smoking alters cell proliferation, endothelial function and the immune response not only of the respiratory and cardiovascular system, but also of the gastrointestinal tract (Berkowitz et al., 2018), predisposing to the development of neoplasms with a percentage of 2.20%; for active smoking and 1.87% for second hand smoke (Soon et al., 2012; Ananthakrishnan, 2015; van der Sloot et al., 2021). Other factors, such as: the use of oral contraceptives, the use of antibiotics, the regular use of non-steroidal anti-inflammatory drugs and the urban environment contribute to the onset of the disease, even homozygosity for the NOD2 gene has shown an increased risk 20 to 40 times of developing CD (Ananthakrishnan, 2015). Dietary risk factors that could increase the risk of developing IBD include: high consumption of saturated fat and monosaccharides and low fiber intake, too (Riordan et al., 1998; Owczarek et al., 2016; Basson, 2012). CD involves important psycho-physical sequelae among those affected by it, by generating the inability to exercise control over their intestinal functions, with a strong impact on the social sphere. This leads the patient to reformulate all their daily plans, with great compromise in the quality of life. Work, relationships and leisure time activities cannot be managed in an orderly and

serene manner: in most cases, the patient gives up most of these things, often facing social isolation and a strong sense of guilt, resulting from constant refusals to social commitments and strong stress that generates a strong link between stress and somatic disease (Agostini et al., 2017) which also affects the nervous system, too (Petruo et al., 2019). Even the numerous surgeries to which people suffering from CD undergo deteriorate the quality of life, just think of the presence of intestinal ostomies which could alter the perception of the body image with important psychological consequences (Gecse et al., 2014; Kappelman et al., 2008; Abraham & Cho, 2009; Khor et al., 2011; Abdalla et al., 2016). 70% of IBD patients believe that stress or their personality traits significantly contribute within a biopsychosocial disease model, the altered gut-brain axis could influence the course and development of the disease and lead to psychological symptoms, such as: Chronic abdominal pain, anxiety and depression, delivering severe emotional stress factors (Matos et al., 2021). Therefore, over time, both social and affective dimensions are worn down by these experiences of suffering: this could lead to real forms of psychological distress, such as anxiety experiences or depressed mood, one out of three patients is in fact affected by symptoms of anxiety and one in four from symptoms of depression (Barberio et al., 2021). It is necessary to pay more attention to the psychological factors and to the sequelae that this disease implies (Song et al., 2020). A study conducted in Brazil found that moderate to severe active disease has a strong impact not only on quality of life, but also on job performance (Parra et al., 2019; Neovius et al., 2013). Predominant lifestyle among IBD patients is the attachment style, which describes the type of bond an individual has with others, particularly with contact persons, such as parents. Attachment style is an important influencing factor for interpersonal functioning and stress. In this regard, studies have shown that individuals with a fearful and worried attachment style have a negative view of themselves, resulting in high levels of dependence on important people and low self-esteem (Engel et al., 2021). Furthermore, several studies have shown that patients with IBD record high levels of emotional distress and poor quality of life (Iglesias et al., 2009). It is interesting to understand how the person suffering from CD perceives and manages its own psycho-physical sequelae implying by the disease; its relating coping strategies and supporting sources, too. Additionally, a link between IBD and mental health problems was foundon suicide, mood, anxiety (Walker et al., 2008; Vigod et al., 2019) and psychotic disorders (Eaton et al., 2010). Therefore, adult-onset IBD has been associated with an increased risk of psychiatric disorders and suicide attempts, by highlight the importance in psychological follow-up within the first year after IBD diagnosis (Ludvigsson et al., 2021), through a multidisciplinary approach that involves several healthcare professionals, in order to identify alternative points of view and solutions to the problems highlighted.

1.1 Aim

The present study aimed to investigate among CD patients their related perceptions on sychological stress according to their demographic characteristics, like sex, age, marital status, educational level, occupation, age of disease, stress perceived.

2. Materials and Methods

2.1 Design

An on-line, observational, cross sectional study was carried out by publicizing the questionnaire through social networks, such as Facebook groups, namely: "CD, ulcerative colitis, virtual community", "Crohn Disease", "Intestinal wellness and nutrition".

After receiving permission by each administer of each Facebook page, the questionnaire was publicized and an active link was posted in order to facilitate its compilation in a period of time between October 2021 and February 2022.

2.2 Sampling

All subjects affected by CD, who voluntary agreed to participate in the present study signed the informed consent. On the other hand, all subjects affected by ulcerative colitis were excluded from the study.

2.3 Questionnaire

In the first part of the questionnaire, demographic data were collected, by referring to all the above mentioned literature searched (Ananthakrishnan, 2015; Walker et al., 2008; Vigod et al., 2019; Kaplan & Ng, 2017; Piovani et al., 2019), specifically:

- sex, as female or male;
- age in years, divided into groups, as: until 20 years, 31-40 years, 41-50 years, 51-60 years, over 61 years;
- marital status, as single, married, divorced, or separated, widowed;
- education level between: junior high, high school diploma, college degree, post-graduateeducation, or none;
- occupational condition, including: student, homemaker, employee, government employee, freelancer, retiree, other not specifically mentioned above;
- how long has the patient known about CD, as: until 1 years, until 5 years, 6-10 years, 11-15 years and over 16 years;

- total weight decrease in the course of the CD: between 0-5kg, between 5-10kg, between 10-20kg or more than 20 kg.

Then, in the second part of the questionnaire it was investigated if participants felt themselves psychologically supported or not and then, the dimension of perceived stress was explored thanks to the "Perceived Stress Scale," consisting of a total of 10 items that focused on the participant's feelings during the past month. The Perceived Stress Scale (Cohen, 1998; Henry & Crawford, 2005), validated in Italian, is used to assess the perception of each of us when faced with situations of daily life and our reaction in response to these events, which can be perceived as destabilizing and can therefore create a state of risk for us. The questionnaire consists of 10 questions, with a value ranging from 1 to 5 depending on the severity of the disturbance caused and the evasion implemented to circumvent the situation 0 = Never 1 = Almost never 2 = Sometimes 3 = Fairly often 4 = Very often.

2.4 Ethical Concerns

In the first part of the questionnaire it was clearly posted ethical considerations. Participation in the study, being free and voluntary, was considered an expression of consent. Those interested in participating were presented with the opportunity to express informed consent and the confidentiality and anonymous nature of the information was guaranteed according to the Declaration of Helsinki principles. The present study was approved by the Ethical Committee of Policlinic in Bari, Italy, withapproval no. 7041/2021.

2.5 Data Analysis

All data collected were classified as categorical variable and presented as frequencies and percentages. The chi-square test was performed between all sampling characteristics according to their perceptions on psychological support. Then, linear regression was assessed between the stress level perception and each sampling characteristics in order to explore which variable was significantly associated to the perception level condition. All p-values $< .05$ were considered as statistical significant.

3. Results

A total of 785 participants were enrolled in the present study. Of these, no significant differences were reported between subjects who felt themselves as psychologically supported and subjects who did not feel as psychologically supported, too. Table 1 showed all frequencies and percentages of participants according their psychological support feeling condition according to their sampling

characteristics. Therefore, it seemed that the psychological supportive condition seemed to be not influenced by all the sampling characteristics collected (p>.05).

Table 1. Demographic characteristics among participants according to their psychological support perception (*n*=785).

Sampling characteristics	*Psychological support*		*p-value*
	Yes n(%)	*No n(%)*	
Sex			
Female	84(10.70)	513(65.40)	.131
Male	35(4.50)	153(19.50)	
Age			
Until 20 years	9(1.10)	36(4.60)	.453
21-30 years	27(3.40)	177(22.50)	
31-40 years	33(4.20)	193(24.60)	
41-50 years	21(2.70)	140(17.80)	
51-60 years	23(2.90)	88(11.20)	
Over 61 years	6(0.80)	32(4.10)	
Marital status			
Single	56(7.10)	340(43.30)	.257
Married	49(6.20)	264(33.60)	
Divorced / Separate	14(1.80)	52(6.60)	
Widower	0(0)	10(1.30)	
Educational level			
Junior high school	22(2.80)	106(13.50)	.512
Diploma	62(7.90)	312(39.70)	
Degree	27(3.40)	194(24.70)	
Post-graduation	8(1.00)	50(6.40)	
None	0(0)	4(0.50)	
Occupation			
Student	3(0.40)	5(0.60)	.060
Housewife	0(0)	15(1.90)	
Subordinate worker	109(13.90)	622(79.20)	
Public employee	4(0.50)	10(1.30)	
Freelancer	0(0)	8(1.00)	
Retired	2(0.30)	5(0.60)	
More	1(0.10)	1(0.10)	
Age-disease			
Until 1 year	0(0)	6(0.80)	.543
2-5 years	2(0.30)	13(1.70)	
6-10 years	0(0)	4(0.50)	
11-15 years	43(5.50)	203(25.90)	
Over 16 years	74(9.40)	440(56.10)	
Perceived Stress (PSS scale):			
Low			
Moderate	2(0.30)	6(0.80)	.232
High	76(9.70)	379(48.30)	
	41(5.20)	281(35.80)	

Note. *p<.05 is statistical significant.

By considering all the sampling characteristics collected and the stress perceived levels (Table 2), only with reference to sex, significant association was found (p=.021). In fact, females reported higher levels in stress perception than males, both in moderate (females: 42.70% vs males: 15.30%) and in high perception levels, too (females: 32.90% vs males: 8.20%). No further significant associations were assessed.

Table 2. Associations between stress perceived levels according to demographic characteristics

Sampling characteristics	*Stress Perceived*			*B*	*t*	*p-value*
	Low n(%)	*Moderate n(%)*	*High n(%)*			
Sex						
Female	4(0.50)	335(42.70)	258(32.90)	-.083	-2.313	.021*
Male	4(0.50)	120(15.30)	64(8.20)			
Age						
Until 20 years	0(0)	24(3.10)	21(2.70)	-.074	-1.538	.125
21-30 years	1(0.10)	123(15.70)	80(10.20)			
31-40 years	2(0.30)	130(16.60)	94(12.00)			
41-50 years	0(0)	84(10.70)	77(9.80)			
51-60 years	3(0.40)	74(9.40)	34(4.30)			
Over 61 years	2(0.30)	20(2.50)	16(2.00)			
Marital status						
Single	3(0.40)	235(29.90)	158(20.10)	.048	1.041	.298
Married	5(0.60)	174(22.20)	134(17.60)			
Divorced /	0(0)	39(5.00)	27(3.40)			
Separate	0(0)	7(0.90)	3(0.40)			
Widower						
Educational level						
Junior high school	3(0.40)	69(8.80)	56(7.10)	-.020	-.566	.572
Diploma	5(0.60)	214(27.30)	155(19.70)			
Degree	0(0)	136(17.30)	85(10.80)			
Post-graduation	0(0)	32(4.10)	26(3.30)			
None	0(0)	4(0.50)	0(0)			
Occupation						
Student	0(0)	2(0.30)	6(0.80)	.013	.352	.725
Housewife	1(0.10)	6(0.80)	8(1.00)			
Subordinate	7(0.90)	431(54.90)	293(37.30)			
worker	0(0)	8(1.00)	6(0.80)			
Public employee	0(0)	4(0.50)	4(0.50)			
Freelancer	0(0)	4(0.50)	3(0.40)			
Retired	0(0)	0(0)	2(0.30)			
More	0(0)	0(0)	0(0)			
	0(0)	0(0)	0(0)			

Sampling characteristics	*Stress Perceived*			*B*	*t*	*p-value*
	Low n(%)	*Moderate n(%)*	*High n(%)*			
Age-disease						
Until 1 year	0(0)	6(0.80)	0(0)	.011	.290	.772
2-5 years	0(0)	8(1.00)	7(0.90)			
6-10 years	0(0)	3(0.40)	1(0.10)			
11-15 years	0(0)	139(17.70)	107(13.60)			
Over 16 years	8(1.00)	299(38.10)	207(26.40)			
Psychological support						
Yes	2(0.30)	76(9.70)	41(5.20)	.056	1.571	.117
No	6(0.80)	379(48.30)	281(35.80)			

Note. *p<.05 is statistical significant.

