ORIGINAL RESEARCH

Predictive Effects of Intolerance of Uncertainty, Perceived Uncertainty and Need for Autonomy on Depression and Anxiety Levels of University Students in the Post-COVID-19 Era

COVID-19 Sonrası Dönemde Belirsizliğe Tahammülsüzlük, Algılanan Belirsizlik ve Özerklik İhtiyacının Üniversite Öğrencilerinin Depresyon ve Anksiyete Düzeyleri Üzerindeki Yordayıcı Etkileri

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Abstract

This study investigates the predictive roles of perceived uncertainty, intolerance of uncertainty, and frustrated need for autonomy on depression and anxiety levels among Turkish university students during a period in which the effects of the COVID-19 pandemic persisted. Prior research indicates that emerging adults are especially vulnerable to heightened anxiety and depressive symptoms under pandemic conditions. Accordingly, we hypothesized that perceived uncertainty, intolerance of uncertainty, and frustrated need for autonomy would each significantly predict levels of depression and anxiety. Data were collected online from 421 university students in Türkiye (ages 19–25; 303 female, 117 male, 1 undisclosed), who completed validated measures assessing perceived uncertainty, intolerance of uncertainty, and basic psychological need satisfaction and frustration. Hypotheses were tested via hierarchical regression analyses conducted in Jamovi software, with gender entered as a control variable. Results demonstrated that, after controlling gender, both intolerance of uncertainty and frustrated need for autonomy significantly predicted increased depression and anxiety, whereas perceived uncertainty did not exert a direct effect in the regression models. To further clarify the role of perceived uncertainty, parallel mediation analyses were performed, revealing that perceived uncertainty indirectly predicted higher levels of depression and anxiety through its effects on autonomy frustration and intolerance of uncertainty. These findings underscore the importance of targeting underlying cognitive and motivational processes in interventions designed to mitigate mental health risks among university students.

Keywords: Depression, Anxiety, Intolerance of Uncertainty, Need for Autonomy, Perceived Uncertainty.

Öz

Bu çalışma, COVID-19 salgınının etkilerinin devam ettiği bir dönemde Türkiye'de eğitimine devam eden üniversite öğrencileri arasında algılanan belirsizlik, belirsizliğe tahammülsüzlük ve engellenmiş özerklik ihtiyacının depresyon ve anksiyete düzeyleri üzerindeki yordayıcı rollerini araştırmaktadır. Önceki araştırmalar, beliren yetişkinlik dönemindeki gençlerin pandemi koşullarında artan anksiyete ve depresif semptomlara karşı özellikle savunmasız olduğunu göstermektedir. Bu doğrultuda, algılanan belirsizlik, belirsizliğe tahammülsüzlük ve engellenmiş özerklik ihtiyacının her birinin depresyon ve anksiyete düzeylerini önemli ölçüde yordayacağı varsayılmıştır. Veriler, Türkiye'deki 421 üniversite öğrencisinden (19-25 yaş; 303 kadın, 117 erkek, 1 belirtmek istemeyen) çevrimiçi olarak toplanmıştır. Katılımcılar algılanan belirsizlik, belirsizliğe tahammülsüzlük ve temel psikolojik ihtiyaç tatmini ve engellenmesini ölçen geçerli ve güvenilir ölçekleri doldurmuştur. Hipotezler Jamovi programında yapılan hiyerarşik regresyon analizleri ile test edilmiş ve cinsiyet kontrol değişkeni olarak girilmiştir. Sonuçlar, cinsiyet kontrol edildikten sonra hem belirsizliğe tahammülsüzlüğün hem de engellenmiş özerklik ihtiyacının artan depresyon ve anksiyeteyi önemli ölçüde yordadığını, algılanan belirsizliğin ise regresyon modellerinde doğrudan bir etkisi olmadığını göstermiştir. Algılanan belirsizliğin rolünü daha iyi anlamak için paralel aracılık analizleri yapılmıştır. Analizler algılanan belirsizliğin, engellenmiş özerklik ihtiyacı ve belirsizliğe tahammülsüzlük aracılığında depresyon ve anksiyete düzeylerindeki artışı dolaylı olarak yordadığını göstermiştir. Bu bulgular, üniversite öğrencileri arasında ruh sağlığı risklerini azaltmak için tasarlanan müdahalelerde altta yatan bilişsel ve motivasyonel süreçleri hedeflemenin önemini vurgulamaktadır.

Anahtar Kelimeler: Depresyon, Anksiyete, Belirsizliğe Tahammülsüzlük, Özerklik İhtiyacı, Algılanan Belirsizlik.

Predictive Effects of Intolerance of Uncertainty, Perceived Uncertainty and Need for Autonomy on Depression and Anxiety Levels of University Students in the Post-COVID-19 Era

The period of emerging adulthood, typically associated with the university years and defined as the period between the ages of 18 and 25, is a developmental stage characterized by significant psychological, social, and emotional transitions (Arnett, 2000). Although it is widely accepted that many aspects of emerging adulthood are considered to be adaptive, for university students, this transitional phase is characterized by uncertainty and inconsistency (Arnett, Žukauskienė, & Sugimura, 2014), which can result in elevated stress levels and psychological health concerns. Understanding the factors that contribute to the development of adverse psychological health conditions, specifically depression and anxiety, is crucial in this context. This study examines how perceived uncertainty, intolerance of uncertainty, and frustrated need for autonomy predict depression and anxiety levels among university students in Türkiye.

