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Intolerance of Uncertainty and Depressive Symptoms in Female Freshmen: The Mediating Role of Cognitive and Behavioral Emotion-Regulation Strategies

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ABSTRACT. Depression among university freshmen has become a serious public health problem; however, the underlying psychological factors and mechanisms remain insufficiently understood in this population. Intolerance of uncertainty (IU) has been considered a strong transdiagnostic risk factor for depression, yet few studies have investigated the pathways through which IU contributes to depressive symptoms in university freshmen. The present study explored whether adaptive and maladaptive cognitive and behavioral emotion regulation strategies mediate the relationship between global and dimensional IU (Prospective Anxiety and Inhibitory Anxiety) and depressive symptoms. A sample of 600 female Romanian freshmen completed self-report measures of IU, cognitive and behavioral emotion regulation strategies, and depressive symptomatology. Hypotheses were tested using PROCESS v5.0, model 4 (Hayes et al., 2025). Our results indicate that only maladaptive cognitive ER strategies mediated the relationship between IUS-Prospective Anxiety and depressive symptoms. In contrast, both deficits in adaptive regulation and increases in maladaptive regulation processes partially mediate the relationship between IUS-Inhibitory Anxiety and global IU and depressive symptoms. Thus, from a clinical point of view, early screening for global and dimensional IU and (mal)adaptive emotion regulation strategies in mental health programs targeting freshmen may help identify students with elevated risk of depression.

Keywords: intolerance of uncertainty; depressive symptoms; cognitive emotion regulation; behavioral emotion regulation; freshmen

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INTRODUCTION

Involvement in high-quality education exceeds individual benefits, significantly impacting national economies and societal well-being (Sabates et al., 2021). Despite universities' efforts to attract students and increase student retention, academic attrition has been increasing due to individual, financial, and social factors (Lorenzo-Quiles et al., 2023). Mental health problems are one of the most important individual contributors to academic failure (dropout and poor performance), with multiple consequences (Lipson et al., 2019).

For most freshmen, the transition from high school to university is stressful (Beiter et al., 2015), further exacerbated by the growing number of uncertainty-related challenges (The Lancet, 2022). In this regard, first-year university students represent a highly vulnerable group, frequently reporting depressive symptoms (Heumann et al., 2024; Zhao et al., 2023). Due to difficulties in adequately addressing these provocations, a considerable number of first-year students worldwide drop out of university. Between 2021 and 2022, over 23% of full-time freshmen in the U.S. abandoned their studies (Hanson, 2024). Similar trends have been documented in Australia (McKee, 2024) and Europe (Spain = 31.8%; Romania = 31.3%; Italy = 26%) (Ibáñez-Cubillas et al., 2023).

Beyond the economic consequences (Neugebauer & Daniel, 2022), the individual psychological repercussions of academic attrition are also significant. Compared to graduates, those who fail to complete their higher education tend to experience higher levels of distress, depression, and social stigma, and lower levels of well-being (Zając et al., 2024). The extent to which university freshmen can tolerate and manage uncertainty is associated with their future physical, psychological, and professional trajectories (Ye et al., 2023). If not promptly addressed, freshmen's psychological maladjustment may have serious short- and long-term consequences (Li et al., 2021).

Students' capacity to tolerate uncertainty and to use adaptive emotion-regulation (ER) strategies plays a significant role in how they manage the increasing number of novel challenges encountered during their transition to university. Both constructs represent patterns of cognitive, emotional, and behavioral responses that can be modified through relatively short-term, evidence-based interventions (Joormann & Stanton, 2016).

Extant research indicates a strong relationship between the frequent use of maladaptive ER strategies and the development and maintenance of depressive symptoms (Aldao et al., 2010), a pattern that may be particularly relevant for university freshmen, who are especially vulnerable to depressive symptomatology (King & dela Rosa, 2019). Nonetheless, the relationship between one's IU, cognitive and behavioral ER strategies, and depressive symptomatology

is complex and still debated (Sahib et al., 2024). A consistent body of research indicates that IU contributes to the development and maintenance of depressive symptoms through direct (by negative cognitive biases and maladaptive information processing) and indirect (through mediators such as maladaptive coping mechanisms, perceived lack of control) pathways, both in the general and student populations (Carleton, 2016; Gentes & Ruscio, 2011). Theoretical models supported by empirical studies link IU to the use of maladaptive ER strategies (e.g., rumination, reassurance-seeking, avoidance), thus contributing to emotional dysregulation (Sahib et al., 2023). The relationship between IU and adaptive and maladaptive ER strategies is key to understanding the underlying mechanisms and prevention/treatment of several mental health problems (Aldao et al., 2010; Sahib et al., 2023).

Male and female students may experience and navigate the transition to university differently (Yau & Cheng, 2014), males tending to adapt more quickly (Cabras & Mondo, 2017). Female freshmen often face more challenges during the transition (higher emotional distress, academic pressure, financial and interpersonal problems) (Graves et al., 2021). Such differences highlight the need to examine these mechanisms more specifically within female freshmen samples.

Most studies have concentrated on the investigation of direct relationships between IU and mental health problems, nevertheless, ER strategies may play a significant, but under-investigated mediating role (Sahib et al., 2023). Although recent pandemic-era research (Wan et al., 2024) has linked IU to depressive symptoms in university students, these results partly reflect situation-specific uncertainty rather than dispositional IU, thus limiting their generalizability.