4. Discussion

The present study aimed to investigate how patients suffering from CD felt themselves as psychological supported and if psychological stress perception could vary according to demographic characteristic. CD, which is on the rise heavily affects the quality of life of patients, often influencing their relational, social and state abilities (Roda et al., 2020). In the present, 785 participants suffering from CD were enrolled in this study, with a female prevalence (76.10%). The overall average age of the responders was 38 ± 12 years, while the discovery of the disease was around 26 ± 11 years. Disease onset at a young age in most cases requires prompt but long-term treatment to prevent flare-ups and disease progression (Roda et al., 2020). The morbidity associated with the disease have the potential to profoundly affect patients, especially in adolescence, not only physically, but also through limitations in social, educational, professional and emotional activities, generating a negative perception of oneself and the surrounding environment. The present results showed that the majority of the sample recruited (84.1%) reported moderate and high stress levels, aged between 21-30 (22.30%) and 31-40 (24.60%) years, did not require psychological support. Among the psychological determinants, literature highlighted how stressful events, lower socio-economic status, ethnicity, persistent anxiety and depression conditions led to an acceptance of negative quality of life, such as feeling affected patients as unsuitable and misunderstood from IBD, especially among females (Leone et al., 2019). In fact, the latter showed greater concerns relating to the CD than the males: they were afraid in feeling burden, in being treated differently because the disease and the feeling less accepted their body image. These findings were in agreement to our study, in which females reported higher levels (p=.021) in moderate stress than males (females: 42.70% vs males: 15.30%) as well as high levels of stress (females: 32.90% vs males: 8.20%). From

the sample recruited it emerged that the majority of subordinate workers' recorded from moderate (54.90%) to high (37.3%) stress. A study conducted in Switzerland found that the majority of IBD patients with full-time jobs experienced high levels in work-related stress (Schreiner et al., 2017). The most important health determinants for CD patients concerned aspects of the world of work, such as job satisfaction and occupational balance, as also highlighted in the study by van Gennep et al. (2020), in which a strong positive association between quality of working life (QWL) and health-related quality of life (HRQL) was found, particularly in 63% of patients presented problems related to fatigue at work, 48% agreed to be obstructed at work. Occupational stress also appeared to have an association with the CD diagnosis (OR: 3.023, 95% CI: 1.413-6.469) (Chadolias et al., 2017). Individuals with a higher education level, high school graduates, reported moderate or high levels of stress, in line with the Wu et al. study (2022). From a study conducted in Korea, 24 IBD patients and 66 patients with ostomy were enrolled, mean total depression and resilience scores in UC were registered. Depression in patients with ostomy was associated also with economic status, sleep disturbance, and sleep time and marital status ($t=2.27$; $p= 0.027$). The singles enrolled in the greatest number within our study recorded high (20.10%) and moderate (29.90%) levels of anxiety. The Freitas et al. (2015) study showed how anxiety mediated the sense of coherence with physical, mental and social relationships. In particular, the female gender seemed to be the one most associated with concerns related to self-image and relationships, as well as sexual performance and intimacy (Armuzzi et al., 2019). In fact, moderate (22.20%) and high (17.60%) stress was also registered in the married sample. 70% of IBD patients believe that stress and their own personalities contribute significantly within a biopsychosocial disease model: the altered gut-brain axis could influence the course and development of the disease and lead to psychological symptoms, such as: Chronic abdominal pain, anxiety and depression; as well as inducing a local inflammatory response in the gastrointestinal tract, increasing intestinal permeability and modifying hypersensitivity and visceral motility, too (Peppas et al., 2021). Emotional stress particularly affected the quality of life in these patients (Matos et al., 2021). A review of the literature showed that IBD patients had approximately a 20% prevalence rate of anxiety and a 15% prevalence rate of depression (Neuendorf et al., 2016). Psychological distress increased morbidity in ulcerative colitis and CD, with impaired inter-family and social relationships (Slonim-Nevo et al., 2017). Patients were emotionally more vulnerable, prone to disturbance because they were unable to reach an adequate resolution of their problems. This determined the presence of depressive conditions, as well as other characteristics, such as: restlessness, irritability, impatience and inability to remain inactive, confirming the hypothesis of the high levels of anxiety that characterize them. Therefore, it would be advisable to direct patients suffering from this pathology to follow psychological support paths (Matos et al., 2021), in order to have positive effects on the acceptance of the disease, as well as excellent

results on the quality of life from a physical, psychological point of view and social. IBD is linked to psychiatric morbidity, but few studies have evaluated general population comparators. In adults, it has been associated with an increased risk of psychiatric disorders and suicide attempts (Ludvigsson et al., 2021), although an aspect little discussed in the literature should be monitored: the increased risk of suicide attempts among adolescents (Butwicka et al., 2019). This scenario indicated that long-term psychological support was considered for IBD patients with childhood-onset. In Sweden, a cohort study for 9 years, in a population of 6,464 people with a diagnosis of childhood-onset IBD (2,831 girls and 3,633 boys; average age 13±4 years, it was possible to ascertain a diagnosis of psychiatric disorder (11.8%) with suicide attempts, mood disorders, anxiety disorders, eating disorders, autism spectrum disorders, attention deficit / hyperactivity disorder (Butwicka et al., 2019). Loftus et al. (2011), highlighted that patients with childhood-onset IBD were at increased risk for both anxiety disorders. Another study in 248 patients only highlighted the risk of depression with a median follow-up of only 3.1 years, during which only 8 patients received antidepressants (Virta et al., 2014). Consequently, IBD patients experience a sense of isolation and social stigma that tends to worsen their qualities of life. For these reasons, it might be important for patients to find the strength to openly speak about their conditions and needs. Certainly the disease typology sometimes embarrassing consequences that could make the path of acceptance very difficult, which is fundamental at the same time, too. In this sense, aid associations play a very important role in supporting patients in more practical matters and in providing them with assistance, which also translates into psychological support. Cognitive-behavioral therapy is now considered a standard, in terms of effectiveness, mood disorder management. Cognitive-based therapies dedicated to trauma processing are also very useful in overcoming the initial shock of diagnosis (Korzenik, 2019). The first step to overcome embarrassment and manage the distrust of others is in fact to accept the Chronic nature of these diseases. Only in this way we could look with greater confidence at therapies, which today allow conditions of well-being that were unthinkable until a few years ago, and at our own future. Once a psychological equilibrium has been found, it is easier for patients to affirm their needs even at work and to talk about their conditions with more serenity, so as to gradually break down the wall of stigma that still surrounds IBD (Taft, 2009; Taft & Keefer, 2016) avoiding its related serious consequences, as suicide or suicide attempts, too.

4.1 Limitations and future perspectives

Although the present study explored how patients suffering from Crohn disease felt themselves as psychological supported and if psychological stress perception could vary according sampling characteristic, several limitations need to be acknowledged. First, this survey used a cross-sectional design, which leads to the

inability to infer causality. Longitudinal studies could be more appropriate in future studies. Then, this study only assessed individual variables of junior high school students; future studies could take into account also social and environmental factors and contextual variables. Finally, we over-relied on self-report data, which could be vulnerable to social desirability bias, therefore, future studies will collect information from multiple informants.

5. Conclusions

The present study revealed compromised aspects of the quality of life in patients suffered from CD and its related psycho-physical sequelae, which allowed to lay the foundations for further studies, studying the comorbidity of this disease with other factors, too. Future randomized controlled trials will investigate the correlation between eating disorders, suicide and CD, a potential linkage that is not well understood in the literature and in the Italian context, too. It should not be forgotten that, in view of their chronicity and low mortality, the real challenge for health professionals could be considered the trajectory on quality of life rather than on the duration of the disease.

Authors' Notes

Data were not presented elsewhere.

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PROBLEMATIC ONLINE GAMING: A LONGITUDINAL STUDY OF A MINDFULNESS-BASED INTERVENTION IN A PSYCHOEDUCATIONAL PREVENTION PROGRAM

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Abstract

The main objective of this study is to investigate the effects of a mindfulness-based psychoeducation program on adolescents' levels of mindfulness and problematic online gaming. The study implemented a 2x3 (experimental group/control group X pre-test/post-test/follow-up test) experimental design. Data was obtained through the Internet Gaming Disorder Scale Short Form (IGDS9-SF) and the Mindful Attention Awareness Scale (MAAS). Adolescents in the experimental group took part in a mindfulness-based psychoeducation program that included one session per week for a total of eight sessions, whereas no intervention was provided to the participants in the control group. The data was analysed using two-way repeated measures ANOVA to see if there were statistically significant differences between measurements and groups. In accordance with the outcomes, the interaction between intervention and assessment (pre-test, post-test, and follow-up test) for the study's dependent variables, problematic online gaming and mindfulness, was significant. This data suggests that the participants' pre-test, post-test, and follow-up test scores were influenced at varying levels by their psychoeducation program. A Bonferroni-adjusted multiple comparison test was employed to determine the cause of the variations. The findings indicate that the mindfulness-based psychoeducation program performed well in decreasing participants' problematic online gaming levels while increasing their mindfulness levels.

Keywords*:* adolescents, problematic online gaming, mindfulness, psychoeducational program.

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Introduction

Games can be said to have an important role in the development of children. Children find the opportunity to develop their emotional, social, and cognitive skills and self-expression through playing (Sezen, 2013). The imaginary worlds created during play allow children to reveal their creativity and develop problem-solving skills (Akgül, 2019). Regarding the sustainability of development, it can be said that games have an important place in adolescents' daily lives. Therefore, games contribute to the development of individuals at various periods of their lives. Nowadays, it can be stated that traditional games have been replaced by online or offline games played with technological devices. Internet-based technologies and online games have become an essential means of leisure, especially for adolescents, showing their effects at every stage of people's lives. The spread of the Internet in every field has enabled distances to be overcome and online games to reach a wider audience. This situation has led to the emergence of a serious competitive race between game groups, professional game clubs, and professional national teams competing on online gaming platforms. The usage rates of online games worldwide and in Türkiye are also noteworthy. According to data from the Turkish Statistical Institute (TÜİK) (2022), 94.7% of children aged 6–15 regularly play online games at least once a week. In the 2023 report published by the Entertainment Software Association (ESA) in the USA, it is stated that people play games for an average of 12.8 hours per week regardless of gender, and 12% of these games are played on smartphones. Yıldırım (2018) conducted a study with adolescents and found that 56.3% of individuals access online games via smartphones, 21.2% via computers, and 9.6% via tablets. It's clearly stated that if these games are played without control and time limits, they may cause negative behaviours such as problematic online gaming (Lermi & Afat, 2020). In this study, problematic online gaming will be defined as a condition where an individual's online gaming behaviour negatively impacts social, psychological, and academic aspects (Ng & Wiemer-Hastings, 2005). This problematic online game playing may cause adolescents to neglect their daily life activities (Kaya, 2013). Supporting this view, studies in the literature indicate that problematic online game playing shows significant positive relationships with depression (Wei et al., 2012), anxiety, aggression (Mehroof & Griffiths, 2010), low academic achievement (Jiang, 2014), and low self-esteem (Younes et al., 2016).

A variety of terms have been used in the literature to describe the negative behaviours that are associated with online gaming. These include gaming addiction, gaming disorder, and problematic online gaming (Kuss et al., 2018; Škařupová & Blinka, 2016). As is commonly known, despite the creation of diagnostic criteria under the name "gaming disorder" in the International Classification of Diseases

(ICD) in 2016 (Balhara et al., 2020), the Diagnostic and Statistical Manual of Mental Disorders (DSM) (APA, 2013) does not yet include formal diagnostic criteria for this condition. At this point, strong criticisms of the criteria published by the ICD and DSM have been raised by scholars working in the field of gaming (Aarseth et al., 2016). These criticisms focus on the weak research base, the reliance of the current definitions on substance use and gambling addiction, and the lack of consensus on symptoms. It is also noted that formalizing this disorder could have negative medical, social, and human rights consequences, particularly leading to false positive diagnoses in children and adolescents. In addition, there have been concerns that research could become overly confirmatory, negatively impacting healthy gamers and potentially stigmatizing millions of children. Supporting this view, it is observed that the term problematic online gaming is frequently used in scales developed under the name of "Internet Gaming Disorder" (Canale et al., 2019; Chang et al., 2022; Colder-Carras & Kardefelt-Winther, 2018; Cudo et al., 2024; Vadlin et al., 2016). In this article, the term problematic online gaming is used, considering both the relevant concerns and the fact that the sample group has not received a diagnosis, as well as the absence of a medical diagnosis covering the content.

Problematic online gaming, which has become a global problem, affects a significant percentage of adolescents worldwide. In Norway, 1.4% of online gamers are identified as problem gamers in mental health, while 7.3% are considered problematic online gamers (Wittek et al., 2016). In Germany, 3% of online gamers are classified as problem gamers (Peukert et al., 2010). In the United States, 15% of young people who play online games are reported to be at risk of problematic online gaming (Tanner, 2007). In Türkiye, when examining the rates of problematic online gaming, it is revealed that adolescents show a high level of interest in this issue, with rates ranging from 3.7% (Arıcak et al., 2018) to 15.1% (Yiğit, 2017). It can be said that problematic online gaming has increased even more today. In a meta-analysis that included 18 scientific studies on problematic online gaming conducted in Asia, Han et al. (2022) compared the prevalence rates of problematic online gaming in the pre-pandemic and post-pandemic periods. The results show an increase from 2.3% to 29.4% in problematic online gaming following the pandemic. Moreover, while a study conducted in Indonesia in 2013 found that the prevalence rate of problematic online gaming was 10% (Jap et al., 2013), this rate increased to 27% by 2020 (Wiguna et al., 2020). When the results are evaluated, it appears that problematic online gaming may become a growing problem, and effective prevention programs are needed to address this issue.