Depression and anxiety are among the most common psychological health problems globally (World Health Organization, 2008) and their prevalence has significantly increased since the COVID-19 pandemic (Asif et al., 2020; Mahmud et al., 2023; Salari et al., 2020; Yang et al., 2021). A meta-analysis examining the impact of the COVID-19 pandemic on university students, based on studies conducted between December 2019 and October 2020, reported that depression and anxiety prevalence rates were 39% and 36%, respectively, aligning with findings from a multinational study that identified rates of 40% and 30% (Li et al., 2021; Ochnik et al., 2021). Similarly, a study in Türkiye found even higher rates among university students during the COVID-19 period, with depression at 55% and anxiety at 36.2% (Aslan & Çınar, 2023). Beyond the pandemic, university students have been identified as a high-risk group for depression and anxiety due to various psychosocial stressors (Auerbach et al., 2018; Buchanan, 2012; Saleh et al., 2017; Ochnik et al., 2021). Research suggests that these mental health challenges are closely linked to academic concerns, separation from family, major social life transitions, and uncertainty about the future (Eisenbarth, Champeau, & Donatelle, 2013; Eryılmaz, Kurtuluş, & Uzun, 2023; Pedrelli et al., 2015). Additionally, these psychological issues negatively impact academic performance, social relationships, and overall well-being (Hunt & Eisenberg, 2010; Mofatteh, 2021; Othman et al., 2019). Given the high prevalence of depression and anxiety among university students, it is crucial to understand the contributing factors for effective intervention strategies. Rather than broadly examining psychological health indicators, this study explicitly investigates three potential predictors: perceived uncertainty, intolerance of uncertainty, and frustrated need for autonomy. The following section provides a conceptual overview of depression and anxiety before reviewing relevant literature on these predictors.

Depression is characterized as a state of negative mood that impacts an individual's life, involving intense and prolonged negative emotions (American Psychiatric Association, 2013). On the other hand, anxiety is defined as reactions to perceived threats (Lewis, 1970), focusing on the anticipation of negative future events (Grupe & Nitschke, 2013). These two mental health conditions frequently co-occur (Brown et al., 2001; Carleton et al., 2012; Groen et al., 2020) and share common symptoms, including negative mood, difficulty focusing, fatigue, and sleep disturbances (Beard et al., 2016; Lamers et al., 2011). Symptoms of one disorder can increase susceptibility to the other, highlighting their close interrelation. Although they have specific characteristics and high levels of co-occurrence, anxiety usually focuses on future-oriented, potential dangers, whereas depression is based on past losses and failures (MacLeod et al., 1997; Pomerantz & Rose, 2014; Rinaldi et al., 2017). Furthermore, according to the Global Burden of Disease (GBD) 2021 report, mental health disorders, particularly depression and anxiety, remain major contributors to the global disease burden, emphasizing the need for urgent

policy measures, increased funding, and improved treatment accessibility (Lancet Psychiatry, 2024). Given their widespread prevalence and impact, understanding the underlying factors contributing to these conditions is crucial for effective intervention strategies. The present study examines explicitly the roles of perceived uncertainty, intolerance of uncertainty, and frustrated need for autonomy in shaping depression and anxiety levels among university students.

The current era is often described as an age of uncertainty (Çakır, 2011), with factors like the pandemic, economic crises, and conflicts playing key roles in creating uncertainty. Understanding how individuals perceive uncertainty and its impact on individuals is essential. Uncertainty is a multifaceted concept addressed in various disciplines and is an integral part of life. Research has shown that uncertainty negatively influences indicators related to psychological health (Birrell et al., 2011; Carleton et al., 2012; Dugas & Ladouceur, 2000). Therefore, understanding uncertainty-related factors and distinguishing between them is crucial to determine how uncertainty affects psychological health positively or negatively. Perceived uncertainty and intolerance of uncertainty are distinct yet interrelated constructs that play significant roles in psychological research. Perceived uncertainty relates to subjective evaluations of the current situation or timeframe, while intolerance of uncertainty deals with the anxiety resulting from this perception process. Uncertainty, which is subjectively experiencing not knowing what to expect or how to react in a given situation (Anderson et al., 2019), is linked to both anxiety and depression (Freeston et al., 1994). The present study hypotheses that the level of perceived uncertainty can be related to the occurrence of these outcomes. More specifically, although uncertainty is negatively associated with psychological health variables, this may be related to how uncertain the current situation is perceived. A review of the relevant literature reveals that studies on perceived uncertainty are limited, and the majority are often carried out with the concepts of intolerance of uncertainty or avoidance of uncertainty. Studies examining perceived uncertainty are relatively limited, and predominantly focused on issues encountered in domains such as medical health (Reich et al., 2006; Steele et al., 2009; Tarhani et al., 2020), management, and organization (Bordia et al., 2004; Downey & Slocum, 1975; Godinic et al., 2020; Kim et al., 2013; Rafferty & Griffin, 2006), or sudden societal changes (Kim & Ng, 2008). During the COVID-19 pandemic, university students experienced high levels of uncertainty about their academic futures, social lives, and health, likely increasing feelings of anxiety and depression (Conrad et al., 2021).

Intolerance of uncertainty, on the other hand, refers to an individual's tendency to see an uncertain situation as uncomfortable or threatening (Budner, 1962; Dugas et al., 2004). It encompasses the negative emotions, thoughts, and behaviors individuals experience when faced with uncertainty (Birrell et al., 2011), and the difficulty in tolerating future uncertainty (Carleton, 2016). Individuals who struggle with uncertainty often perceive ambiguous situations as dangerous, which can lead to avoidance behaviors and more significant psychological distress (Andrews et al., 2023; Bottesi et al., 2019; Lee, 2018). For instance, research has found a positive correlation between intolerance of uncertainty and anxiety disorders, highlighting its significant role in mediating the link between perceived stress and mental health outcomes (Andrews et al., 2023; Boelen & Reijntjes, 2009). Intolerance of uncertainty is strongly linked to anxiety disorders and is recognized as a significant factor in depression (Carleton, 2016; Carleton et al., 2012; Huang et al., 2019; Saulnier et al., 2019). A high level of intolerance of uncertainty can lead to maladaptive coping methods, such as avoidance behaviors or excessive worrying, which worsen anxiety and depressive symptoms (Boswell et al., 2013; Flores et al., 2018). Although much of the literature focuses on intolerance of uncertainty, it is equally important to assess how uncertain the current situation is perceived. Unlike intolerance of uncertainty, which reflects an individual's dispositional tendency to find uncertainty distressing, perceived uncertainty refers to the subjective evaluation of environmental unpredictability. This distinction is critical because individuals may perceive an event as highly uncertain without necessarily having a low tolerance for