Literature supports the approach of analyzing IU both as a global construct and in terms of its two dimensions - prospective anxiety and inhibitory anxiety - for several interrelated reasons. First, literature reveals that the global IU score is a robust predictor of general psychological distress across disorders, capturing an overall vulnerability to emotional disorders (McEvoy & Mahoney, 2012). Second, empirical factor-analytic work consistently supports a two-factor structure of IU, distinguishing between PA and IA (Carleton et al., 2007) or a bi-factorial structure including two dimensions (i.e., prospective and inhibitory anxiety) and one general factor (Hale et al., 2016; Shihata et al., 2017; 2018). Although moderately correlated, the two dimensions of IUS capture partially distinct aspects of responding to uncertainty rather than a single homogeneous construct and they have incremental validity over the general factor (Gentes & Ruscio, 2011). Third, empirical research highlights differential patterns of associations for the two dimensions of IU. While PA is more strongly

related to cognitive processes such as worry and repetitive negative thinking, IA is more closely associated with behavioral inhibition, avoidance, and functional impairment (Carleton et al., 2007; Gentes & Ruscio, 2011).

Given that the temporal sequence through which ER strategies mediate the relationship between IU and depressive symptoms has not yet been clearly established (Sahib et al., 2023), the present study investigated the effects of the global and bidimensional components of IU (prospective and inhibitory anxiety) on depressive symptoms through four parallel mediators: (a) adaptive cognitive, (b) maladaptive cognitive, (c) adaptive behavioral, and (d) maladaptive behavioral ER strategies. The present study explores these mechanisms in the context of transition to university (a psychologically demanding life event) using a sample of female freshmen in a post-pandemic context. The focus on this specific population is justified for two major reasons: *(i)* women consistently report higher levels of depressive symptoms than men, disparity particularly pronounced in adolescence and early adulthood (Kuehner, 2017), trend confirmed among university students as well (Heumann et al., 2024); *(ii)* women also tend to employ more frequently than men maladaptive ER strategies (e.g., rumination) (Nolen-Hoeksema et al., 2008), and report significantly higher levels of IU (Buhr & Dugas, 2006).

Theoretically, examining prospective and inhibitory anxiety separately allows for greater mechanistic precision in understanding cognitive versus behavioral pathways to psychopathology, such as depressive symptoms. A better understanding of the proposed relationships is particularly relevant for adolescents and young adults, who face an increasing number of personal and social challenges during a critical developmental stage (Williams & Roberts, 2023), and who are highly vulnerable to the consequences of maladaptive reactions.

LITERATURE REVIEW

Depressive symptoms refer to a group of physiological (fatigue, weight change), cognitive (impaired concentration, memory), affective (low mood, sadness, worthlessness, anhedonia), and behavioral (isolation, low levels of activity) reactions that persist for a longer time and interfere with adaptive daily functioning (Fried & Nesse, 2015).

Li et al.'s (2022) systematic review and meta-analysis, including 63 published studies and over 100.000 participants, yielded a pooled prevalence of depressive symptoms of 33.6% (95%CI 29.3%-37.8%), with an increase observed in investigations conducted after the COVID-19 pandemic (35.9%, 95%CI 20.2-51.7%). Heumann et al.'s (2024) meta-analysis, including 60

published investigations on higher education students in Germany, indicated that over 21% report depressive symptoms, female students being more affected than males (29%-23.1%). Lasting depressive symptoms in freshmen may reduce motivation, impair physical health, lead to poor sleep habits, lower academic performance, increase engagement in risk-behaviors, and impair quality of life (Bruffaerts et al., 2018; Ibrahim et al., 2013; Pascoe et al., 2020). A significant predictor of depressive symptoms in university students is the reduced capacity to tolerate uncertain situations (Sahib et al., 2023).

IU is frequently conceptualized as the *"individual's dispositional incapacity to endure the aversive response triggered by the perceived absence of salient, key, or sufficient information, and sustained by the associated perception of uncertainty"* (Carleton, 2016, p. 31). IU may also be considered a cognitive bias that increases distress in uncertain situations, thereby functioning as a significant transdiagnostic vulnerability factor in the development and persistence of psychopathology, especially anxiety and depressive symptoms (Sahib et al., 2023; Saulnier et al., 2019). Chronic perceptions of uncertainty and constant fear of future possibilities may undermine adaptive psychological functioning, and further lead to hopelessness and helplessness, core features of depressive symptomatology (Nekić & Mamić, 2019). Accordingly, individuals with higher levels of IU are more susceptible to depressive symptomatology, as they tend to struggle to efficiently cope with situations which they perceive as ambiguous or unpredictable (Shihata et al., 2016).

IU typically comprises two components: Prospective Anxiety (i.e., cognitive need for predictability) and Inhibitory Anxiety (i.e., behavioral tendency to avoid situations perceived as uncertain) (McEvoy & Mahoney, 2011). Based on the belief that anticipating all possible outcomes is helpful, prospective IU often leads to information-seeking behaviors (Birrell et al., 2011), even if this can hinder problem-solving processes (Einstein, 2014). In contrast, inhibitory IU is associated with avoidance and maladaptive coping behaviors that impair optimal functioning (Einstein, 2014). These two dimensions of IU may contribute to psychological dysfunctions through distinct mechanisms and pathways. This distinction is especially relevant, given that many forms of mental illness are characterized by different patterns of emotion dysregulation (Aslan et al., 2024).