The literature uses various therapies and interventions to prevent problematic gaming. These methods include behavioural therapy, cognitive behavioural therapy, mindfulness-based interventions, and cognitive behavioural therapy programmes developed specifically for problematic online gaming (Dong & Potenza, 2014; Torres-Rodrigues et al., 2018). A meta-analysis comparing 17 different

interventions for problematic online gaming shows that mindfulness-based interventions are more effective than cognitive behavioural therapy (Kim et al., 2022).

Mindfulness interventions, unlike other psychotherapy models, focus not on changing thoughts but on observing them without judgment (Kabat-Zinn, 2009). This approach helps individuals cope with their thoughts and emotions more healthily without resisting them. Since online games are frequently used as a form of entertainment (Hauge & Gentile, 2003), adolescents will likely resist quitting games. However, mindfulness, by its nature, is less likely to be rejected, potentially leading to more positive results compared to other therapy models. For instance, mindfulness-based interventions are commonly used to reduce stress (Brooks et al., 2021; Ma et al., 2022; Marciniak et al., 2020; Zhang et al., 2019). Another advantage of mindfulness is that it enables individuals to become aware of automatic thoughts generated by the body and mind, helping them avoid reactive behaviours. This can have a direct positive effect on habits performed automatically while gaming, such as drinking coffee or eating. Given the positive correlations between problematic online gaming behaviour and stress and anxiety (Canale et al., 2019; Che et al., 2017; Rajab et al., 2020), the experiential learning that adolescents gain through mindfulness may directly contribute to stress reduction, which in turn can decrease problematic online gaming levels.

Another theoretical model was presented by Scerri et al. (2019). This study consistently emphasizes the psychological needs for a better understanding of the underlying risk factors of problematic online gaming. According to this theory, while gaming offers a simple and accessible way to alleviate distress, relying on gaming to fulfil unmet psychological needs invites problematic use. Self-Determination Theory highlights the importance of three universal, intrinsic psychological needs: relatedness, competence, and autonomy. Supporting this theory, research indicates that in daily life, the need for competence, autonomy, and relatedness (Allen & Anderson, 2018; Bekir & Çelik, 2019; Mills et al., 2018), a sense of belonging (Saritepeci et al., 2023), and the need for compassion (Wong et al., 2024; Tang et al., 2023) are essential.

Considering the above studies and theoretical models, mindfulness-based interventions have been more effective (Lee & Cho, 2021) and more cost-effective (Bentley et al., 2022) than other interventions. In addition, in order to make mindfulness activities more effective, the inclusion of psychological needs that are highly related to online games in prevention sessions will make the study more effective. Considering that awareness-based interventions naturally increase individuals' awareness, these interventions may be more effective in reducing the levels of problematic online gaming. In this context, mindfulness-based interventions will be used in this study. The following hypotheses will be investigated within the scope of this research.

H1: *Participants in the mindfulness-based psychoeducation group will demonstrate a greater decrease in problematic online gaming than the control group*

at the post-test assessment, and this difference will persist at the three-month follow-up assessment.

H2: *Participants in the mindfulness-based psychoeducation group will demonstrate a greater increase in mindfulness levels than the control group at the post-test assessment, and this difference will persist at the three-month follow-up assessment.*

Method

This research aims to examine the effect of a mindfulness-based psychoeducation program on adolescents' mindfulness levels and problematic online gaming levels. A 2x3 (experimental/control groups x pre-test/post-test/follow-up test) experimental design was used in the study. This design includes a minimum of two factors to evaluate the effects on the dependent variable. One of these factors represents the different experimental treatment conditions that constitute the experimental and control groups, while the other represents the measurements (pre-test, post-test, and follow-up test) of adolescents taken at various time periods (Karasar, 2005).

Participants

The research was conducted in a high school in Türkiye during the 2023/24 academic year. Participants were selected at random from those who did not get psychological support or take any psychiatric medication and who played online games. A sample of 242 high school adolescents who volunteered to participate was selected for the study. In this study, 131 participants with a standard deviation above 1 were included to analyse the effect of the mindfulness-based programme on problematic online gaming, more specifically. Fischer and Milfont (2010) stated that individuals with a standard deviation above 1 could be selected to include those with higher scores on the applied psychological scale (i.e., high rates of problematic online gaming). In this study, the standard deviation of the participants was 1 or above. Of these, 46 agreed to participate in the psychoeducational study (male = 40, female = 6). Of these 46, only 26 were included in the study. To ensure equal gender representation, female participants were included directly, while only the first 20 male participants were included. Participants were placed in experimental and control groups based on IGDS9-SF score ranking. First, the males and then the females were distributed into groups. The male with the highest score was placed in Group 1, and the male with the second-highest score was placed in Group 2, and continued until each group had 13 participants. The groups were then randomly

assigned as experimental and control groups. Descriptive information on the 26 adolescents included in the study is provided in Table 1.

Table 1. Descriptive information about the experimental and control groups

		Group-1 (Experiment)	Group-2 (Control)	Total
Gender	Male	10	10	20
	Female	3	3	6
	Total	13	13	26
Game Type	MOBA	4	3	7
	FPS	6	6	12
	RTS	3	4	7
	Total	13	13	26
Grade	Preparatory C.	2	1	3
	9	6	5	11
	10	3	5	8
	11	2	2	4
From whom did he/she learn to play games?	To Yourself	2	2	4
	Friend	6	8	14
	Family	5	3	8
	Total	13	13	26

Preparatory Class: The first year after moving from middle school to high school. *MOBA*: Multiplayer Online Battle Arena, *FPS*: First-Person Shooter, *RTS*: Real-Time Strategy.

It was observed that many participants who agreed to take part in the study were male. This predominance is consistent with findings in the literature (Bilgin, 2015; Johansson and Götestam, 2004; Tazawa and Okada, 2001). Veltri et al. (2014) stated in their study that it is common for online game playing to be more prevalent among males, attributing this to game producers not making sufficient efforts to ensure gender equality and creating content that is particularly appealing to a male audience. Therefore, it was considered acceptable to have a higher number of male participants in the study, resulting in groups that were predominantly composed of males.

Data Collection Tools

In this study, the personal information form and two scales by the author were used to collect data.

Personal Information Form: This form consists of questions designed to obtain information about the participants' gender, grade, game type, from whom they learned to play games, and weekly playing time.

The Internet Gaming Disorder Scale Short Form (IGDS9-SF): This scale, developed by Pontes and Griffiths (2015), is used to analyse levels of problematic online gaming by measuring addictive tendencies. It was adapted for the

Turkish culture by Arıcak et al. (2018). The research involved adolescents aged 10–19, and the scale was tested using confirmatory factor analysis (CFA), with fit indices reported as $\chi^2/df = 4.79$, CFI = 0.90, and RMSEA = 0.09. Research into the validity and reliability of the IGDS9-SF was conducted, and the results showed that it is a valid and reliable tool (Cronbach's alpha = 0.82).

The Mindfulness Awareness Scale (MAAS): The MAAS was developed by Brown (2003) and adapted for Turkish culture by Özyeşil et al. (2019). The MAAS measures differences in mindfulness and attention skills in relation to experiences. Confirmatory factor analysis confirmed one factor ($\chi^2/df = 1.69$, RMSEA = 0.57, TLI = 0.88, CFI = 0.90), and the scale's Cronbach's alpha reliability value was calculated as 0.82. Test-retest reliability is 0.86. Research into the validity and reliability of the MAAS was conducted, and the results showed that it is a valid and reliable tool.

Mindfulness-Based Psychoeducation Programme Prepared to Reduce the Level of Problematic Online Gaming

Purpose and General Features of the Programme: The mindfulness-based psychoeducation programme, designed to reduce the level of problematic online gaming, was planned as 8 sessions, each lasting 60-90 minutes, with at least one session per week. The programme aims to inform adolescents about the harms of online games, help them recognize their emotions, focus on the present moment, learn about autopilot behaviour, understand the triad of emotion, thought, and behaviour, and establish the relationship between gaming and needs such as achievement, autonomy, relatedness, self-compassion, and belonging. It also emphasizes the importance of habits in life. The purpose of the psychoeducation sessions and their titles are provided in Table 2

Table 2. Purpose of psychoeducational sessions

Session Title	Purposes
Introduction	• Facilitating group leader and members to get to know each other, • Increasing their mindfulness, • Familiarizing them with the psycho-education program aimed at reducing problematic online gaming levels, • Normalizing of games, • Recognizing emotions.
Here and Now	• Focusing on the present moment and learning to apply the concept of "autopilot" in their lives, • Recognizing when they are on autopilot while playing online games, • Becoming aware of missed opportunities while gaming.
E-T-B	• Understanding the triad of emotion, thought, and behavior (E-T-B), • Identifying negative automatic thoughts, • Grasping the importance of mindful sitting.

Session Title	Purposes
Psychological Needs	• Recognizing the need for achievement, autonomy, and relatedness (Psychological Needs), • Understanding the relationship between these needs and online gaming, • Setting weekly activities and goals, • Realizing the importance of acting mindfully.
Psychological Needs	• Introducing self-compassion and the need for belonging to school and family (Psychological Needs), • Understanding the relationship between these needs and online gaming.
Habits-1	• Understanding the importance of habits in life, • Recognizing habits associated with online gaming, • Realizing the significance of mindful eating.
Habits-2	• Understanding the importance of habits in life • Recognizing habits associated with online gaming, • Realizing the significance of mindful colouring.
Last session	• Evaluating the group process and expressing feelings about the process, • Assessing the extent to which group members have achieved their goals and expectations.

Process of Developing the Psychoeducation Program

This study was developed in response to the pressing need to address the problematic online gaming that has become increasingly widespread. To this end, a mindfulness-based psychoeducation programme was formulated as a means of intervention. It is widely accepted that mindfulness-based interventions are third-wave therapies, an extension of cognitive behavioral therapies (Hayes, 2004). They also exhibit significant variations in terms of their content, including acceptance, cognitive diffusion, and dialectical behaviour, among others (Hayes et al., 2004). In the field of mental health, the application of mindfulness techniques has been demonstrated in various programmes, including the Mindfulness-Based Stress Reduction Program (Kabat-Zinn, 1990), Mindfulness-Based Cognitive Therapy (Segal et al., 2002), and Dialectical Behavior Therapy (Linehan et al., 1999). Acceptance and Commitment Therapy (Hayes et al., 1999) is another example of this approach. Although cognitive behavioural therapies form the basis of this research, innovative and mindful interventions will also be included. Moreover, the research content comprised an in-depth examination of the philosophy, intervention techniques, exercises, applications, psychoeducation, and intervention programmes that form the foundation of mindfulness. Moreover, a review of the academic literature on problematic online gaming, which was the dependent variable of the study, was conducted. Recent research findings suggest that mindfulness-based group studies are frequently conducted in closed groups (Brown et al., 2020). In accordance with the information provided, it was determined that a closed group format would be the optimal study design. An examination of intervention programmes for the 12-17 age range revealed that 8-session programmes are commonly used for this age group (Johnson & Wade, 2019; Sun et al., 2021; Warnecke et al., 2011). The initial session began with the implementation of

normalising games and the recognition of emotions (Kökönyei et al., 2019; Park et al., 2016; Santos et al., 2016; Sakuma et al., 2017). The second session focused on automatic thoughts and moment-to-moment awareness, reflecting the fundamental stages of mindfulness (Kuyken et al., 2008; Li et al., 2017; Yao et al., 2017; Williams et al., 2006). The third session focused on the relationship between emotions, thoughts, behaviours, and games, and the identification of negative automatic thoughts (Chen & Jordan, 2020; Kuss et al., 2018). The fourth and fifth sessions focused on psychological needs, including achievement, autonomy, relatedness, self-compassion, and belonging. The sixth and seventh sessions focused on mindfulness-based interventions and changing frequently used habits to prevent problematic behaviours. The final session focused on the skills necessary for receiving feedback and saying goodbye (DeLucia-Waack, 2006; Trotzer, 2004).

Data Collection and Analysing

Before administering the measurement tools, the aims of the scientific study were explained, and the participants were informed about how to complete the measurement tools. The pre-test application of the scale was conducted online, while the other applications were carried out face-to-face. To determine which tests should be used in analysing the data, the data obtained from the IGDS9-SF and MAAS were considered. Multiple conditions must be met to determine whether the data obtained from the study show a normal distribution. The first of these is that the kurtosis and skewness values should be between +3 and -3, as stated by Tabachnick and Fidell (2007). To test the conformity of the data to the normal distribution, the skewness and kurtosis values of the experimental and control groups were calculated and are presented in Table 3.