uncertainty. Perceived uncertainty may be a stressor, leading to increased cognitive load and anticipatory anxiety (Grupe & Nitschke, 2013). The multifaceted uncertainty that characterizes the contemporary era appears to have a detrimental effect on many dimensions of psychological health. Beyond cognitive and emotional responses to uncertainty, psychological well-being is also shaped by fulfilling basic psychological needs, as outlined in Self-Determination Theory (Deci & Ryan, 2000). This framework identifies autonomy, competence, and relatedness as fundamental to mental health. When any of these needs are not met, adverse psychological outcomes such as depression, anxiety, and stress may occur (Vansteenkiste et al., 2020). The restrictions, uncertainties, and social distancing rules imposed during the pandemic are believed to have made it difficult for individuals to fulfill their basic psychological needs. Research suggests that in times of unpredictability, the ability to exert control over one's circumstances becomes particularly salient, and the frustration of autonomy can amplify the psychological toll of uncertainty (Vermote et al., 2021). When individuals experience high levels of uncertainty but lack the autonomy to navigate it effectively, their psychological well-being may be further compromised. Thus, one significant concept during this time can be seen as the frustration of the need for autonomy. Autonomy refers to an individual's ability to control their behavior, participate in decision-making processes, and take responsibility for these processes, feeling a sense of will and freedom (Deci & Ryan, 2000). If an individual participates in decision-making processes through intrinsic motivation, this indicates satisfaction of the need for autonomy. However, when an individual is compelled into a situation, the frustration of this need occurs. In this regard, need frustration differs from the mere absence of need satisfaction. It has been suggested that need satisfaction and need frustration exist in an asymmetric relationship, where the absence of need satisfaction does not necessarily imply the presence of need frustration, yet need frustration inherently signifies the absence of need satisfaction (Vansteenkiste & Ryan, 2013). This study examines the need for autonomy through the lens of frustration.

Frustrated autonomy occurs when an individual is compelled to take action under external or internal pressures rather than by their own choice (Chen et al., 2015). In particular, the frustration of basic psychological needs may occur when such needs are actively impeded by social contextual influences (Vansteenkiste et al., 2020). This situation hampers the individual's self-regulation and decision-making processes, negatively affecting their psychological well-being. The constraints imposed during the COVID-19 pandemic have made it challenging for many individuals, especially university students, to fulfill their need for autonomy. Students had to adapt to remote education and online learning environments during the pandemic, which hindered their ability to satisfy their need for autonomy and likely increased psychological difficulties. Studies conducted during this period indicate a decrease in the satisfaction of psychological needs, especially among university students (Müller et al., 2021; Levine et al., 2022), leading to increased negative emotions such as depression, anxiety, and helplessness (Cantarero et al., 2020; Dasinger & Gibson, 2024; Šakan et al., 2020; Vermote et al., 2022). While Self-Determination Theory highlights the importance of competence and relatedness in overall well-being, the unprecedented disruptions caused by COVID-19—particularly remote learning and limited in-person social interactions—had a pronounced effect on university students' autonomy. In a study examining the satisfaction of psychological needs during the pandemic, it was found that the satisfaction of autonomy needs decreased. In contrast, the satisfaction of relatedness needs showed a slight but statistically significant increase (Cantarero et al., 2021). Similarly, another study observed that during a period of anticipated uncertainty, participants' satisfaction with competence needs increased over time (Howell & Sweeny, 2019). Moreover, when considering the developmental characteristics of emerging adulthood, which constitutes the sample of the study, this period is characterized by an increased desire for independence (Arnett, 2000). Additionally, Deci and Ryan (2000) emphasize that optimal functioning is not possible in a given social environment if autonomy

needs remain unmet. An individual who cannot control an outcome is, by necessity, deprived of autonomy (Deci & Ryan, 1987). Thus, we chose to focus our investigation on the ways that frustration of autonomy contributes explicitly to depression and anxiety. Research consistently demonstrates that meeting needs positively influences psychological health, while frustration with these needs has negative repercussions (See Costa et al., 2022; Quested et al., 2011; Novak et al., 2021). For example, a study by Baard et al. (2004) revealed that meeting autonomy needs is linked to higher self-esteem, positive emotions, and lower levels of negative emotions. Yu et al. (2016) found that teachers' autonomy-supportive methods contributed to students' satisfaction with basic psychological needs, thereby reducing anxiety levels. Therefore, supporting autonomy plays a crucial role in meeting these needs. In this context, the frustration of autonomy needs should not be overlooked when examining depression and anxiety levels. From a cultural perspective, Türkiye is classified as a collectivist society (Hofstede, 1980). In collectivist cultures, prioritizing collective goals over personal aspirations is fundamental, and one of the most important norms for achieving this is acting in harmony. However, being part of a collectivist culture does not imply that autonomy is unimportant within society. On the contrary, according to Self-Determination Theory (SDT), basic psychological needs are universal (Coleman, 2000), and their satisfaction is facilitated within an autonomy-supportive environment (Deci & Ryan, 2002). Moreover, autonomy is conceptually distinct from independence and individuality (Chirkov et al., 2003). Similarly, autonomy does not equate to the absence of relatedness with others (İmamoğlu, 2003; Kağıtçıbaşı, 2005). Instead, it refers to an individual's capacity to regulate their own actions in a self-determined manner. Considering both Türkiye's collectivist orientation and the significance of autonomy-supportive environments, the need to investigate the impact of autonomy satisfaction and frustration on psychological health within this cultural context becomes evident. In the present study, understanding how this inclusive nature of autonomy influences the psychological health of emerging adults in Türkiye is of particular importance.