ER refers to the processes through which individuals influence their emotional experiences and expressions (Gross, 1998). Literature distinguishes between adaptive (consistently linked to improved emotional functioning and psychological well-being) and maladaptive strategies (associated with emotional distress and increased risk for psychopathology) (Aldao et al., 2010). These strategies may operate through both cognitive and behavioral mechanisms, a distinction that has guided the development of measurement tools, such as the Cognitive Emotion Regulation Questionnaire (CERQ) and Behavioral Emotion

Regulation Questionnaire (BERQ) (Garnefski et al., 2002; Kraaij & Garnefski, 2019). CERQ is a 36-item self-report instrument measuring nine specific cognitive strategies people use to emotionally cope with negative events, including theoretically considered adaptive (acceptance, positive refocusing, refocus on planning, positive reappraisal, putting into perspective) and maladaptive (self-blame, rumination, catastrophizing, other-blame) forms of ER. The CERQ has been widely applied across diverse populations and is valued for identifying changeable cognitive patterns that are modifiable through personal experiences or psychotherapy (Garnefski et al., 2001).

Individuals may also rely on behavioral ER strategies to manage intense negative emotions following adverse events. To assess such patterns, Kraaij and Garnefski (2019) developed the 20-item self-report Behavioral Emotion Regulation Questionnaire, which includes both maladaptive (withdrawal and ignoring) and adaptive (distraction, active approach, and social support seeking) strategies (Joormann & Stanton, 2016; Kraaij & Garnefski, 2019).

A potential mechanism underlying the relationship between IU and depressive symptoms is emotion regulation, including both adaptive and maladaptive cognitive and behavioral strategies. Higher IU may predict increased depressive symptom severity indirectly through reduced use of adaptive emotion regulation strategies and greater reliance on maladaptive emotion regulation strategies.

Adaptive cognitive emotion regulation strategies may likewise reduce the impact of IU on depression. For example, cognitive reappraisal and mindfulness facilitate more flexible interpretations of ambiguous situations and reduce emotional distress associated with uncertainty (Garland et al., 2015). Moreover, research evidenced that higher IU is associated with reduced reappraisal capacity and greater reliance on suppression strategies (Shu et al., 2022). Thus, it is expected that individuals who struggle to implement adaptive emotion regulation strategies may be particularly susceptible to experiencing depressive symptoms in the context of elevated uncertainty.

The same reduced effect of IU on depressive symptoms could be found in the case of adaptive behavioral ER strategies. Indirect evidence for this effect is provided by the role of adaptive behavioral strategies such as behavioral activation and problem-solving in buffering the negative effects of uncertainty by promoting psychological flexibility, environmental reward, and effective coping (Shudo et al., 2017). Thus, based on these empirical arguments, we advance that:

Hypothesis 1: adaptive cognitive and behavioral ER strategies mediate the relationship between global IU and depressive symptoms.

IU has been identified as a critical transdiagnostic vulnerability factor that contributes to maladaptive cognitive and behavioral strategies across multiple mental health disorders (McEvoy & Mahoney, 2012).

From a cognitive perspective, individuals high in IU may engage in repetitive negative thinking, particularly rumination, as an attempt to reduce ambiguity and gain certainty. Huang et al. (2019), using cross-sectional and longitudinal analyses, have shown that rumination significantly mediated the relationship between IU and depressive symptoms. Moreover, Sahib et al.'s (2023) meta-analysis has revealed that individuals high in IU are more likely to rely on maladaptive emotion regulation strategies and less likely to engage in adaptive forms of regulation. Similarly, longitudinal evidence indicates that maladaptive strategies such as rumination and thought suppression mediate the association between IU and emotional difficulties, including depressive symptoms (Sahib et al., 2024). These findings suggest that maladaptive cognitive emotion regulation strategies may partially explain how IU contributes to depression.

Individuals with elevated IU frequently engage in avoidance behaviors and behavioral withdrawal in an effort to minimize distress associated with uncertain situations (Boswell et al., 2013; Dugas & Robichaud, 2007). Although avoidance may provide short-term emotional relief, it reduces engagement with rewarding and meaningful experiences, thereby reinforcing helplessness and contributing to the maintenance of depressive symptoms (Kanter et al., 2010; Veale, 2008). Based on these empirical arguments, we advance that:

Hypothesis 2: maladaptive cognitive and behavioral ER strategies mediate the relationship between global IU and depressive symptoms.

The cognitive tendency to anticipate and excessively worry about future uncertainty (i.e., PA), may generate depressive symptoms through its influence on emotion regulation processes. It can affect adaptive cognitive and behavioral regulation by increasing anticipatory worry and indecisiveness, thereby reducing engagement in using adaptive strategies like cognitive reappraisal and acceptance, and respectively in rewarding or goal-directed activities (Carleton et al., 2007; McEvoy & Mahoney, 2012; Sahib et al., 2023). Rather, individuals high in PA frequently engage in maladaptive cognitive emotion regulation strategies, such as rumination, catastrophizing, and repetitive negative thinking, in an attempt to reduce ambiguity and increase predictability (Carleton et al., 2007). They can also adopt behaviors that in the short term reduce distress, but in the long run these behaviors tend to intensify negative affect and sustain cognitive vulnerability to depression over time. Accordingly, we consider that adaptive and maladaptive

cognitive and behavioral emotion regulation strategies can explain how tendency to anticipate and excessively worry about future uncertainty translates into depressive symptomatology. Therefore, considering the cognitive nature of PA, we expect that maladaptive cognitive ER strategies will be a stronger mediator of the relationship between PA and depressive symptoms. Thus, we consider that:

Hypothesis 3: adaptive cognitive and behavioral ER strategies mediate the relationship between prospective anxiety and depressive symptoms;

Hypothesis 4: maladaptive cognitive and behavioral ER strategies mediate the relationship between prospective anxiety and depressive symptoms;

IA is the behavioral tendency to avoid situations perceived as uncertain. High scores on IA may limit an individual's opportunities to employ adaptive regulation strategies, including the cognitive and behavioral ones. We expect that IA may contribute to depressive symptoms more through maladaptive behavioral emotion regulation mechanisms than the cognitive ones and adaptive ER strategies. Individuals high in IA often respond to uncertain situations with behavioral withdrawal, avoidance, and reduced initiation of goal-directed behavior (Carleton et al., 2007; Morriss et al., 2023). As literature reveals, these behavioral strategies are strongly linked to depression and they may act as mediators in the relationship between IU and emotional distress (Choudhary et al., 2023; Panjwani et al., 2024). Thus, based on these empirical arguments, we advance that:

Hypothesis 5: adaptive cognitive and behavioral ER strategies mediate the relationship between inhibitory anxiety and depressive symptoms;

Hypothesis 6: maladaptive cognitive and behavioral ER strategies mediate the relationship between inhibitory anxiety and depressive symptoms;

METHODS

Participants

Our sample included 600 Romanian female students (M_{age} = 22.61 years, SD = 7.32) from a large university in northwestern Romania. Participants were recruited through convenience sampling and participated voluntarily after providing informed consent to anonymously take part in the study. Regarding the highest level of education, 78.83% of the participants finished high school, 10.33% had a bachelor's, 10.11% had a master's, and 0.67% a PhD degree. 73%

of the participants were enrolled in full-time education, and 27% in the distance-learning program. Furthermore, 54.17% of the participants declared that they were involved in a romantic relationship. Regarding employment status, 67.17% reported being unemployed, 4.50% reported working on projects, 6.50% had a part-time job, and 21.83% were employed full-time.

Instruments

We assessed the following demographic variables: age, type of educational enrolment (full-time education vs. distance learning), highest form of education, having a romantic partner (no vs. yes), and status of employment (no, projects, part-time, full-time).

Depressive symptoms were measured using the Beck Depression Inventory-II (BDI-II) (Beck et al., 1979; Romanian adaptation by David & Dobrean, 2012). This 21-item, self-report instrument evaluates the presence and severity of depressive symptoms in adolescents and adults, covering somatic, cognitive, and behavioral dimensions of depression.

Intolerance of Uncertainty was measured using the 12-item Intolerance of Uncertainty Scale (IUS-12) (Carleton et al., 2007), with the Romanian translation and adaptation completed by the authors in 2020. The IUS-12 provides a total score, along with scores for two subscales: Prospective Anxiety (IUS-PA) and Inhibitory Anxiety (IUS-IA).

Cognitive ER strategies were assessed using the Cognitive Emotion Regulation Questionnaire (Garnefski et al., 2002; Romanian adaptation by Perte & Tincas, 2010). The CERQ is a 36-item self-report tool designed to evaluate cognitive ER strategies individuals use in response to adverse events. The nine subscales of the CERQ have been theoretically grouped in adaptive (acceptance, positive refocusing, refocus on planning, positive reappraisal, putting into perspective), and maladaptive scales (self-blame, rumination, catastrophizing, and other-blame). Based on the results of previous studies conducted on Romanian population and preliminary investigations of the present data, the adaptive strategies facet was computed excluding the acceptance subscale (Kállay & Visu-Petra, 2014; Kállay & Cheie, 2022).

Behavioral ER strategies were measured using the 20-item Behavioral Emotion Regulation Questionnaire (Kraaij & Garnefski, 2019; translated by the authors in 2021). The five subscales of the BERQ assess adaptive (seeking distractions, active approach, seeking social support), and maladaptive behavioral ER strategies (withdrawal, ignoring). Based on the factor analysis conducted on a Romanian sample, the adaptive strategies facet was computed excluding the seeking distraction subscale, since its items did not adequately load on the adaptive strategies subscale (Kállay & Rus, in review).

Procedure

The research protocol of this study was approved by the Ethics Committee of the Babeș-Bolyai University, Cluj-Napoca, Romania [Research Ethics Approval No. 830/03.11.2023; data available at request to authors). Data were collected in January 2025 using Google Forms. The instruments were administered only after the participants formally consented to participate in the study.

Analytical strategy

Analyses were performed using IBM SPSS v25 (IBM Corp., 2017). First, we conducted preliminary descriptive, correlational, and internal consistency analyses. Next, multiple parallel mediation analyses were performed using the PROCESS v5.0 for IBMSPSS v. 25 (Hayes et al., 2025), Model 4 with 5000 bootstrap samples. In this model, the dimensions and global score of IU were predictors, depression was the criterion, and the mediators comprised adaptive vs. maladaptive cognitive and behavioral ER strategies. The covariates were age, type of actual education form (regular vs. distance learning), highest form of education, having a romantic partner (no vs. yes), and status of employment (no, projects, part-time, full-time employment). To reduce the impact of family-wise error, we considered each dimension of IU one by one as covariate in the mediation analysis.