Table 3. Standard deviation, arithmetic mean, kurtosis, kurtosis standard error, skewness, skewness standard error table

Scale	Group	Measuring	*N*	$\bar{x}$	*SD*	Kurt.	K. SE	Skew.	S.SE
IGDS9-SF	Experiment	Pre-Test	13	27.9	6.46	.51	1.19	-.48	.61
		Post-Test	13	21.4	4.57	-.32	1.19	-.89	.61
		Follow-up T.	13	24.0	4.88	1.94	1.19	-1.40	.61
	Control	Pre-Test	13	26.2	7.07	-.14	1.19	-.93	.61
		Post-Test	13	26.6	6.73	.14	1.19	-.90	.61
		Follow-up T.	13	27.5	5.91	.22	1.19	-.80	.61
MAAS	Experiment	Pre-Test	13	53.4	14.7	-.77	1.19	.40	.61
		Post-Test	13	64.7	8.28	-.53	1.19	.30	.61
		Follow-up T.	13	57.2	9.97	-.98	1.19	-.11	.61
	Control	Pre-Test	13	53.6	10.4	2.02	1.19	-.46	.61
		Post-Test	13	27.9	6.46	.51	1.19	-.48	.61
		Follow-up T.	13	21.4	4.57	-.32	1.19	-.89	.61

SD: Standard Deviation. N: Participants. $\bar{x}$: Arithmetic Mean. Kurt: Kurtosis. K. SE: Standard Error of Kurtosis. Skew: Skewness. S.SE: Skewness Standard Error.

When Table 3 is evaluated. it is seen that all test results obtained from the IGDS9-SF and MAAS meet the normality assumption. Since the number of participants was less than 50. The Shapiro-Wilk test was used (Elliot & Woodward, 2007). and the results are presented in Table 4

Table 4. Results of the Shapiro-Wilk normality test

Scale	Group	Measuring	*W*	N	*p*
IGDS9-SF	Experiment	Pre-Test	.964	13	.814
		Post-Test	.867	13	.057
		Follow-up T.	.858	13	.037
	Control	Pre-Test	.894	13	.109
		Post-Test	.889	13	.094
		Follow-up T.	.940	13	.460
MAAS	Experiment	Pre-Test	.944	13	.511
		Post-Test	.971	13	.908
		Follow-up T.	.968	13	.865
	Control	Pre-Test	945	13	.526
		Post-Test	.917	13	.226
		Follow-up T.	.961	13	.767

Considering Table 4, it can be concluded that the pre-test. post-test. and follow-up test scores of the experimental and control groups' IGDS9-SF and MAAS pre-test. post-test. and follow-up test scores were normally distributed. To use parametric tests in the analysis of the data obtained from the measurements in the study. the kurtosis. skewness. and Shapiro-Wilk results must show homogeneity of variances (Levene's Test) (Pasin et al., 2016), covariances of groups must be equal for binary combinations of measurement sets (Box's M Test), and the sphericity condition (Mauchly's Test) must be tested (Leech et al., 2005). The results are presented in Table 5.

Table 5. Levene. Box's M and sphericity test results

Groups	Variables	Levene				Box's M			Test of Sphericity	
		F	*sd1*	*sd2*	*p*	Statistic	*F*	*p*	Mauchly's W	*p*
IGDS9-SF	Pre-Test	.68	1	24	.41	13.32	1.91	.078	.85	.15
	Post-Test	.34	1	24	.45					
	Follow-up T.	.42	1	24	.52					
MAAS	Pre-Test	1.12	1	18	.30	15.97	2.38	.057	.76	.05
	Post-Test	3.37	1	18	.08					
	Follow-up T.	.003	1	18	.95					

The Levene's test result ($p > .05$) in Table 5 shows that the variances of the experimental and control groups are equal in terms of IGDS9-SF and MAAS. Additionally, the Box's M test result ($p > .05$) indicates that the covariances of the

groups are equal for the binary combinations of the measurement sets. When the Mauchly test result ($p > .05$) is analysed. it is seen that the assumption of sphericity among the assumptions of ANOVA for Repeated Measures is met. As a result. in line with the hypotheses of the study. the repeated measures ANOVA test was used to test the effectiveness of the mindfulness-based psychoeducation programme prepared to reduce the level of problematic online game playing on the dependent variables (problematic online game playing level and mindfulness).

Findings

Preliminary Analyses: The independent samples t-test was used to compare the pre-test scores obtained from the IGDS9-SF and MAAS by participants in the experimental and control groups. The results of the analysis are presented in Table 6.

Table 6. Table of results for the pre-test mean scores of the IGDS9-SF and MAAS for the experimental and control groups.

Scales	Variables	*N*	$\bar{x}$	*SS*	*t*	*p*
IGDS9-SF Pre-Test	Experimental Group	13	27.9	6.46	.63	.53
	Control Group	13	26.2	7.07		
MAAS Pre-Test	Experimental Group	13	53.46	14.75	-.04	.76
	Control Group	13	53.69	10.45		

As seen in Table 6, there is no significant difference between the IGDS9-SF and MAAS mean scores of participants in the experimental and control groups ($p > .05$).

Findings Related to the Effect of the Mindfulness-Based Psycho-Education Programme on Adolescents' Problematic Online Gaming: In the study. the first hypothesis. "*Participants in the mindfulness-based psychoeducation group will demonstrate a greater decrease in problematic online gaming than the control group at the post-test assessment, and this difference will persist at the three-month follow-up assessment.*" was tested using a 2x3 repeated measures analysis of variance. The results of the repeated measures analysis of variance (ANOVA) test for the average scores of the experimental and control groups on the IGDS9-SF are presented in Table 7.

Table 7: Analysis of variance (ANOVA) test for repeated measures

Source of Variance	Sums of Square	*Df*	Mean Square	F	p	η2
Between Groups						
Experimental and Control Groups	100.16	1	100.16	16.05	.00	.24
Error	156.00	25	8.66			
Within Groups						
Measurement (Pre-test, Post-test, and Follow-up)	121.10	2	60.55	14.09	.00	.32
Group * Measurement T. Interaction	165.30	2	94.99	19.23	.00	.34
Error	206.25	48	4.93			

As seen in Table 7, when only the groups are considered independently of the measurements. A significant difference is found in the mean scores of the IGDS9-SF ($F_{1.24} = 16.051$; $p < 0.05$, $\eta^2 = 0.24$). When only the order of measurements is considered independently of the group variable. the IGDS9-SF scores of all participants change depending on the change in measurements ($F_{1.24} = 14.091$; $p < 0.05$, $\eta^2 = 0.32$). The group * measurement interaction results show that the mean IGDS9-SF scores differ between the experimental and control groups as the measurements (Pre-test, Post-test, Follow-up) change ($F_{1.24} = 19.235$; $p < 0.05$, $\eta^2 = 0.34$). 34% of the change in IGDS9-SF scores observed across the measurements between the groups is explained by the experimental procedure. A η^2 value greater than 0.14 indicates that the effect of the independent variable (the psycho-education program applied to the participants) is strong. To determine from which groups the difference in the intervention * measurement interaction originated, and in which direction this difference was. the Bonferroni test was applied. The findings are presented in Table 8.

Table 8. Bonferroni Test Results for IGDS9-SF Mean Scores

IGDS9-SF - Bonferroni		Experiment Group			Control Group		
		Pre-Test Mean Difference (I-J)	Post-Test Mean Difference (I-J)	Follow-Up Test Mean Difference (I-J)	Pre-Test Mean Difference (I-J)	Post-Test Mean Difference (I-J)	Follow-Up Test Mean Difference (I-J)
Experiment Group	Pre-Test				1.69		
	Post-Test	-6.46*				-5.15*	
	Follow-up T.	-3.84*	2.61*				-3.46*
Control Group	Pre-Test						
	Post-Test				-.384		
	Follow-up T.				-1.30	-.923	

*p < .05

As seen in Table 8, the difference between the experimental group's IGDS9-SF pre-test mean score ($\bar{x} = 27.90$) and post-test mean score ($\bar{x} = 21.4$) was found to

be statistically significant (-6.461* $p < .05$). The difference between the experimental group's post-test means score ($\bar{x} = 21.4$) and follow-up test mean score ($\bar{x} = 24.0$) was also significant (2.615* $p < .05$). Another finding indicates that the difference between the experimental group's pre-test mean score ($\bar{x} = 27.90$) and follow-up test mean score ($\bar{x} = 24$) was significant as well (-3.846* $p < .05$).

The findings related to the first hypothesis of the study show that the mindfulness-based psychoeducation program resulted in a statistically significant decrease in the IGDS9-SF mean scores of participants in the experimental group compared to those in the control group after the experimental intervention. Despite some increase, the effect of these decreases continued. Based on these findings. the first hypothesis of the research is confirmed. To support the first hypothesis of the study. an independent samples t-test was conducted to determine whether there was a statistically significant difference between the experimental and control groups in terms of online gaming durations (pre-test, post-test, and follow-up test). The results of the analysis are presented in Table 9.

Table 9. Mean Online Gaming Duration of Participants

		N	$\bar{x}$	*SD*	*t*	*p*
Pre-Test Online Gaming Duration	Experiment Group	13	13.0	3.02	-.19	.85
	Control Group	13	13.2	3.17		
Post-Test Online Gaming Duration	Experiment Group	13	7.77	2.16	-3.35	.00
	Control Group	13	11.3	3.22		
Follow-Up Test Online Gaming Duration	Experiment Group	13	8.85	2.34	-3.30	.00
	Control Group	13	12.2	2.86		

*p<0.05

As seen in Table 9, there is no significant difference between the pre-test mean scores of the experimental and control groups in terms of online gaming duration ($p > .05$). However. significant differences are observed in the post-test and follow-up test scores. These findings support the results obtained from the IGDS9-SF mean scores.

Findings on the Effect of the Mindfulness-Based Psycho-Education Program on Adolescents' Mindfulness Levels: In the study. a 2x3 repeated measures analysis of variance (ANOVA) was conducted to test the second hypothesis. which states: " *H2: Participants in the mindfulness-based psychoeducation group will demonstrate a greater increase in mindfulness levels than the control group at the post-test assessment, and this difference will persist at the three-month follow-up assessment.*" The results of the repeated measures ANOVA test for the mean MAAS scores of the experimental and control groups are presented in Table 10.

Table 10. Analysis of variance (ANOVA) test for repeated measures

Source of Variance	Sums of Squares	*Df*	Mean Square	*F*	*p*	η2
Between Groups						
Experimental and Control Groups	614.77	1	614.88	2.03	.04	.18
Error	7269.43	24	302.78			
Within Groups						
Measurement Times (Pre-test, Post-test, and Follow-up)	272.10	2	136.05	8.41	.00	.26
Group * Measurement T. Interaction	628.92	2	388.50	19.46	.00	.28
Error	775.64	48	16.15			

As seen in Table 10, when only the groups are considered independently of the measurements. a significant difference is found in the mean MAAS scores ($F_{1.24} = 2.030$; $p < 0.05$, $\eta^2 = 0.18$). When only the order of measurements is considered independently of the group variable. the MAAS scores of all participants change depending on the change in measurements ($F_{1.24} = 8.419$; $p < 0.05$, $\eta^2 = 0.26$). The group* measurement interaction results show that the mean MAAS scores differ between the experimental and control groups as the measurements (Pre-test, Post-test, Follow-up) change ($F_{1.24} = 19.460$; $p < 0.05$, $\eta^2 = 0.28$). 28% of the change in MAAS scores observed across the measurements between the groups is explained by the experimental procedure. A η^2 value greater than 0.14 indicates that the effect of the independent variable (the psycho-education program applied to the participants) is strong. To determine from which groups the difference in the intervention * measurement interaction originated and in which direction this difference was. the Bonferroni test was applied. The findings are presented in Table 11.

Table 11. Bonferroni Test Results for MAAS Mean Scores

MAAS - Bonferroni		Experiment Group			Control Group		
		Pre-Test Mean Difference (I-J)	Post-Test Mean Difference (I-J)	Follow-Up Test Mean Difference (I-J)	Pre-Test Mean Difference (I-J)	Post-Test Mean Difference (I-J)	Follow-Up Test Mean Difference (I-J)
Experiment Group	Pre-Test				-.23		
	Post-Test	11.30*				13.30*	
	Follow-up T.	-3.76*	-7.53*				3.97*
Control Group	Pre-Test						
	Post-Test				-2.22		
	Follow-up T.				.230	2.00	

As seen in Table 11. the difference between the experimental group's MAAS pre-test means score ($\bar{x} = 53.46$) and post-test mean score ($\bar{x} = 64.76$) is significant (11.307* $p < .05$). The difference between the experimental group's post-test means score ($\bar{x} = 64.76$) and follow-up test mean score ($\bar{x} = 57.23$) is also

significant (-7.615* $p < .05$). Another finding indicates that the difference between the experimental group's pre-test mean score ($\bar{x} = 53.46$) and follow-up test mean score ($\bar{x} = 57.23$) is significant as well (-3.979* $p < .05$).