Considering the relationships between these variables and psychological health, this study aims to investigate the predictive roles of perceived uncertainty, intolerance of uncertainty, and frustrated need for autonomy on depression and anxiety levels in Turkish university students. By conducting hierarchical regression analyses for both depression and anxiety, the study aims to provide insights into how these factors contribute to mental health outcomes in emerging adults, particularly in a context where the effects of global stressors such as the COVID-19 pandemic continue to persist. The present study aims to contribute to the extant literature on psychological health during emerging adulthood, while considering environmental contexts. The research hypotheses formulated for this purpose are as follows:

H1: Depression and anxiety are positively and significantly related to perceived uncertainty, intolerance of uncertainty, and frustrated autonomy needs.

As outlined in the previous sections, previous research has systematically demonstrated that autonomy frustration directly undermines psychological health and volitional control (Deci & Ryan, 2000; Vansteenkiste et al., 2020). Given its fundamental role in self-regulation and psychological need satisfaction, it is expected to exert the most potent effect on mental health outcomes. Intolerance of uncertainty, as a cognitive-affective bias, is anticipated to have a secondary but significant effect, amplifying anxiety and depressive symptoms through maladaptive cognitive responses (Carleton, 2016; Boelen & Reijntjes, 2009). Finally, perceived uncertainty, given its dependence on contextual variables and its lack of trait-like stability, is expected to have the weakest predictive power. While perceived uncertainty is conceptually linked to psychological distress, its predictive strength remains inconsistent across empirical studies. Given its explanatory nature and dependence on external contexts rather than

stable cognitive or dispositional factors, it will be introduced last in the analyses to assess its incremental contribution beyond trait-level predictors.

H2: Frustrated need for autonomy, intolerance of uncertainty, and perceived uncertainty, respectively, positively and significantly predict depression levels.

H3: Frustrated need for autonomy, intolerance of uncertainty, and perceived uncertainty, respectively, positively and significantly predict anxiety levels.

This hypothesis order aligns with theoretical perspectives emphasizing the primacy of fundamental psychological needs, the cognitive appraisal nature of uncertainty intolerance, and the situational specificity of perceived uncertainty.

Method

Participants

In line with the objectives of the present study, the sample consists of university students continuing their education in Türkiye. The study sample consists of 421 university students aged between 19 and 25 years ($M = 21.88$; $SD = 1.05$). In the sample, 72% were female ($n = 303$), 27.8% were male ($n = 117$), and 0.2% ($n = 1$) did not specify their gender. Among the participants, 19.7% ($n = 83$) reported relocating due to the COVID-19 pandemic, 26.1% ($n = 110$) reported having no face-to-face interaction with their social circle, 38.2% ($n = 161$) stated that they communicated with their social circle daily through social media and phone, and 60.5% ($n = 253$) shared their living space with someone else.

Instruments

In this framework, the study utilized the "Basic Psychological Needs Satisfaction and Frustration Scale" to evaluate participants' frustrated autonomy needs, "Intolerance of Uncertainty Scale - Short Form" to measure participants' tolerance towards uncertainty, the "Perceived Uncertainty Scale" to assess how uncertain they perceive the current situation, the "Depression, Anxiety, Stress - 21 Scale" to determine their levels of depression and anxiety, and demographic information was collected through a demographic information form. An informed consent form was obtained from all participants before the study.

Basic Psychological Needs Satisfaction and Frustration Scale

This 25-item self-report scale, developed by Chen et al. (2015), was adapted into Turkish by Selvi and Bozo (2020). The scale items are rated on a 5-point Likert scale (1 = Strongly Disagree; 5 = Strongly Agree) and comprise six dimensions, each consisting of four items, measuring both the satisfaction and frustration of autonomy, relatedness, and competence needs. In the present study, analyses were conducted using the four items assessing the frustrated need for autonomy, focusing specifically on its sub-dimensions (e.g., "I feel that I am forced to do many things that I would not prefer to do."). The Turkish adaptation of the scale demonstrated validity and retained structural characteristics similar to the original version. Cronbach's alpha coefficient for the frustrated need for autonomy subscale was reported as .74 in the adaptation study, while in the current study, McDonald's omega coefficient was calculated as .77.

Intolerance of Uncertainty Scale - Short Form

This scale, originally developed by Freeston et al. (1994) and shortened by Carleton and colleagues (2007), was utilized to gauge participants' levels of intolerance towards uncertain situations. The 12-item scale is scored on a 5-point Likert scale (1: Not at all characteristics of me; 5: Entirely characteristic of me) and evaluates participants' tolerance of uncertainty in uncertain situations (e.g., "When it's time

to act, uncertainty paralyses me"). The scale includes two subdimensions: prospective anxiety and inhibitory anxiety. The Turkish adaptation of the scale was conducted by Sarıçam et al. (2014), with a calculated internal consistency coefficient of .88. In this study, the McDonald's omega internal consistency coefficient was found to be .90.