RESULTS

Table 1 presents indicators of internal consistency, means, standard deviations, and r Bravais-Pearson correlation coefficient matrix.

Table 1. *Descriptive statistics and correlations matrix (N = 600)*

Variables	Mean	Standard deviation	1	2	3	4	5	6	7	8
1. IUS-PA	20.70	5.83	(.87)							
2. IUS-IA	13.47	4.51	.77***	(.84)						
3. IU-global score	34.17	9.73	.95***	.92***	(.91)					
4. Adaptive cognitive ER strategies	45.63	13.31	-.16***	-.22***	-.20***	(.88)				
5. Maladaptive cognitive ER strategies	32.95	9.72	.37***	.36***	.39***	.00	(.80)			
6. Maladaptive behavioral ER strategies	17.19	6.48	.32***	.39***	.37***	-.14***	.31***	(.86)		
7. Adaptive behavioral ER strategies	26.24	6.47	-.04	-.13***	-.08*	.37***	.08*	-.36***	(.80)	
8. Depressive symptoms	11.46	8.31	.42***	.48***	.47***	-.29***	.48***	.47***	-.22***	(.88)

Note: *p < .05, **p < .01, ***p < .001 (2-tailed); alpha Cronbach internal consistency coefficient is presented in parentheses.

Three parallel mediation analyses were conducted with depressive symptoms as dependent variable, prospective and inhibitory anxiety, and global scores of IU as predictors, and adaptive and maladaptive cognitive and behavioral ER strategies as mediators. Partial results of these regressions are presented in Table 2-4.

Global scores of IU were negatively associated with adaptive cognitive and behavioral ER strategies (b = -.27, p < .001; b = -.06, p < .05). Furthermore, global IU was positively associated with both maladaptive cognitive and behavioral ER strategies (b = .37, p < .001, b = .24, p < .001) and depressive symptoms (b = .18, p < .001). Depressive symptoms were negatively associated with adaptive cognitive and behavioral ER strategies (b = -.12 p < .001; b = -.10 p < .05) and positively related to both maladaptive cognitive and behavioral ER strategies (b = .28, p < .001, b = .28, p < .001). Depressive symptoms were higher in the case of the students enrolled in the distance learning education form (b = 2.26, p < .01) (Table 2).

The total effect of global scores of IU on depressive symptoms was significant and positive (.39, p < .001, *95%CI* [.33; .45]. Both direct and total indirect effects were positive (.18, p < .001, *95%CI* [.12; .23]; .21, *95%CI* [.17; .26]. An indirect relationship was found between IU and depressive symptoms through adaptive cognitive (.03, *95%CI* [.02; .05]) and behavioral ER strategies (.01, 95%CI [.001; .02]), respectively through maladaptive cognitive and behavioral ER strategies (.10, *95%CI* [.08; .14]; .07, *95%CI* [.04; .10]). The variance explained by the total model in depression was 26.35% (p < .001). Hypotheses 1 and 2 were fully supported.

Table 2. *Partial results of the parallel mediation analyses with depressive symptoms as outcome and global score on IU as predictor (N = 600)*

Type of Effect	B	SE	LLCI	ULCI	bootMean	bootSE	bootLLCI	bootULCI
Direct effects								
IU-global score	.18***	.03	.12	.23	.18	.03	.11	.24
Adaptive cognitive ER strategies	-.12***	.02	-.16	-.08	-.12	.02	-.16	-.08
Maladaptive cognitive ER strategies	.28***	.03	.22	.34	.28	.03	.22	.35
Maladaptive behavioral ER strategies	.28***	.05	.19	.38	.28	.05	.18	.39
Adaptive behavioral ER strategies	-.10*	.05	-.19	-.01	-.10	.05	-.20	-.01
Age	-.09	.06	-.22	.03	-.09	.06	-.21	.02
Type of education	2.26**	.90	.50	4.03	2.26	1.01	.26	4.20

Type of Effect	B	SE	LLCI	ULCI	bootMean	bootSE	bootLLCI	bootULCI
Level of education	-.88	.64	-2.14	.38	-.88	.63	-2.15	.35
Relationship status	.61	.51	-.40	1.62	.61	.53	-.44	1.64
Type of work	-.55	.29	-1.13	.03	-.54	.31	-1.15	.06
Indirect effects								
Adaptive cognitive ER strategies	.03					.001	.02	.05
Maladaptive cognitive ER strategies	.10					.02	.08	.14
Maladaptive behavioral ER strategies	.07					.01	.04	.10
Adaptive behavioral ER strategies	.01					.004	.001	.02
Total indirect effect	.21					.02	.17	.26

Note: *$p < .05$, **$p < .05$, ***$p < .001$; SE = standard error; LLCI = low-level confidence interval; ULCI = upper-level confidence interval.

We found that IUS-PA was not significantly associated with the adaptive cognitive ER strategies ($b = .03$, $p > .05$) but was associated with maladaptive cognitive ER strategies ($b = .42$, $p < .001$). Furthermore, IUS-PA positively related with adaptive behavioral ER strategies ($b = .14$, $p < .05$) but not with maladaptive behavioral ER strategies ($b = .08$, $p > .05$) and depressive symptoms ($b = .06$, $p > .05$). Depressive symptoms were negatively related with both adaptive cognitive and behavioral ER strategies ($b = -.12$, $p < .001$, $b = -.10$, $p < .05$) and positively related to both maladaptive cognitive and behavioral ER strategies ($b = .28$, $p < .001$, $b = .28$, $p < .001$) (Table 3). Depressive symptoms were higher in the case of the students enrolled in the distance learning education form ($b = 2.18$, $p < .05$).