The findings related to the second hypothesis of the study show that the mindfulness-based psychoeducation program resulted in a statistically significant increase in the MAAS mean scores of participants in the experimental group compared to those in the control group after the experimental intervention. Despite a slight decrease. the effect of this increase continued. Based on these findings. the second hypothesis of the research is confirmed.

Discussion

Discussion of Findings on the Effect of the Mindfulness-Based Psychoeducation Program on Adolescents' Problematic Online Gaming Levels: An examination of the pre-test, post-test, and follow-up test scores of adolescents who participated in the mindfulness-based psychoeducation program revealed a decrease in problematic online gaming levels; however, an increase was observed during the three months following the completion of the experimental processes. When these follow-up test results are compared with the pre-test results, it is evident that the effect persisted. These findings support the hypothesis that "*Participants in the mindfulness-based psychoeducation group will demonstrate a greater decrease in problematic online gaming than the control group at the post-test assessment, and this difference will persist at the three-month follow-up assessment*." The results of this study are consistent with findings from another research in the field (Li et al., 2017; Li et al., 2018; Yao et al., 2017).

The results of the present study indicate that, by the end of the psychoeducation process, the level of problematic online gaming among adolescents in the experimental group had decreased. These findings are believed to have been achieved by emphasizing the recognition of emotions (Kökönyei et al., 2019; Park et al., 2016; Santos et al., 2016), awareness of being on autopilot while playing online games (Kuyken et al., 2008; Williams et al., 2006; Wright et al., 2019), and the relationship between psychological needs and online gaming (Torres-Rodriguez et al., 2018) during the sessions of the current study.

The dynamics of online games encompass various emotional responses, such as attachment, coping with stress, loneliness in real life, compassion, and emotional avoidance (Boran & Sürücü, 2022; Oğuz & Şenel, 2022). These emotional responses create a foundation for adolescents to form attachments with in-game characters and to escape from real-life stressors (Gökmen, 2019). The multiplayer nature of online games inherently triggers a sense of competition among players (Yükçü & Kaplanoğlu, 2018). Over time, this sense of competition may intensify,

leading adolescents to participate in another online gaming community where they can find compassion and support, ultimately fostering a sense of belonging to that group (Bekir, 2018). As a result, adolescents may fulfill their needs for communication, belonging, compassion, and achievement through online games, thereby reducing the importance of these needs in real life (Özarslan & Perdahçı, 2023). In the present study, addressing the automatic thoughts that may arise from problematic online gaming and highlighting the differences between real-life successes and failures and those in games may have contributed to the reduction in adolescents' levels of problematic online gaming.

A significant finding of the present study is that problematic online gaming increased in the follow-up test after the post-test measurements in both the experimental and control groups. In the case of Turkey, the high school entrance exam (HSEE) system is implemented as a compulsory requirement for students to transition from middle school to high school. The examination system used to assess students employs a grading scale that categorizes students as high achievers or low achievers, with the highest score being 500 points. The lowest exam score attained by participants in this study was 375. Consequently, it can be stated that the participants exhibited characteristics of successful students to a certain extent. Although the literature often shows a negative relationship between academic achievement and online gaming (Anand, 2007; Drummond & Sauer, 2014; Şahin, 2016), it has also been suggested that online gaming has little impact on adolescents' academic success. Dağ et al. (2021) found that participants with high levels of problematic online gaming could also have high levels of academic achievement. The literature also shows strong negative relationships between academic achievement and academic procrastination (e.g., delaying studying for exams, not completing assignments on time, missing important academic tasks) (Çetin & Ceyhan, 2018). Given that the adolescents in this study were admitted to high school based on their scores, their academic success was likely high, leading to low levels of academic procrastination, and consequently, they may have waited until the completion of academic tasks before engaging in online gaming.

Supporting this view, the use of self-regulation strategies is positively associated with academic achievement (Paterson, 1996; Pintrich & DeGroot, 1990), suggesting that during periods of intense academic demands, adolescents may have focused on academic success and adjusted their online gaming time accordingly during leisure periods. Additionally, the preference for online gaming as a primary leisure activity among adolescents (Hazar et al., 2017), the perception of vacation as a time for online gaming (Biricik & Atik, 2021), and special events with record discounts organized by the world's largest gaming platform, STEAM, during the "Great Seasonal Sale" in June (STEAM, 2023) may have contributed to the increase in problematic online gaming levels.

In conclusion, although there was an increase in the follow-up test IGDS9-SF mean scores, significant differences in online gaming time between the

experimental and control groups were observed in the post-test and follow-up tests. These results suggest that the control group had higher online gaming times compared to the experimental group, supporting the first hypothesis.

Discussion of Findings on the Effect of the Mindfulness-Based Psychoeducation Program on Adolescents' Mindfulness Levels: An examination of the pre-test, post-test, and follow-up test scores of adolescents who participated in the mindfulness-based psychoeducation program designed to reduce problematic online gaming levels revealed an increase in mindfulness levels; however, a decrease was observed during the three months following the completion of the experimental processes. When these follow-up test results are compared with the pre-test results, it is evident that the effect persisted. These findings support the hypothesis that "*Participants in the mindfulness-based psychoeducation group will demonstrate a greater increase in mindfulness levels than the control group at the post-test assessment, and this difference will persist at the three-month follow-up assessment.*" The results of this study are consistent with findings from other research in the field (Li et al., 2017; Li et al., 2018; Özçakmak-Altınay, 2023; Serap-Keçeli, 2017; Sharma et al., 2021).

The results of the present study indicate that the mindfulness levels of participants in the experimental group increased by the end of the psychoeducation process. These findings are believed to have been achieved through the mindfulness-based interventions applied during the psychoeducation sessions, which emphasized focusing on the present moment, learning and applying the concept of 'autopilot' in daily life (Kircaburun et al., 2019; Li et al., 2017; Mettler et al., 2020; Yao et al., 2017; Yu et al., 2018; Zajac et al., 2020; Zhang et al., 2019), mindful sitting, movement (Semple & Lee, 2008; Semple & Lee, 2014; Williams & Penman, 2011; Wright et al., 2019), mindful eating (Monroe, 2015; Kristeller & Epel, 2014), and the importance of mindful coloring (Carsley et al., 2015; Carsley & Heath, 2020).

In mindfulness-based interventions, topics such as body awareness (Surawy et al., 2015), the mind-body relationship (Kabat-Zinn, 1982), cognitive distortions (Güldal, 2019), and automatic thoughts are frequently addressed, using exercises like body scanning, sitting meditation, and focusing on bodily sensations (Carsley et al., 2015; Carsley & Heath, 2020; Kristeller & Epel, 2014; Monroe, 2015; Semple & Lee, 2008; Semple & Lee, 2014; Williams & Penman, 2011). These exercises form the foundation of mindfulness-based interventions (Hayes et al., 2004; Linehan et al., 1999; Segal et al., 2002). In the present study, the use of these activities may have contributed to participants' increased mindfulness by bringing automatic thoughts to the surface.

Another finding of the present study is that the mindfulness levels of both the experimental and control groups decreased in the follow-up test after the post-test measurements. There could be multiple reasons for the decrease in mindfulness scores observed in the follow-up tests. Mindfulness activities require personal introspection, deep reflection, and a focus on the present moment (Kabat-Zinn,

1990). Given that online games are filled with external rewards and entertainment-seeking elements, it might have been challenging for adolescents to maintain their focus on mindfulness-based activities. Another reason for the decrease could be that the psychoeducation intervention program primarily focused on online gaming, making it difficult to generalize the mindfulness gained to other areas of life. This situation might have led to an increase in mindfulness levels in the post-test, but a limitation and decrease in the follow-up tests.

Conclusion

The findings of this study demonstrate that the mindfulness-based psychoeducation program effectively increased mindfulness levels and reduced problematic online gaming behaviors among adolescents in the experimental group. By focusing on present-moment awareness, autopilot, and the integration of mindfulness practices such as mindful sitting, movement, eating, and colouring, the program helped participants enhance their mindfulness and decrease their engagement in problematic online gaming.

However, the follow-up tests revealed a decline in mindfulness levels after the program ended, suggesting that sustaining mindfulness practices over time may be challenging, particularly in the face of external distractions like online gaming. The decrease in mindfulness observed during the follow-up period highlights the need for continued support and reinforcement of mindfulness practices beyond the duration of the intervention.

Moreover, the study's focus on online gaming may have limited the generalization of mindfulness skills to other areas of the participants' lives, indicating that future programs should consider a broader application of mindfulness to enhance its long-term effectiveness. Despite these challenges, the overall results support the effectiveness of mindfulness-based interventions in promoting healthier behaviours among adolescents. Future research could explore strategies to maintain and reinforce mindfulness practices over time, ensuring that the benefits of such interventions are sustained in the long term

Limitations

This study has several limitations that should be considered. Firstly, it was conducted exclusively with Turkish high school students, within a specific sample group and at selected schools. Additionally, the majority of participants were male, which is another limitation. Moreover, given Türkiye's cultural diversity, conducting the study within a single region presents a limitation. The researcher leading the

study holds a PhD and has a European-accredited cognitive behavioural therapy certification (EACBT) as well as a mindfulness-based cognitive therapy (MBCT) certification. This might raise questions about the program's applicability. It would be valuable to compare these findings with those obtained when the program is implemented by a trained professional.

Authors' Notes

This study is based on the author's doctoral thesis, completed under the supervision of Assoc. Prof. Dr. Filiz Gültekin.

Author's contribution: Conception: S.B., Design: S.B. Data collection: S.B., Analysis: S.B., Writing: S.B,

Conflict of interest: The authors declare no conflict of interest.

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INVESTIGATING THE MEDIATING ROLE OF COGNITIVE FLEXIBILITY AND INTOLERANCE OF UNCERTAINTY IN THE RELATIONSHIP BETWEEN PERFECTIONISM AND RESILIENCE

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Abstract

This research explores whether cognitive flexibility and intolerance of uncertainty function as intermediary mechanisms in the association between perfectionism and resilience. The participant group in this study comprised 424 undergraduate students (302 women, 122 men) pursuing education across various departments within the Faculties of Education, Economics and Administrative Sciences, and Engineering at a public university. The data collected in the study were evaluated through Pearson Correlation and Bootstrap analyses. The study revealed a significant negative relationship between perfectionism and resilience. Additionally, a noteworthy inverse linkage was identified between perfectionism and cognitive flexibility. In addition, a significant positive link was identified between perfectionism and intolerance of uncertainty. In addition, resilience exhibited a meaningful positive correlation with cognitive flexibility, whereas it was inversely associated with intolerance of uncertainty. The analysis further revealed that cognitive flexibility and intolerance of uncertainty were complete mediators in the relationship between perfectionism and resilience.

Keywords: Resilience, perfectionism, cognitive flexibility, intolerance of uncertainty.

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Introduction

The rapidly changing social structure, economic fluctuations, and global uncertainties are testing individuals' psychological resilience more than ever. University life, in particular, is a complex process that challenges the mental health of young adults and requires them to cope with various sources of stress. It is widely recognized as a challenging period where individuals face numerous problems and learn to find solutions to these issues (Aluede et al., 2006; Erdur-Baker & Bıçak, 2006). Studies indicate that, in this phase, university students face an elevated risk of encountering mental health issues (Özel et al., 2020; Hyun et al., 2006). Studies also indicate that university students encounter economic, academic, adaptation, and social difficulties throughout their educational journey (Camadan & Kıraç, 2020; Donat et al., 2019). The intense stress experienced by students can negatively impact their overall quality of life (Yıldız et al., 2024). A study conducted with 5.829 students in Turkey found that university students face emotional, economic, academic, and romantic challenges (Erkan et al., 2012). Similarly, research in the United States revealed that university students often face considerable distress from academic, occupational, and financial concerns (King et al., 2014). These multidimensional challenges adversely affect students' psychological resilience, further complicating their adaptation processes. At this point, the positive psychology approach emphasizes that individuals' internal resources and strengths directly influence their ability to cope with stress and overcome challenging life events. Specifically, positive individual characteristics such as love, courage, perseverance, future orientation, and spiritual development enhance individuals' resilience, making them more resistant to difficulties (Seligman & Csikszentmihalyi, 2000). Within this framework, the initial phase of positive psychology emphasizes studies focused on strengthening psychological resilience and identifying strategies to build coping abilities when confronted with stress and hardship. According to Fredrickson (2001), positive emotions increase individuals' resistance to stressful situations and contribute to greater flexibility and adaptability. These results underscore the need to bolster university students' psychological resilience to safeguard their mental well-being and preserve life quality amid their complex challenges.

Resilience

One of the key adaptive skills of individuals is resilience (Weston & Parkin, 2010). Masten (2014) described resilience as the ability to adjust to difficult circumstances that endanger a person's growth and overall life trajectory. Conversely, Rutter (1985) highlighted resilience as a fluid concept shaped by the interplay between protective and risk factors, which modifies how adverse experiences affect an individual. It can be stated that resilience significantly

influences individuals' adaptability and their ability to endure stressful and adverse experiences (Zautra et al., 2010). Individuals exhibiting elevated resilience tend not to succumb to stress; they recover more swiftly and emerge fortified from challenging life events (Henderson & Milstein, 1996).