Perceived Uncertainty Scale

Developed by Çavdar, Konukoğlu, and Boyacıoğlu (in preparation for publication), this scale was used to measure participants' perception of the current circumstances as uncertain. The scale consists of 12 items scored on a 5-point Likert scale (1: Strongly disagree; 5: Strongly agree) and is divided into two dimensions: central uncertainty (e.g., "In light of the current circumstances, the future feels highly uncertain to me.") and environmental uncertainty (e.g., "Given the impacts of climate change and environmental pollution, it is difficult to predict what kind of world we will inhabit in the future."). Items in the central uncertainty dimension measure situations that substantially affect an individual's life and are perceived as occurring within a relatively near time frame and are clearly experienced in daily activities. Conversely, items in the environmental uncertainty dimension pertain to circumstances that indirectly influence individuals' lives, are perceived to lie farther on the temporal horizon, and hold significance within a broader intellectual context. In this study, the McDonald's omega internal consistency coefficient was found to be .86.

Depression, Anxiety, Stress - 21 Scale

Developed by Lovibond and Lovibond (1995) and adapted into Turkish by Sarıçam (2018), this scale was used to assess depression, anxiety, and stress levels. The scale consists of 21 items (7 per subdimension) scored on a 4-point Likert scale (0 = Never; 3 = Always) and includes subdimensions for depression (e.g., "I experienced a profound sense of having no expectations."), anxiety (e.g., "I had tremors in my body (e.g. in my hands).") and stress. In accordance with the research objectives, the focus was placed on the depression and anxiety dimensions of the scale. Internal consistency coefficients for the Turkish adaptation were reported as .87 for depression, and .85 for anxiety. In this study, McDonald's omega internal consistency coefficients were found to be .89 for the depression dimension and .85 for the anxiety dimension.

Data Collection and Procedure

Ethical approval for the research was obtained from Dokuz Eylül University on November 10, 2021 (Approval No: E-87347630-659-140129). Data collection was conducted through online platforms between May and November 2022, a period during which Türkiye had transitioned mainly from emergency pandemic restrictions to a "living with COVID-19" phase. Thus, participants' perceptions of uncertainty and autonomy frustration likely reflect more stable, chronic pandemic-related stressors (e.g., ongoing economic volatility, hybrid learning formats) rather than immediate crisis responses. In order to evaluate the proposed relationships, correlation and hierarchical regression analyses were conducted utilizing the relevant modules of Jamovi 2.3 software. Prior to conducting these analyses, assumption tests were carried out to prepare the data for analysis. The subsequent section will provide a comprehensive overview of the analyses performed.

Results

Correlation Analysis Results

Correlation analyses were first conducted to examine the relationships between the study variables (see Table 1). The results indicate positive and significant relationships between the variables, consistent with the hypotheses. As shown in Table 1, depression was positively and significantly related to the

other study variables (.265 ≤ r ≤ .653, p < .001). Similarly, anxiety levels were positively and significantly correlated with the other variables (.231 ≤ r ≤ .441, p < .001). In other words, the first hypothesis of the study was supported. Increased levels of perceived uncertainty, intolerance of uncertainty, and frustrated need for autonomy were positively and significantly associated with higher levels of depression and anxiety.

Table 1

Pearson Correlation Coefficients for Research Variables

	M (SD)	1	2	3	4	5
1. Depression	1.08 (.71)	—				
2. Anxiety	.79 (.63)	.65***	—			
3. Intolerance of uncertainty	3.21 (.74)	.33***	.37***	—		
4. Perceived uncertainty	4.10 (.53)	.26***	.23***	.27***	—	
5. Frustrated need for autonomy	3.52 (.79)	.52***	.44***	.34***	.38***	—

Note. *** p < .001

Hierarchical Regression Analyses

To identify the variables predicting depression and anxiety levels among university students living in Türkiye, a four-step hierarchical regression analysis was conducted. Before performing the analyses, the assumptions for hierarchical regression were checked. To evaluate the assumptions of hierarchical regression, tests for normality (Kolmogorov-Smirnov and Shapiro-Wilk), multicollinearity (VIF and Tolerance), and homogeneity of variance (Breusch-Pagan and Levene's) were conducted. Specifically, the Kolmogorov-Smirnov and Shapiro-Wilk tests were used to assess the normal distribution. The Kolmogorov-Smirnov result indicated p > .05, but the Shapiro-Wilk test yielded p < .001. In addition, examination of Q-Q plots and histograms showed that the assumption of normality was largely satisfied. To assess potential multicollinearity among the independent variables, VIF (Variance Inflation Factor) and Tolerance values were inspected. All variables had VIF values below 10 and Tolerance values above 0.1, indicating an absence of problematic multicollinearity. Although Levene's test supported the homogeneity of variance (p > .05), results from the Breusch-Pagan test (p < .001) suggested heteroskedasticity. Consequently, hierarchical regression analyses were performed using robust standard errors (HC3) approach. The variables were entered into the analysis based on theoretical and logical reasoning. In the first step, gender was included as a control variable to account for its potential influence on the analyses. The second variable included the frustrated need for autonomy, as it has been consistently linked to psychological health. In the third step, intolerance of uncertainty was added, followed by perceived uncertainty in the final step. Since the examination of perceived uncertainty was conducted from an exploratory perspective, it was incorporated into the analysis in the final step, considering the methodological approach of hierarchical regression analysis. Consequently, to investigate the effects on depression and anxiety, variables were entered into the analysis in a stepwise manner: gender was included in the first step, followed by frustrated need for autonomy in the second step, intolerance of uncertainty in the third step, and perceived uncertainty in the final step. The analyses were initially performed to identify the predictors of depression levels, followed by an examination of the variables predicting anxiety levels.