The total effect of the IUS-PA on depressive symptoms was significant and positive (.19, $p < .05$, *95%CI* [.03; .34]). The direct effect was not significant (.06, $p > .05$, 95%CI [-.07; .20]), while the total indirect effect was significant and positive (.12, *95%CI* [.03; .22]). An indirect relationship was found only between IUS-PA and depressive symptoms through maladaptive cognitive ER strategies (.12, *95%CI* [.06; .19]). The other tested mediation paths were not significant. 27.30% of the variance in depressive symptoms was explained by all variables included in the total model. Thus, Hypothesis 3 has not received empirical support, while Hypothesis 4 was partially supported.

Table 3. *Partial results of the parallel mediation analyses with depressive symptoms as outcome and IUS-PA as predictor (N = 600)*

Type of Effect	b	SE	LLCI	ULCI	bootMean	bootSE	bootLLCI	bootULCI
Direct effects								
IUS-PA	.06	.07	-.07	.34	.06	.07	-.07	.20
Adaptive cognitive ER strategies	-.12***	.02	-.16	.20	-.12	.02	-.16	-.07
Maladaptive cognitive ER strategies	.28***	.03	.22	.34	.28	.03	.22	.34
Maladaptive behavioral ER strategies	.28***	.05	.19	.37	.28	.05	.27	.38
Adaptive behavioral ER strategies	-.10*	.05	-.18	-.01	-.10	.05	-.28	-.01
Age	-.09	.06	-.21	.04	-.09	.06	-.21	.02
Type of education	2.18*	.90	.41	3.94	2.18	1.02	.11	4.15
Level of education	-.88	.64	-2.13	.38	-.88	.63	-2.15	.33
Relationship status	.67	.52	-.34	1.68	.67	.53	-.38	1.71
Type of work	-.52	.30	-1.10	.06	-.52	.31	-1.11	.09
IUS-IA	.33***	.10	.15	.51	.33	.09	.15	.52
Indirect effects								
Adaptive cognitive ER strategies	-.00					.02	-.04	.03
Maladaptive cognitive ER strategies	.12					.03	.06	.19
Maladaptive behavioral ER strategies	.02					.02	-.01	.07
Adaptive behavioral ER strategies	-.02					.01	-.04	.00
Total indirect effect	.12					.05	.03	.22

Note: *$p < .05$, **$p < .05$, ***$p < .001$; SE = standard error; LLCI = low-level confidence interval; ULCI = upper-level confidence interval.

IUS-IA had consistent associations with both adaptive cognitive and behavioral ER strategies. Specifically, IUS-IA was negatively associated with both adaptive cognitive and behavioral ER strategies ($b = -.68$, $p < .001$; $b = -.33$, $p < .001$), and positively with both maladaptive cognitive and behavioral ER strategies ($b = .32$, $p < .05$, $b = .45$, $p < .001$), and depressive symptoms ($b = .33$, $p < .001$). Depression was negatively correlated with adaptive cognitive and behavioral ER strategies ($b = -.12$, $p < .001$, $b = -.10$, $p < .05$), and positively with maladaptive cognitive and behavioral ER strategies ($b = .28$, $p < .001$, $b = .28$, $p < .001$) (Table 4). Depressive symptoms were higher in the case of the students enrolled in the distance learning education form ($b = 2.18$, $p < .05$).

The total effect of the IUS-IA on depressive symptoms was significant and positive (.66, $p < .001$, *95%CI* [.46; .86]). Both direct and total indirect effects were positive (.33, $p < .001$, *95%CI* [.15; .51]; .33, *95%CI* [.22; .46]). An indirect relationship was found between IUS-IA and depressive symptoms through adaptive (.08, *95%CI* [.04; .14]; .03, *95%CI* [.01; .08]) and maladaptive cognitive and behavioral ER strategies (.09, *95%CI* [.01; .17]; .13, *95%CI* [.07; .21]). 27.30% of the variance in depressive symptoms is explained by all variables included in the total model. Hypothesis 5 and Hypothesis 6 received empirical support.

Table 4. *Partial results of the parallel mediation analyses with depressive symptoms as outcome and IUS-IA as predictor (N = 600)*

Type of Effect	b	SE	LLCI	ULCI	bootMean	bootSE	bootLLCI	bootULCI
Direct effects								
IUS-IA	.33***	.10	.15	.51	.33	.10	.16	.52
Adaptive cognitive ER strategies	-.12***	.02	-.16	-.08	-.12	.02	-.16	-.08
Maladaptive cognitive ER strategies	.28***	.03	.22	.34	.28	.03	.22	.34
Maladaptive behavioral ER strategies	.28***	.05	.19	.37	.28	.05	.17	.39
Adaptive behavioral ER strategies	-.10*	.05	-.19	-.01	-.10	.05	-.19	-.01
Age	-.09	.06	-.21	.04	-.09	.06	-.21	.02
Type of education	2.18*	.90	.41	3.94	2.16	1.01	.23	4.12
Level of education	-.88	.64	-2.13	.38	-.87	.64	-2.15	.39
Relationship status	.67	.51	-.34	1.68	.69	.53	-.40	1.70
Type of work	-.52	.30	-1.10	.06	-.51	.31	-1.14	.17
IUS-PA	.06	.07	-.07	.20	.06	.07	-.08	.19
Indirect effects								
Adaptive cognitive ER strategies	.08					.02	.04	.14
Maladaptive cognitive ER strategies	.09					.04	.01	.17
Maladaptive behavioral ER strategies	.13					.04	.07	.21
Adaptive behavioral ER strategies	.03					.04	.01	.08
Total indirect effect	.33					.06	.22	.46

Note: *$p < .05$, **$p < .05$, ***$p < .001$; SE = standard error; LLCI = low-level confidence interval; ULCI = upper-level confidence interval.