Resilience, by its nature, relies on risk and protective factors within its framework (Gu & Day, 2007). Risk factors include disorders, deficiencies, and challenges individuals face (Nicotera & Laser-Maira, 2017). Conversely, these adversities are mitigated by protective factors, which enhance individuals' resilience (Masten et al., 1990). It is observed that while some individuals succumb to challenging events, others successfully cope with them, a difference attributed mainly to their levels of resilience (Watters et al., 2023). This underscores the significance of diverse psychological elements that shape resilience, with perfectionism recognized as a significant contributing factor (Klibert et al., 2014).

Perfectionism

Perfectionism refers to the tendency to impose performance standards on oneself or others that exceed what is reasonably required by the circumstances (Frost et al., 1990). It predominantly stems from the need for approval, love, non-rejection, and acceptance (Tuncer & Voltan-Acar, 2006). Hewitt and Flett (1991) framed perfectionism as a multidimensional construct encompassing self-directed, other-directed, and socially imposed forms. In a related framework, Frost et al. (1990) identified six components of perfectionism: elevated personal benchmarks, sensitivity to errors, perceived parental demands, critical parental feedback, hesitation in decision-making, and emphasis on orderliness. Pacht (1984) argued that striving for perfection does not represent a healthy goal; rather, it is considered an unhealthy behavior. Perfectionist individuals perceive stress more intensely than others throughout their lives and may adopt a more rigid and critical stance toward themselves and others (Rice et al., 2006).

Cognitive Flexibility

Cognitive flexibility (Sheppard & Hicks, 2017) and resilience (Bannazadeh et al., 2022) are among the variables considered to be associated with perfectionism. Cognitive flexibility refers to an individual's ability to modify their thought processes and behaviors in response to evolving situations and changing demands (Martin & Anderson, 1998). It describes a person's ability to navigate difficulties by generating solutions and forming varied viewpoints on particular situations (Richer, 2011). Another definition suggests that as individuals grow and develop, the number of stimuli in their environment increases, requiring them to adjust themselves accordingly to cope with these stimuli (Crone et al., 2004).

Two key aspects commonly characterize cognitive flexibility: a learning-oriented process and an individual's ability to accommodate novel or changing circumstances (Payne et al., 1988). Cognitive flexibility involves shifting mental frameworks in response to changing circumstances. It is conceptualized in three dimensions: (1) viewing difficult situations with a sense of control, (2) identifying alternative explanations for behaviors and events, and (3) generating different solutions for complex problems (Dennis & Vander Wal, 2010).

Moreover, it has been noted that individuals with high cognitive flexibility tend to recognize a range of possible options when faced with decision-making in varying contexts (Martin & Rubin, 1994). Conversely, cognitively inflexible individuals become distracted, struggle to adapt to new situations, approach events with a fixed mindset, and often resist change (Jonassen & Grabowski, 1993).

Intolerance of Uncertainty

Another variable linked to perfectionism is intolerance of uncertainty (Saadi et al., 2019), which is also associated with resilience (Lee, 2019). Intolerance of uncertainty denotes a tendency to react to ambiguous or unpredictable circumstances with maladaptive cognitive, emotional, and behavioral responses (Buhr & Dugas, 2002). Hofstede (2001) characterized intolerance of uncertainty as discomfort or unease experienced in ambiguous or unclear circumstances. Another definition explains intolerance of uncertainty as the discomfort individuals experience when confronted with the possibility of an event unfolding in an undesirable manner (Carleton et al., 2007). According to Budner (1962), individuals experience intolerance of uncertainty, particularly when the uncertain situation is new or unfamiliar, complex or difficult to resolve, caused by contradictory circumstances where the appropriate course of action is unclear, or when individuals perceive the situation as threatening.

When examining the causes of intolerance of uncertainty, it is evident that this condition is closely related to personality traits. Studies suggest that people with anxious or perfectionist traits, a strong need for control, or a persistent desire for certainty are likelier to display elevated intolerance of uncertainty (Çardak, 2012). It has also been underscored that individuals exhibiting elevated intolerance of uncertainty tend to expect unfavorable consequences when confronted with unclear or unpredictable situations. They tend to interpret these events exaggeratedly, display a negative cognitive bias, and experience impaired functionality when uncertain (Buhr & Dugas, 2002; Yook et al., 2010). It has also been observed that intolerance of uncertainty frequently leads to increased anxiety and the development of harmful emotional responses (Karataş & Uzun, 2018).

The Relationship Between Resilience, Cognitive Flexibility, Intolerance of Uncertainty, and Perfectionism

A strong positive correlation has been consistently reported between resilience and cognitive flexibility across various studies (Arici-Ozcan et al., 2019; Ateş & Sağar, 2021a; Bannazadeh et al., 2022; Güleç, 2020; Seçim, 2020; Taşkın-Aydın, 2022). Several studies also reveal notable positive associations between resilience, cognitive flexibility, and various psychological constructs, including life goals (Güleç, 2020), emotion regulation (Arici-Ozcan et al., 2019; Seçim, 2020), self-compassion (Yelpaze, 2020), self-efficacy (Ateş & Sağar, 2021b), insight (Kaya et al., 2021), and forgiveness (Demirtaş, 2021).

On the other hand, negative associations have been identified between resilience and loneliness (Yelpaze, 2020), as well as between resilience and cognitive flexibility and impulsivity related to suicide attempts (Ram et al., 2019). A significant inverse relationship has also been consistently documented between resilience and intolerance of uncertainty in numerous studies (Aydın & Ersoy-Özcan, 2021; Joshi, 2020; Karataş & Tagay, 2021; Lee, 2019; Saatçı, 2020; Taşkın-Aydın, 2022). Furthermore, empirical findings have demonstrated a meaningful inverse association between resilience and perfectionism (Klibert et al., 2014; Saadi et al., 2019; Sheppard & Hicks, 2017).

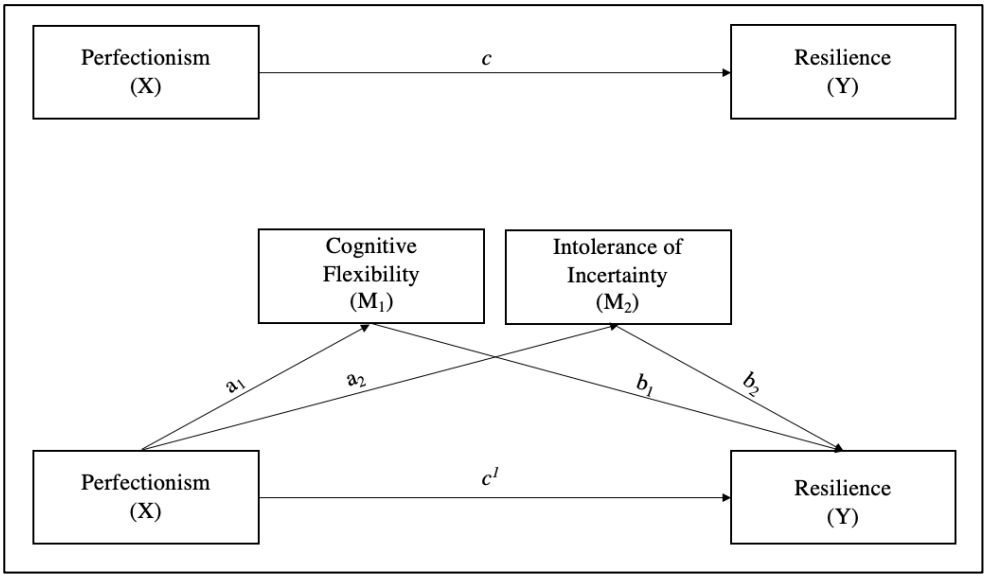
Likewise, research has identified a significant negative association between cognitive flexibility and perfectionism (Çutuk, 2020; Hayatbini et al., 2021). In contrast, a positive and significant correlation has been observed between intolerance of uncertainty and perfectionism (Reuther et al., 2013; Saatçı, 2020; Williams & Levinson, 2020).

The Current Study

Resilience is a crucial quality that enables university students to manage the challenges they face effectively and adjust successfully to university life. Perfectionism is associated with a rigid mindset, which may pose a risk to resilience. To gain a deeper insight into the interplay between perfectionism and resilience, exploring how cognitive flexibility and intolerance of uncertainty function as mediating variables within this relationship is crucial. Consequently, cognitive flexibility may alleviate the negative impact of perfectionism on resilience, whereas intolerance of uncertainty may amplify it.

An examination of the relevant literature suggests that these variables have not previously been investigated collectively within an integrated analytical model. It was hypothesized that university students' psychological resilience could be

predicted by their levels of perfectionism. In addition, cognitive flexibility and intolerance of uncertainty might operate as intermediary variables in the association between perfectionism and resilience (Figure 1).



(Abbreviations: X: Independent variables, Y: Dependent variables, M_1: Mediator 1, M_2: Mediator 2) (Hayes, 2013) Model 4

Figure 1. The hypothetical model of the study

H_1: A significant inverse association between perfectionism and resilience (path c) is observed.
H_2: Perfectionism demonstrates a significant negative linkage with cognitive flexibility (path a_1)
H_3: Perfectionism is positively and significantly associated with intolerance of uncertainty (*path* a_2).
H_4: Cognitive flexibility is positively and significantly related to resilience (*path* b_1).
H_5: Intolerance of uncertainty is negatively and significantly related to resilience (*path* b_2).
H_6: Cognitive flexibility and intolerance of uncertainty mediate the relationship between perfectionism and resilience.

Method

Research Design

This study employed a relational survey design to examine the intermediary roles of cognitive flexibility and intolerance of uncertainty in the association between perfectionism and resilience. This design aims to determine whether a relationship

exists between two or more variables and to assess the magnitude of such associations (Creswell, 2012; Johnson & Christensen, 2010).

Participants

The participants comprised 424 students pursuing their studies at various public university departments during the 2022–2023 academic year. Of these, 140 students were from the Faculty of Education, including programs such as Guidance and Psychological Counseling, English Language Teaching, Preschool Teaching, and Mathematics Teaching. 145 students were from the Faculty of Economics and Administrative Sciences, studying in departments such as Economics, Econometrics, Finance, Business Administration, and Labour Economics and Industrial Relations. The remaining 139 students were from the Faculty of Engineering, which included programs such as Industrial Engineering, Environmental Engineering, Mechanical Engineering, and Electrical and Electronics Engineering. Of the individuals who participated in the study, 302 identified as female (71.2%) and 122 as male (28.8%). Participants' ages ranged from 18 to 23, with a mean age of 19.24.

Instruments

Brief Resilience Scale: The scale was initially developed by Smith et al. (2008) and subsequently adapted to Turkish culture by Doğan (2015). The instrument consists of six items on a 5-point Likert scale, with response categories ranging from "1 – Not at All Suitable" to "5 – Completely Suitable." Items 2, 4, and 6 are scored in reverse. Higher total scores reflect greater levels of resilience. The scale is unidimensional, and results from the Exploratory Factor Analysis (EFA) conducted to assess its validity indicated that it accounts for 54% of the total variance. The scale's reliability was evaluated using Cronbach's alpha internal consistency coefficient, which was reported as 0.83 (Doğan, 2015). In this study, the psychometric properties of the Brief Resilience Scale were reassessed to evaluate its suitability for the target population. The Confirmatory Factor Analysis (CFA) conducted to examine the scale's validity indicated that the model-data fit was acceptable ($\chi^2/df = 2.326$, RMSEA = .056, SRMR = .0208, CFI = .993, NFI = .908, GFI = .987, TLI = .985) (Byrne, 2001; Kline, 2015). In the present research, the internal consistency coefficient of the scale, as measured by Cronbach's alpha, was calculated to be .89, indicating a high level of reliability. Example items from the scale include: Item 1: "*I can recover quickly after troubled times,"* and Item 4: "*When something bad happens, it is difficult for me to get over it*."

Big Three Perfectionism Scale: The scale developed by Feher et al. (2020) was adapted to Turkish culture by Kaçar-Başaran et al. (2020). The instrument consists of 16 items formatted on a 5-point Likert scale, with response options

ranging from "(1) Strongly Disagree" to "(5) Strongly Agree." Elevated total scores on the scale reflect greater levels of perfectionism. The instrument is structured around three subdimensions: Rigid Perfectionism, Self-Critical Perfectionism, and Narcissistic Perfectionism. The Cronbach's alpha internal consistency coefficients for these subscales were reported as .85 for Rigid Perfectionism, .86 for Self-Critical Perfectionism, and .75 for Narcissistic Perfectionism. Test-retest reliability coefficients were .80, .87, and .79, respectively (Kaçar-Başaran et al., 2020). This study reassessed the validity and reliability analyses of the Big Three Perfectionism Scale to confirm its suitability for the research sample. The Confirmatory Factor Analysis (CFA) performed to evaluate the scale's construct validity demonstrated that the model exhibited an adequate level of fit with the observed data ($\chi^2/df = 2.738$, RMSEA = .064, SRMR = .663, CFI = .912, NFI = .870, GFI = .932, TLI = .912) (Byrne, 2001; Kline, 2015). In the context of this study, the Cronbach's alpha coefficient computed to evaluate the overall internal consistency of the scale was determined to be .82. Example items from the scale include: Item 6: "*When I do not do things perfectly, people get disappointed*." and Item 14: "*Striving to be as perfect as possible makes me feel valuable*."