A hierarchical regression analysis was conducted to examine the predictors of depression, including gender, frustrated need for autonomy, intolerance of uncertainty, and perceived uncertainty. In the first step, gender was entered as a control variable. The model did not explain a significant proportion of the variance in depression scores, R^2 = .000, $F(1, 418)$ = 0.037, p = .848. Gender was not a significant predictor (β = .021, p = .856). In the second step, frustrated need for autonomy was added to the model,

which resulted in a significant increase in explained variance ($\Delta R^2 = .267$, $\Delta F(1, 417) = 152.19$, $p < .001$). The overall model was significant, $R^2 = .267$, $F(2, 417) = 76.12$, $p < .001$. Frustrated need for autonomy was a strong predictor of depression ($\beta = .518$, $p < .001$), whereas gender remained non-significant ($\beta = .087$, $p = .387$). In the third step, intolerance of uncertainty was included, further improving the model's explanatory power ($\Delta R^2 = .029$, $\Delta F(1, 416) = 16.90$, $p < .001$). The overall model remained significant, $R^2 = .296$, $F(3, 416) = 58.31$, $p < .001$. Both frustrated need for autonomy ($\beta = .458$, $p < .001$) and intolerance of uncertainty ($\beta = .179$, $p < .001$) were significant predictors of depression, whereas gender remained non-significant ($\beta = .097$, $p = .327$). In the final step, perceived uncertainty was added to the model. However, it did not significantly contribute to the explained variance in depression scores ($\Delta R^2 = .003$, $\Delta F(1, 415) = 1.94$, $p = .165$). The final model accounted for $R^2 = .299$, $F(4, 415) = 44.32$, $p < .001$. Frustrated need for autonomy ($\beta = .439$, $p < .001$) and intolerance of uncertainty ($\beta = .169$, $p < .001$) remained significant predictors, whereas perceived uncertainty was not a significant predictor ($\beta = .063$, $p = .188$). This hierarchical regression analysis suggests that frustrated need for autonomy and intolerance of uncertainty are significant predictors of depression, whereas gender and perceived uncertainty do not contribute significantly.

Table 2

Hierarchical Regression Analysis of the Depression Model

Step	Variable	B	95% CI		SE	β	R²	ΔR²
			LL	UL				
1	Constant	1.081	1.005	1.157	.041	-	.000	.000
	Gender	.015	-0.137	0.167	.082	.021		
2	Constant	-.555	-0.824	-0.286	.112	-	.267	.267
	Gender	.062	-0.069	0.192	.071	.087		
	Frustrated need for autonomy	.467	0.393	0.541	.033	.518		
3	Constant	-.918	-1.234	-0.603	.147	-	.296	.029
	Gender	.069	-0.059	0.197	.070	.097		
	Frustrated need for autonomy	.413	0.336	0.491	.035	.458		
	Intolerance of Uncertainty	.173	0.090	0.256	.046	.179		
4	Constant	-1.170	-1.645	-0.695	.240	-	.299	.003
	Gender	.085	-0.045	0.215	.072	.119		
	Frustrated need for autonomy	.395	0.314	0.477	.036	.439		
	Intolerance of Uncertainty	.163	0.079	0.247	.047	.169		
	Perceived Uncertainty	.085	-0.035	0.206	.065	.063		

The second hierarchical regression analysis was repeated with anxiety level as the dependent variable (see Table 3). In the first step, gender was entered as a control variable. The model accounted for a small but significant proportion of the variance in anxiety scores, $R^2 = .012$, $F(1, 418) = 4.96$, $p = .027$. Gender was a significant predictor ($\beta = -.241$, $p = .025$), indicating that males reported slightly lower anxiety scores compared to females. In the second step, the frustrated need for autonomy was added to the model, which resulted in a significant increase in explained variance ($\Delta R^2 = .187$, $\Delta F(1, 417) = 97.14$, $p < .001$). The overall model was significant, $R^2 = .198$, $F(2, 417) = 51.62$, $p < .001$. Frustrated need for autonomy was a strong predictor of anxiety ($\beta = .433$, $p < .001$), whereas gender was no longer a significant predictor ($\beta = -.186$, $p = .060$). In the third step, intolerance of uncertainty was included, further improving the model's explanatory power ($\Delta R^2 = .053$, $\Delta F(1, 416) = 29.70$, $p < .001$). The overall model remained significant, $R^2 = .252$, $F(3, 416) = 46.70$, $p < .001$. Both frustrated need for autonomy ($\beta = .351$, $p < .001$) and intolerance of uncertainty ($\beta = .245$, $p < .001$) were significant predictors of anxiety, whereas gender remained non-significant ($\beta = -.172$, $p = .076$). In the final step, perceived

uncertainty was added to the model. However, it did not significantly contribute to the explained variance in anxiety scores ($\Delta R^2 = .000$, $\Delta F_{(1, 415)} = 0.203$, $p = .652$). The final model accounted for $R^2 = .252$, $F_{(4, 415)} = 35.01$, $p < .001$. Frustrated need for autonomy ($\beta = .345$, $p < .001$) and intolerance of uncertainty ($\beta = .242$, $p < .001$) remained significant predictors, whereas perceived uncertainty was not a significant predictor ($\beta = .021$, $p = .632$). This hierarchical regression analysis suggests that frustrated need for autonomy and intolerance of uncertainty are significant predictors of anxiety, whereas gender and perceived uncertainty do not contribute significantly. These findings highlight the importance of psychological needs and cognitive styles in understanding anxiety.