DISCUSSION

The present study examined the mediating role of both adaptive and maladaptive cognitive and behavioral ER strategies in the relationship between IU, respectively its components (prospective and inhibitory anxiety) and depressive symptoms in a sample of female Romanian freshmen.

Adaptive and maladaptive cognitive and behavioral ER strategies partially mediated the relationship between the global score of IU and depressive symptoms (H1, H2). These results indicate that higher levels of IU were associated with lower use of adaptive cognitive and behavioral ER strategies, which in turn predicted greater depressive symptom severity, indicating a significant indirect effect. Thus, individuals high in dispositional incapacity to endure the aversive response triggered by the perceived absence of salient, key, or sufficient information, and sustained by the associated perception of uncertainty may be less likely to engage in adaptive strategies thereby increasing their vulnerability to depressive symptomatology. These results are consistent with prior evidence showing that IU is negatively associated with adaptive regulatory capacities and that such strategies play a protective role in emotional functioning (Garland et al., 2015; Shu et al., 2022). Moreover, our data also indicate that individuals high in IU rely greater on cognitive and behavioral maladaptive ER strategies. In turn, these emotion regulation strategies relate to increased depressive symptom severity. These findings align with previous research that evidenced significant relationships between IU with maladaptive cognitive and behavioral ER strategies (Carleton, 2016), associative patterns between mental health problems such as depressive symptoms and adaptive and maladaptive ER strategies (Brzozowksi & Crossey, 2024; Garnefski et al., 2002; Sahib et al., 2023; Saulnier et al., 2019).

We found that only maladaptive cognitive ER strategies fully mediated the relationship between IUS-PA and depressive symptoms (H4 partially supported). None of the other ER strategies tested mediated this relationship (H3). An explanation for this result may lie in the heightened cognitive need for predictability (McEvoy & Mahoney, 2011), which may more proximally be linked to cognitive appraisal processes. This may increase threat sensitivity and activate maladaptive ER strategies such as rumination and catastrophizing (Birrell et al., 2011). In line with this interpretation, maladaptive cognitive ER strategies emerged as mediators in contrast to behavioral strategies, which operate later in the emotion generation process, downstream of cognitive appraisal (Gross, 1998). This pattern of results suggests that the relationship between the cognitive tendency to anticipate and worry about future uncertainty (i.e., PA) and depressive symptoms is primarily driven by maladaptive cognitive regulatory processes, rather than by deficits in cognitive and behavioral adaptive regulation. Prospective

forms of intolerance of uncertainty are inherently cognitive in nature and therefore more strongly expressed through maladaptive cognitions (Carleton et al., 2007; McEvoy & Mahoney, 2012) than through adaptive cognitions and (mal)adaptive behaviors. Furthermore, evidence suggests that adaptive behavioral ER strategies are less frequently employed by individuals high on IU (Knowles et al., 2022).

In contrast, our data provided empirical support for both hypothesized mediation pathways linking IA to depressive symptoms through all the four categories of emotion regulation (ER) strategies. Specifically, both adaptive and maladaptive cognitive and behavioral ER strategies significantly partially mediated the relationship between IA and depressive symptomatology (H5; H6). These results suggest that IA relates to depressive symptoms through multiple regulatory mechanisms. Consistent with our expectation, higher levels of IA are related to reduced engagement in adaptive cognitive and behavioral strategies, which in turn are associated with higher depressive symptom severity. This finding suggests that the behavioral inhibition characteristic of IA may indirectly limit opportunities for adaptive coping, thereby increasing vulnerability to depressive affect. When individuals are unable or unwilling to act under conditions of high uncertainty, they may also be less likely to implement behavioral and cognitive strategies that typically buffer emotional distress. Additionally, individuals high in IA manifest a greater reliance on maladaptive strategies, which in turn predicted increased depressive symptoms. These results are consistent with theoretical and empirical literature suggesting that IA reflects a behavioral tendency toward avoidance of uncertain situations, which may reinforce disengagement from functional activities and maintain depressive symptoms (Carleton et al., 2007; Morriss et al., 2023). Our findings are in line with past research that evidenced further maladaptive ER strategies are robust predictors of depressive symptoms and serve as key mediators in the relationship between IU and emotional distress (Choudhary et al., 2023; Panjwani et al., 2023).

Additionally, we found that female freshmen enrolled in distance learning reported significantly higher levels of depressive symptoms than freshmen enrolled in full-time education programs. Several explanations may be viable for this finding. First, usually female freshmen enrolled in distance learning are older and have more, sometimes conflicting roles (students, caregivers, employees) than those enrolled in full-time education (Waterhouse et al., 2022). Furthermore, it is also plausible to presume that female freshmen enrolled in distance learning may encounter more and different types of uncertainty/ambiguity (academic, personal, social) affecting their mental well-being. Secondly, the structure of teaching-learning is significantly different. Distance learning students need more effort to better manage time, academic tasks, and procrastination is more frequently encountered among them (Broadbent & Poon, 2015). Thirdly, they

are less exposed to possibilities of face-to-face contact and collaborative learning, which may lead to feelings of isolation and loneliness, one of the strongest predictors of depressive symptoms (Rutkowska et al., 2022).