Cognitive Flexibility Scale: Originally developed by Martin and Rubin (1994) and later adapted into Turkish by Çelikkaleli (2014), this instrument consists of 12 items rated on a 6-point Likert scale, with response options ranging from "(1) Strongly Disagree" to "(6) Strongly Agree." Items 2, 3, 6, and 10 are reverse scored. Elevated scores on the instrument signify a higher degree of cognitive flexibility. The scale is unidimensional, and the Exploratory Factor Analysis (EFA) conducted to assess its validity showed that it explained 43% of the total variance. The scale's reliability, as assessed through Cronbach's alpha, was found to be 0.74 in the study conducted by Çelikkaleli (2014). This study's validity and reliability analyses of the Cognitive Flexibility Scale were re-evaluated. The Confirmatory Factor Analysis (CFA) conducted to examine the scale's validity indicated that the model-data fit was acceptable ($\chi^2/df = 3.245$, RMSEA = .073, SRMR = .054, CFI = .913, NFI = .880, GFI = .944, TLI = .880) (Byrne, 2001; Kline, 2015). The scale's internal consistency, as measured by Cronbach's alpha, was calculated to be .80, indicating an acceptable level of reliability. Example items from the scale include: Item 6: "*I cannot develop different perspectives when deciding how to behave*," and Item 9: "*I can behave in different ways in any situation*."

Intolerance of Uncertainty Scale: Initially developed by Carleton et al. (2007), the scale was later adapted to the Turkish context by Sarıçam et al. (2014). It consists of 12 items rated on a 5-point Likert scale, with response categories ranging from "(1) Not Suitable for Me at All" to "(5) Completely Suitable for Me." The first item is reverse-coded. Higher scores reflect a higher level of intolerance of uncertainty. The scale is structured into two dimensions: Prospective Anxiety and

Inhibitory Anxiety. The Exploratory Factor Analysis (EFA) conducted to determine its validity showed that the total variance explained was 78%. The scale's reliability, as indicated by internal consistency coefficients, was found to be .88 for the overall measure, .84 for the Prospective Anxiety subscale, and .77 for the Inhibitory Anxiety subscale (Sarıçam et al., 2014). In this study, the validity and reliability analyses of the Intolerance of Uncertainty Scale were re-evaluated. The Confirmatory Factor Analysis (CFA) conducted to assess the scale's validity indicated that the model-data fit was acceptable ($\chi^2/df = 2.690$, RMSEA = .063, SRMR = .0436, CFI = .956, NFI = .933, GFI = .949, TLI = .942) (Byrne, 2001; Kline, 2015). The overall internal consistency of the scale, as determined by Cronbach's alpha, was calculated to be .87, indicating a high level of reliability. Example items from the scale include: Item 1: "*Unexpected events bother me a lot*," and Item 5: "*I always want to know what the future holds for me*."

Data Collection

In the present study, authorization was secured from the original researchers responsible for adapting the scales into Turkish, ensuring their appropriate use within the scope of the research. The necessary legal and ethical approvals were then secured from a state university's "Scientific Research and Publication Ethics Committee (Social and Human Sciences)" to implement the data collection tools. Following this, official approval for data collection was obtained from the administrative authorities of the university where the study was conducted. After receiving these permissions, the study's aims were explained to the university students who constituted the study group, and they were assured of the confidentiality of the data. The researchers administered the scale applications face-to-face in a classroom setting with volunteer participants.

Data Analysis

Before proceeding with the data analysis, the dataset was examined for incomplete entries, and it was verified that no missing data were presentIn order to reassess the reliability of the measurement tools utilized in the study, Cronbach's alpha coefficients were calculated, and Confirmatory Factor Analysis (CFA) was employed to assess their construct validity. The findings indicated that the instruments demonstrated acceptable levels of validity and reliability.

This research explored the intermediary influence of cognitive flexibility and intolerance of uncertainty in clarifying the association between perfectionism and resilience. Mediation analysis was utilized to assess the degree to which one or more mediating variables (M) transmit the effect of an independent variable (X) on a dependent variable (Y). The current investigation utilized a multiple mediation framework to examine the indirect pathways underlying the relationship among the variables. This analytical model aims to illustrate the pathways through which the

independent variable impacts the mediators and, subsequently, how these mediators influence the dependent variable. This comprehensive structure evaluates the independent variable's direct and mediated (indirect) effects on the dependent variable (Hayes, 2013).

Before performing the analyses, it was verified that the assumptions of normal distribution and the absence of multicollinearity issues were met (Pallant, 2020). The skewness and kurtosis statistics, which were examined to assess the normality of the variable distributions, were determined to be within the acceptable thresholds recommended in the literature (Table 2) (Tabachnick & Fidell, 2013). Additionally, the z-scores calculated for the items were considered when identifying outliers related to the normality of the variables. Mertler and Vannatta (2016) state that data with z-scores less than -4 or greater than +4 are considered univariate outliers. The calculations revealed that no data points fell within these extreme values.

To assess multicollinearity, Tolerance Values (TV) were found to range between .737 and .905, and the Variance Inflation Factor (VIF) values ranged from 1.105 to 1.259 (Field, 2009). Additionally, the Durbin-Watson coefficient was calculated as 1.925, indicating independence of residuals and falling within the acceptable range (Tabachnick & Fidell, 2013). These results confirmed that all necessary assumptions were satisfied, permitting the execution of further analyses.

In the analyses, the SPSS 25.0 Process Macro 4.1—specifically Model 4, which utilizes the bootstrap method developed by Hayes—was employed to test the hypotheses within the scope of multiple mediation analysis. This procedure examined the intermediary functions of cognitive flexibility and intolerance of uncertainty in the association between the predictor variable (perfectionism) and the outcome variable (resilience). Furthermore, descriptive indicators such as frequency, percentage, standard deviation, skewness, and kurtosis were computed to facilitate the interpretation of the data.

The mediating roles of cognitive flexibility and intolerance of uncertainty in the link between perfectionism and resilience were analyzed through the Bootstrap technique, employing 5000 resampling iterations. This approach yields more robust and dependable estimates than the Sobel test (Gürbüz, 2019). In mediation analyses conducted via the Bootstrap technique, the research hypothesis is supported only if the derived 95% confidence interval does not encompass the value zero (MacKinnon et al., 2004). The AMOS 21.0 software package was also utilized for data analysis, with the significance level set at .05.

Findings

Descriptive statistics for perfectionism, resilience, cognitive flexibility, and intolerance of uncertainty were analyzed. The findings from these analyses are displayed in Table 1.

Table 1. Descriptive Statistics of Perfectionism, Resilience, Intolerance to Uncertainty, and Cognitive Flexibility Variables

Variables	*n*	Min.	Max.	$\bar{x}$	*Sd*	Skewness	Kurtosis
Perfectionism	424	23.00	76.00	47.927	9.317	.108	-.007
Resilience	424	6.00	30.00	18.296	5.332	-.098	-.259
Cognitive Flexibility	424	30.00	72.00	52.895	7.749	-.058	-.098
Intolerance of Uncertainty	424	16.00	60.00	39.141	9.232	-.126	-.372

$\bar{x}$, arithmetic mean; Sd, Standard deviation.

An examination of Table 1 reveals that the arithmetic means ($\bar{x}$) and standard deviations (*SD*) for the variables are as follows: perfectionism ($\bar{x}$ = 47.93, *SD* = 9.32), resilience ($\bar{x}$ = 18.30, *SD* = 5.33), cognitive flexibility ($\bar{x}$ = 52.90, *SD* = 7.75), and intolerance of uncertainty ($\bar{x}$ = 39.14, *SD* = 9.23). Furthermore, the skewness values for the variables range from –.058 to –.126, while the kurtosis values range from –.007 to –.372, indicating that the data distributions are approximately standard. The relationships among the variables—perfectionism, resilience, cognitive flexibility, and intolerance of uncertainty—were also analyzed, and the results are presented in Table 2.

Table 2. Pearson Correlation Analysis Results for the Relationship between Perfectionism, Resilience, Cognitive Flexibility, and Intolerance of Uncertainty

Değişkenler	(1)	(2)	(3)	(4)
(1) Perfectionism	1.00			
(2) Resilience	–.24**	1.00		
(3) Cognitive Flexibility	–.16**	.46**	1.00	
(4)Intolerance of Uncertainty	.45**	–.42**	–.31**	1.00

**p<.01

A review of Table 2 reveals several statistically meaningful associations among the variables examined in the study. More precisely, perfectionism demonstrated a statistically significant inverse correlation with both resilience (r = –.24, p < .01) and cognitive flexibility (r = –.16, p < .01), whereas it exhibited a significant positive association with intolerance of uncertainty (r = .45, p < .01). Additionally, resilience showed a significant positive correlation with cognitive flexibility (r = .46, p < .01) and a significant negative correlation with intolerance of uncertainty (r = –.42, p < .01). A significant negative relationship was also observed between cognitive flexibility and intolerance of uncertainty (r = –.31, p < .01).

A regression analysis was performed using the Hayes Process macro with the bootstrap method to determine whether cognitive flexibility and intolerance of uncertainty function as mediators in the association between perfectionism and resilience. The outcomes of this analysis are detailed in Table 3.

Table 3. Regression-based findings of the multiple parallel mediation model (n=424)

	Dependent Variables											
	M_1				M_2				Y			
Independent Variables	*b*	*SE*	*LLCI*	*ULCI*	*b*	*SE*	*LLCI*	*ULCI*	*b*	*SE*	*LLCI*	*ULCI*
Direct Effects												
X	-.131*	.040	-.209	-.052	.411**	.042	.329	.493	-.031	.026	-.083	.020
M_1	-	-	-	-	-	-	-	-	.252**	.029	.194	.310
M_2	-	-	-	-	-	-	-	-	-.164**	.027	-.218	-.111
Constant	59.152*	1.952	55.315	62.989	34.758**	3.607	27.667	41.848	12.887**	2.240	8.482	17.292
	R^2=.246				R^2=.263				R^2=.303			
Indirect Effects					*b*	*SE*	*LLCI*	*ULCI*	Full Standardized Effect Size			
X → M_1 → Y					-.032**	.011	-.057	-.012	(*b* = -.187**, %95 BCA CI [-.253 to −.119])			
X → M_2 → Y					-.067**	.014	-.096	-.041				
X → M_1 + M_2 → Y					-.006**	.003	-.012	-.002				

*$p < 0.05$, **$p < 0.001$ Abbreviations: X, Perfectionism; Y, Resilience; M_1, Cognitive Flexibility, M_2, Intolerance of Incertainty; b, Standardized beta coefficients; SE, Standard error; LLCI, Lower-limit of confidence interval; BCA, Biased corrected accelerated; ULCI, Upper-limit of confidence interval; CI, Confidence interval

When the direct effects in Table 3 were analysed, it was found that the independent variable perfectionism negatively and significantly predicted one of the mediating variables, cognitive flexibility (*b* = –.131, 95% CI [–.209 to –.052]). On the other hand, perfectionism positively and significantly predicted intolerance of ambiguity, another mediator variable (*b* =.411, 95% CI [.329 to .493]). In addition, cognitive flexibility, a mediating variable, positively and significantly predicts resilience, the dependent variable (*b* =.252, 95% BCA CI [.194 to .310]). An examination of the indirect effects presented in the table revealed that cognitive flexibility served as a mediating variable in the association between the independent variable, perfectionism, and the dependent variable, resilience (*b* = –.032, 95% BCA CI [–.057, –.012]). Intolerance of uncertainty also mediated the relationship between perfectionism and resilience (*b* = –.067, 95% BCA CI [–.096 to –.039]). The mediating roles of cognitive flexibility and intolerance of uncertainty in the link between perfectionism and resilience were supported, as evidenced by the indirect effect (*b* = –.006, 95% BCA CI [–.012, –.002]). The table indicates that the fully standardized magnitude of the mediation effect is K2 = –.187, representing the proportion of the maximum potential indirect effect. According to Preacher and Kelly (2011), an effect size approaching 0.01 is considered small, around 0.09 as moderate, and near 0.25 as large. Within this framework, the strength of the

mediation effect observed in the model appears to approach a high magnitude. The related statistical outcomes of the model are illustrated in Figure 2.