Table 3

Hierarchical Regression Analysis of Anxiety Model

Step	Variable	B	95% CI		SE	β	R²	ΔR²
			LL	UL				
1	Constant	.757	0.690	0.823	.033	-	.012	.012
	Gender	-.151	-0.284	-0.018	.067	-.241		
2	Constant	-.446	-0.693	-0.199	.101	-	.198	.187
	Gender	-.116	-0.237	0.004	.062	-.186		
	Frustrated need for autonomy	.343	0.275	0.412	.030	.433		
3	Constant	-.883	-1.169	-0.597	.126	-	.252	.053
	Gender	-.108	-0.224	0.009	.061	-.172		
	Frustrated need for autonomy	.278	0.208	0.349	.031	.351		
	Intolerance of Uncertainty	.208	0.133	0.283	.039	.245		
4	Constant	-.957	-1.389	-0.525	.203	-	.252	.000
	Gender	-.103	-0.221	0.015	.061	-.165		
	Frustrated need for autonomy	.273	0.199	0.347	.031	.345		
	Intolerance of Uncertainty	.205	0.129	0.281	.040	.242		
	Perceived Uncertainty	.025	-0.084	0.135	.052	.021		

The results of the hierarchical regression analyses indicated that perceived uncertainty did not exhibit significant explanatory power in either model. These findings suggest that the effect of perceived uncertainty on depression and anxiety may not be direct but rather mediated through frustrated need for autonomy and intolerance of uncertainty. Therefore, parallel mediation analyses were conducted to determine whether the impact of perceived uncertainty on depression and anxiety is indirect.

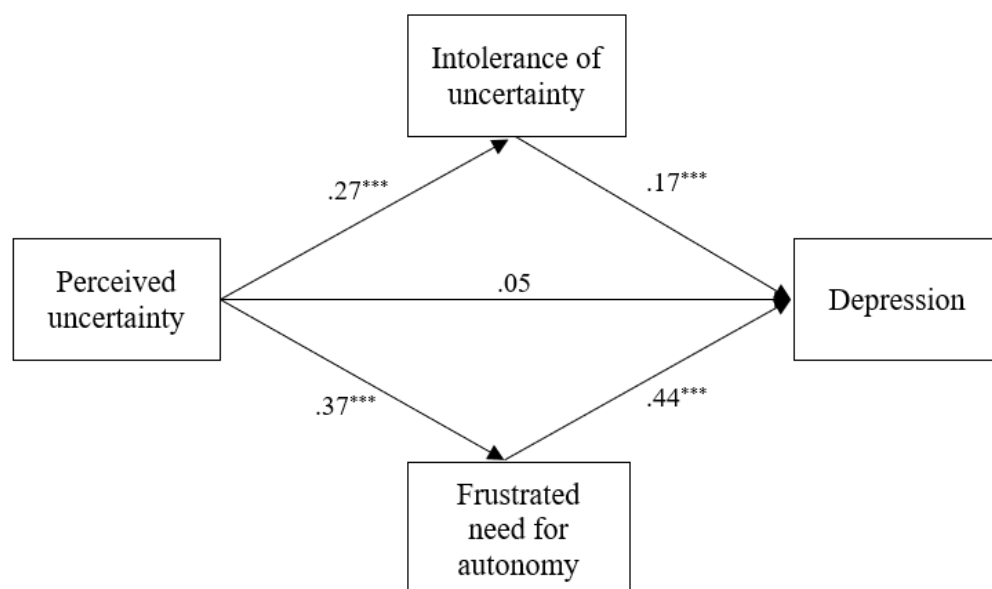**Parallel Mediation Analysis**

Mediation analysis was performed using the "jAMM" module (Gallucci, 2020) in the Jamovi software package, employing bias-corrected bootstrapping within the General Linear Model (GLM). In the analysis, perceived uncertainty was used as the predictor variable, while intolerance of uncertainty and frustrated need for autonomy were included as parallel mediators. The outcome variables, depression and anxiety, were examined separately to assess how the mediation effects influenced their relationships.

Firstly, an analysis was conducted on the depression model. A parallel mediation analysis was conducted to examine whether the frustrated need for autonomy and intolerance of uncertainty mediated the relationship between perceived uncertainty and depression. The results indicated that the total effect of perceived uncertainty on depression was significant, $\beta = .265$, $t(419) = 5.64$, $p < .001$. An examination of the mediational pathways revealed that the indirect effect of perceived uncertainty on depression through the frustrated need for autonomy was statistically significant ($\beta = .166$, $z = 6.30$, p

< .001). Similarly, intolerance of uncertainty served as a significant mediator (β =.046, z = 3.21, p = .001). In the first mediator model, perceived uncertainty was a significant predictor of frustrated need for autonomy (β = 0.375, $t(419)$ = 8.29, p < .001). Likewise, perceived uncertainty was found to be a significant predictor of intolerance of uncertainty (β = 0.272, $t(419)$ = 5.79, p < .001). When both mediators and the predictor were entered simultaneously into the whole model predicting depression, the direct effect of perceived uncertainty on depression was not significant (β = 0.053, $t(417)$ = 1.19, p = .234). However, both mediators emerged as significant predictors of depression: Frustrated need for autonomy, β = 0.442, $t(417)$ = 9.66, p < .001, and intolerance of uncertainty, β = 0.169, $t(417)$ = 3.83, p < .001. The overall full model accounted for 30% of the variance in depression, $F(3, 417)$ = 59.50, p < .001. These results indicate that perceived uncertainty influences depressive symptoms indirectly through both mediators rather than exerting a direct effect. In other words, higher perceived uncertainty is associated with increased levels of both frustrated need for autonomy and intolerance of uncertainty, ultimately leading to greater depressive symptoms (See Fig.1). The presence of significant indirect effects alongside a non-significant direct effect supports a full mediation model, emphasizing the critical role of these mediators in explaining the association between perceived uncertainty and depression.

**Figure 1**

Parallel Mediation Analysis for Depression

Note: ***p < .001. Path coefficients are standardized coefficients (β).