Our investigation contributes to a better understanding of the complex relationship between IU and ER in the development and maintenance of depressive symptoms in female freshmen. More specifically, our findings show how the inability to efficiently tolerate uncertainty and regulate accompanying emotional states (through both cognitive and behavioral ER strategies) may lead to depressive symptoms. By considering IU both globally and bi-dimensionally and including both cognitive and behavioral adaptive and maladaptive ER strategies, this approach revealed essential differences between the two facets of IU in their pathways to depressive symptoms. Our results further clarify the way in which cognitive and behavioral ER strategies mediate the relationship between IU, respectively its dimensions, and depressive symptoms.

These findings have also clinical implications by highlighting IU and ER strategies, in particular the maladaptive ones, as key targets for screening and intervention programs designed to identify at-risk freshmen and prevent and reduce depressive symptomatology in female first-year students. Moreover, since female freshmen are typically more vulnerable than their male counterparts, such prevention and intervention programs may become even more efficient if adapted to gender specificities.

The present study has several limitations that should be taken into consideration when interpreting the results. While the mediation analyses examined indirect pathways between IU, ER strategies and depressive symptoms, due to the cross-sectional design of the study, causal relationships and the temporal ordering of variables could not be established. Consequently, it remains unclear whether IU or its dimensions influences ER strategies and depressive symptoms, or if the reverse is also possible. For instance, persistent reliance on maladaptive ER strategies may not only emerge as a consequence of IU and exacerbate emotional distress but may also contribute to the maintenance and amplification of uncertainty perceptions, thereby creating a self-perpetuating cycle that heightens vulnerability to depressive symptomatology (Aldao et al., 2010; Saulnier et al., 2019). Individuals high in IU are particularly prone to this cycle, since their difficulties in tolerating uncertainty and frequent use of maladaptive ER strategies may sustain depressive symptomatology (Zlomke & Jeter, 2014). Future studies should adopt longitudinal or experimental designs to capture the causal relationships between these variables and to reveal their mechanisms. Tracking these variables over time could clarify if fluctuations in IU result in adopting certain types of ER strategies that subsequently generate depressive symptoms. Also, such designs could establish whether these relationships are stable over time and/or context dependent (Knowles et al., 2022).

Our study focused on IU with particular emphasis on its downstream outcomes as ER strategies and depressive symptoms. Future research focusing on the identification of the most frequent sources of uncertainty among freshmen, and how this hierarchy of priorities changes as they adapt or not with the challenges of academic life, may facilitate a better understanding of the major risk and protective factors for depression in this population.

Moreover, as our measures focused on the dispositional behavioural ER strategies, future studies should investigate behavioural ER strategies from a situational perspective as well (Kraaij & Garnefski, 2019). Combining dispositional and situational perspectives could provide an integrative picture of how individuals employ these strategies in general and specific stressful situations.

Furthermore, we exclusively focused on broad categories of adaptive and maladaptive cognitive and behavioral strategies based on work conducted by Garnefski et al. (2001;2002), and Kraaij and Garnefski (2019). Consequently, future studies are warranted to elucidate how specific strategies uniquely underlie the pathways linking global and dimensional IU to depressive symptoms.

The employed convenience sampling strategy might have resulted in a sample that is not representative to the general female freshman or general population. Furthermore, although most investigations indicate that women in general, as well as female freshmen are more prone to experience depressive symptoms (Graves et al., 2021), studying gender differences in the way male and female freshmen adapt and maladapt to the specific requirements of academic life remains highly relevant (Cabras & Mondo, 2017). Expanding the sample to include demographically more diverse groups (e.g., male participants, clinical samples), would allow potential subgroup analyses.

Being based on self-reports raises concerns about common method bias and social desirability effects. To overcome the limitations of self-report bias and common method variance, future research should incorporate multi-source (e.g., peers, family), multi-method and objective measures (e.g., behavioral observations, physiological measures) (Grupe & Nitschke, 2013). Triangulation could offer a more nuanced understanding of the relationships between the examined variables. As our data revealed that certain ER strategies do not function as theoretically expected, it would be worthwhile to examine in-depth the psychometric properties of the instruments used to measure such strategies and to better understand if these characteristics of the ER strategies are rather given by the context or culture and not by the measurement instrument itself.

CONCLUSION

This study advances previous knowledge by examining as parallel processes adaptive and maladaptive cognitive and behavioral ER strategies in the relationship between global and dimensional IU and depressive symptoms in female freshmen. Taken together, our findings underscore maladaptive cognitive ER strategies as the primary mechanism linking PA to depressive symptoms, while highlighting multiple regulatory mechanisms that are partially involved in the relationship between IA, global score on IU, and depressive symptoms. They emphasize the value of early detection of freshmen who have difficulties in tolerating uncertainties, as well as those who frequently rely on maladaptive cognitive and behavioral ER strategies. In this way, our investigation points to the possibility of reducing depressive symptomatology, while addressing challenges specific to the highly vulnerable freshmen population.

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