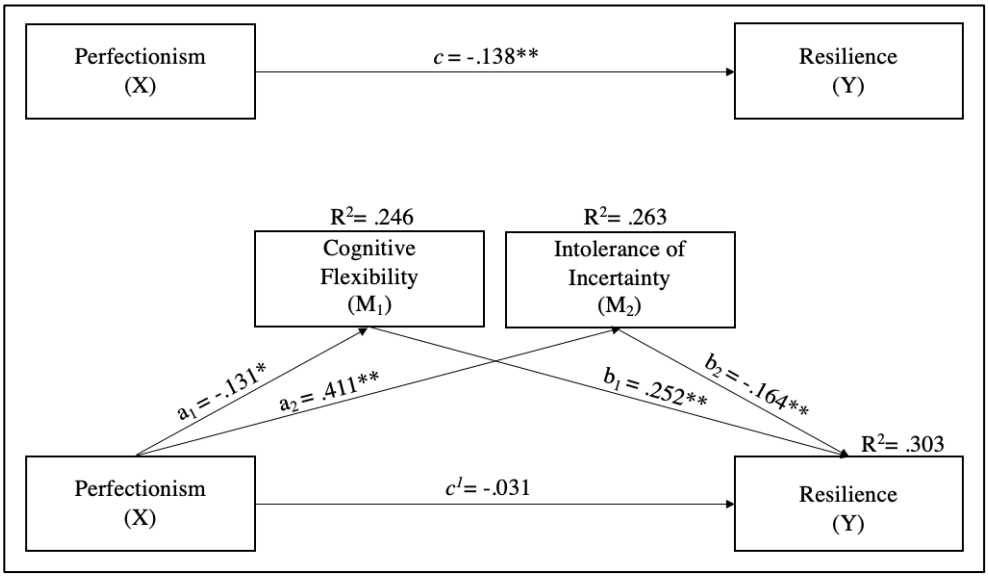


Figure 2. Illustration of the hypothetical mediation model proposed in the study

Examining the R^2 values in Figure 2 shows that perfectionism accounts for 25% of the variance in cognitive flexibility, 26% in intolerance of uncertainty, and 30% in resilience when considered alongside cognitive flexibility and intolerance of uncertainty. The model indicates that the combined influence of perfectionism, cognitive flexibility, and intolerance of uncertainty on resilience constitutes a large effect size ($R^2 = 0.26$), as Cohen (1988) suggested.

Figure 2 reveals that in the absence of mediating variables, the predictor variable perfectionism demonstrates a statistically significant association with the outcome variable resilience ($c = -.138$). However, after incorporating the mediators—cognitive flexibility and intolerance of uncertainty—into the model, the direct effect of perfectionism on resilience becomes statistically insignificant ($c_1 = -.031$). This finding indicates that cognitive flexibility and intolerance of uncertainty fully mediate the relationship between perfectionism and resilience (Baron & Kenny, 1986). All research hypotheses—H_1 through H6—were supported based on these results.

Discussion

This study primarily explores the connections among perfectionism, cognitive flexibility, intolerance of uncertainty, and psychological resilience in university students. It specifically seeks to clarify the nature of the link between perfectionism and psychological resilience, while examining whether cognitive flexibility and intolerance of uncertainty act as mediating variables in this relationship.

The empirical data corroborated the initial assumption of the research, suggesting that a meaningful and inverse association exists between perfectionism and resilience. A review of the literature shows that numerous studies are consistent with this finding (Klibert et al., 2014; Saadi et al., 2019; Sheppard & Hicks, 2017). Perfectionist individuals often experience various psychological problems when they fail to achieve their self-imposed goals or make even minor mistakes (Eley et al., 2020). Hibbard and Davies (2011) emphasized that university students exhibiting perfectionistic traits are at greater risk for psychological challenges such as depressive symptoms, eating-related disturbances, and social isolation. Perfectionist individuals are known to hold unrealistic and excessively high expectations for both themselves and others.

In contrast, resilience is typically associated with developing realistic and reasonable expectations in adversity. Therefore, these two characteristics contradict each other. In this context, the low tolerance for mistakes observed in perfectionist individuals may prevent them from maintaining psychological strength when confronted with errors or setbacks.

The study further revealed a significant negative association between perfectionism and cognitive flexibility. This result aligns with earlier studies by Çutuk (2020) and Hayatbini et al. (2021). Frost et al. (1993) highlighted that a core feature of perfectionism involves an overwhelming preoccupation with making mistakes. According to this perspective, perfectionist individuals hold extremely rigid beliefs about avoiding mistakes and maintain very high personal standards (Frost et al., 1990). In contrast, individuals with high cognitive flexibility tend to view mistakes as a regular part of daily life and believe that the important aspect is to learn from them (Anderson, 2002). Additionally, those with high cognitive flexibility possess a more adaptable mindset than perfectionist individuals, enabling them to adjust more easily and consider alternative situations effectively (Martin & Anderson, 1998). Given these explanations, it can be inferred that perfectionism, rooted in a rigid way of thinking, is inversely associated with cognitive flexibility, which reflects openness to diverse perspectives.

In addition, the findings confirmed a significant and positive relationship between perfectionism and intolerance of uncertainty. Examining existing scholarly work indicates that multiple prior investigations align with and substantiate this

result (Reuther et al., 2013; Williams & Levinson, 2020). Perfectionist individuals frequently establish unattainable goals and persistently strive to attain them (Burns, 1980). They also tend to exert substantial control over the steps to reach these goals (Periasamy & Ashby, 2002). Similarly, it has been observed that individuals with high intolerance of uncertainty often regard the possibility of adverse events as intolerable and burdensome to accept (Dugas et al., 2001). Therefore, it can be inferred that there is a linear relationship between the excessive desire for control characteristic of perfectionism and the inability to accept situations beyond one's control, as seen in intolerance of uncertainty.

The study also confirmed a significant positive relationship between cognitive flexibility and resilience. This outcome is consistent with existing studies (Southwick & Charney, 2018; Sünbül, 2020). Individuals demonstrating elevated cognitive flexibility are characterized by their capacity to focus on specific issues, adopt a solution-oriented perspective in confronting difficulties, and adapt proficiently to diverse contexts and novel circumstances (Jonassen & Grabowski, 1993). Additionally, individuals with high levels of resilience demonstrate strong adaptation and coping skills (Block & Kremen, 1996). Those with high cognitive flexibility perceive themselves as capable of effectively overcoming challenging situations by adjusting their thought patterns (Dennis & Vander Wal, 2010). Similarly, individuals with high resilience, like those with high cognitive flexibility, tend to emerge stronger from difficult experiences (Earvolino-Ramirez, 2007). These findings imply that cognitive flexibility, which facilitates smooth adaptation to novel situations, and resilience, which involves recovering from adverse experiences, are interrelated traits that mutually enhance each other.

The research further confirmed a meaningful inverse association between intolerance of uncertainty and resilience. A literature review also indicated a similar negative association (Joshi et al., 2020; Kılınç & Uzun, 2022; Lee, 2019). Uncertainty is a cognitive condition that arises when individuals struggle to interpret or find meaning in the events they encounter (Crigger, 1996). In addition, individuals may perceive uncertainty as threatening and anxious (Dugas et al., 1994) and experience intense stress during uncertainty (Bailey et al., 2009). For this reason, people intolerant of uncertainty may also react negatively in behavioural, emotional, or intellectual terms during uncertainty (Buhr & Dugas, 2002). While uncertainty is recognized as a significant risk factor that can undermine resilience (Weick & Sutcliffe, 2011), individuals with high levels of resilience tend to handle uncertain situations more effectively (Fraser et al., 1999). Moreover, individuals exhibiting high levels of resilience tend to withstand adverse consequences better than those who do not (Lee, 2009). Kim (2016) emphasized that individuals with high resilience possess stronger adaptive skills and an enhanced ability to cope with uncertain situations they may face in the future. In the same vein, school belonging has also been found to positively predict psychological resilience, partially through its inverse relationship with digital game addiction (Aslan et al., 2024). These insights

highlight that resilience is fundamentally connected to the ability to withstand uncertainty and sustain psychological stability during challenging circumstances.

Finally, the results revealed that cognitive flexibility and intolerance of uncertainty mediate the link between perfectionism and resilience. Canas et al. (2006) conceptualized cognitive flexibility as utilizing mental processing strategies effectively when confronted with unexpected conditions. Accordingly, individuals possessing elevated cognitive flexibility are expected to modify their problem-solving techniques by situational requirements (Orendain & Wood, 2012). Research has shown that individuals with high cognitive flexibility are more effective in handling personal challenges and managing stress (Koesten et al., 2009), report higher levels of life satisfaction (Smith & Konik, 2021), and generally experience greater happiness (Demirtaş, 2020).

In contrast, individuals exhibiting elevated levels of intolerance of uncertainty may refrain from engaging in problem-solving when encountering routine difficulties, which can in turn intensify feelings of anxiety (Zlomke & Jeter, 2014). Studies have also indicated that such individuals are more prone to experiencing elevated levels of anxiety and depression (Carleton et al., 2012). Furthermore, intolerance of uncertainty has been found to trigger feelings of insecurity and negatively impact physical and psychological well-being (Morse, 2021). It has also been noted that individuals with high intolerance of uncertainty often exhibit increased anxiety, possess limited coping abilities (Taha et al., 2013), and struggle with effective problem-solving when faced with ambiguous or uncertain circumstances (Yook et al., 2010).

Limitations and Implications

This study has certain limitations. Primarily, the proposed model was examined using a cross-sectional design, which restricts the ability to make causal interpretations. As a result, establishing cause-and-effect relationships among the variables is not possible. Future studies could benefit from adopting longitudinal research designs to more effectively explore the causal links between perfectionism, cognitive flexibility, intolerance of uncertainty, and resilience. Longitudinal approaches enable researchers to track changes and interactions over time, offering a more comprehensive understanding of how these variables influence one another.

Moreover, the study is limited by the inherent constraints of a quantitative research framework. In future inquiries, employing integrated methodological strategies, such as mixed-method approaches, could yield a more comprehensive and nuanced exploration of the interrelations among the examined constructs. The current sample, comprising undergraduate students from a public university in Turkey, restricts

the applicability of the results to comparable cohorts. For enhanced generalizability, subsequent studies might include broader and more heterogeneous participant groups, such as individuals from varying age ranges or sociocultural backgrounds.

The participant group in this research was selected through a convenience sampling technique, which may restrict the extent to which the findings can be generalized to a broader population due to potential limitations in sample representativeness. To enhance the generalizability of future findings, it is recommended that researchers employ probability sampling techniques, allowing for broader and more accurate population inferences. This would provide a more representative view of the broader population and strengthen the reliability of the findings.

The findings of this study emphasize the critical role of cognitive flexibility and tolerance of uncertainty in buffering the adverse impact of perfectionism on resilience. These findings suggest that cognitive flexibility is a buffer against the rigid thought patterns characteristic of perfectionism. At the same time, the acceptance of uncertainty helps alleviate anxiety and stress related to unexpected challenges.

From an applied standpoint, the findings suggest that psychoeducational interventions targeting the enhancement of cognitive flexibility and the reduction of intolerance of uncertainty may offer valuable benefits for university students. Integrating resilience-building programs into the academic curriculum, particularly those targeting perfectionist students, may foster psychological well-being and promote adaptive coping strategies. Furthermore, therapeutic approaches like Cognitive Behavioral Therapy (CBT), Acceptance and Commitment Therapy (ACT), and Mindfulness-Based Stress Reduction (MBSR) can be employed to support individuals with perfectionistic tendencies in cultivating more adaptable thought patterns and enhancing their tolerance for uncertainty. These interventions may support students in better managing academic pressures, building psychological strength, and ultimately enhancing their overall well-being and success.

Conclusion

The study's findings suggest that enhancing cognitive flexibility and decreasing intolerance of uncertainty are key factors in lessening the adverse effects of perfectionism on resilience. Accordingly, enhancing cognitive flexibility and tolerance for ambiguity helps decrease rigid thinking associated with perfectionism while increasing resilience. Consequently, promoting adaptability and tolerance for uncertainty can weaken rigid thought patterns linked to perfectionism, fostering greater resilience.

Authors' Notes

Authors' Contributions: İ.T. identified the research question, conducted the analyses, and drafted the manuscript; O.A. assisted with interpreting the study findings, and collaborated in drafting and revising the manuscript. F.C. collected research data and reported the research. All authors read and approved the final manuscript.

Data Sharing and Declaration: Materials and analysis code for the current study are available from the corresponding author on reasonable request.

Ethical Approval: All procedures performed in this study were in accordance with the ethical standards of the institutional research committee, as well as with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Conflict of Interest: The authors have no competing interests to declare that are relevant to the content of this article. No funding was received for conducting this study.

Consent to Participate: Informed consent was obtained from all individual participants or their legal guardians included in the study.

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