The same procedure was conducted for the anxiety model. A parallel mediation analysis was conducted to examine whether the frustrated need for autonomy and intolerance of uncertainty mediated the relationship between perceived uncertainty and anxiety. The total effect of perceived uncertainty on anxiety was significant, β = .231, $t(419)$ = 4.85, p < .001. Assessment of the mediation pathways showed that perceived uncertainty influenced anxiety indirectly through the frustrated need for autonomy, with a significant indirect effect, β = .130, z = 5.50, p < .001 and also through intolerance of uncertainty, which was found to be a significant mediator β = .066, z = 3.92, p < .001. In the mediator models, perceived uncertainty significantly predicted the frustrated need for autonomy, β = .375, $t(419)$ = 8.29, p < .001, and also significantly predicted intolerance of uncertainty, β = .272, $t(419)$ = 5.81, p < .001. When both mediators and perceived uncertainty were entered simultaneously into the whole model predicting anxiety, the direct effect of perceived uncertainty on anxiety was not significant, β = .035, $t(417)$ = 0.76, p = .447. However, both mediators emerged as significant predictors of anxiety:

frustrated need for autonomy, $\beta = .346$, $t(417) = 7.34$, $p < .001$, and intolerance of uncertainty, $\beta = .242$, $t(417) = 5.31$, $p < .001$. The whole model accounted for 24.9% of the variance in anxiety, $F(3, 417) = 46.20$, $p < .001$. These findings suggest that perceived uncertainty impacts anxiety through indirect mechanisms rather than directly affecting anxiety levels (See Fig.2). As in the depression model, the non-significant direct effect alongside significant indirect effects supports a full mediation model, reinforcing the crucial role of these mediators in elucidating the relationship between perceived uncertainty and anxiety.

Figure 2

Parallel Mediation Analysis for Anxiety
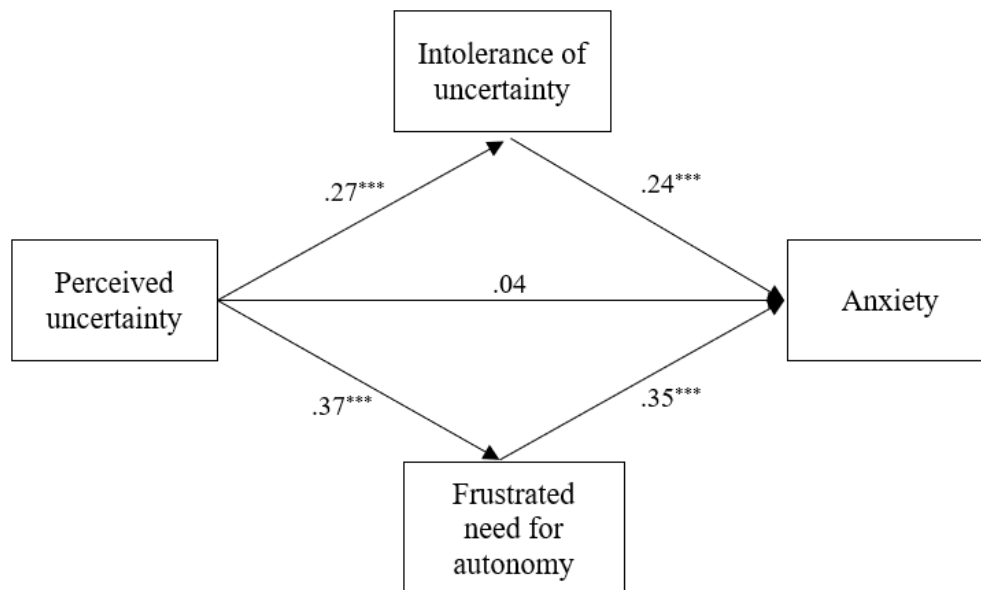
Note: ***p < .001. Path coefficients are standardized coefficients (β).

Discussion

The present study aimed to examine the predictive roles of perceived uncertainty, intolerance of uncertainty, and frustrated need for autonomy on depression and anxiety among university students in Türkiye during the post-pandemic uncertain era. The findings of this study offer significant insights into the key factors influencing depression and anxiety levels among university students in Türkiye. Our findings indicate that while the frustrated need for autonomy and intolerance of uncertainty are robust predictors of both depression and anxiety, perceived uncertainty does not exhibit a direct effect. Instead, further mediation analyses revealed that perceived uncertainty influences psychological distress indirectly through its effects on both intolerance of uncertainty and frustrated need for autonomy. These results contribute to the extant literature by clarifying the differential roles of uncertainty constructs and highlighting the importance of basic psychological needs in mental health outcomes.

The strong impact of the frustrated need for autonomy on both depression and anxiety observed in the findings confirms the importance of autonomy, as highlighted by the Self-Determination Theory (Deci & Ryan, 2000). The frustration of autonomy needs appears to compromise volitional decision-making, leading to adverse mental health consequences. Our results are supported by previous research that has documented the detrimental impact of autonomy frustration on psychological functioning (Chen et al., 2015; Deci & Ryan, 2000; Kasser & Ryan, 1993; Vansteenkiste et al., 2020). Although the data for this study were collected during a period when people mainly had adapted to the pandemic, the discovery

that the frustrated need for autonomy predicts increased levels of depression and anxiety remains important. During the pandemic, many university students faced challenges in meeting their basic psychological needs due to restrictions on their education and social lives, leading to negative impacts on their mental health (Šakan et al., 2020; Vermote et al., 2022). The study findings align with existing literature, indicating that the frustration of autonomy needs among university students is a primary predictor of heightened depression and anxiety levels. This emphasizes the critical need to support students' autonomy to safeguard their mental health. Moreover, the emphasis on autonomy is particularly relevant in the context of Türkiye's collectivist culture, where the interplay between personal independence and social harmony can create unique challenges for emerging adults (İmamoğlu, 2003)..

The hierarchical regression analyses, which controlled for gender in the first step, demonstrated that gender initially exhibited a modest influence on anxiety; however, its effect was attenuated as other predictors were introduced. This finding suggests that while gender differences may be present in baseline analyses, the cognitive-affective processes associated with uncertainty and autonomy frustration predominantly drive the mental health outcomes observed in this sample. Moreover, the significant contribution of intolerance of uncertainty corroborates earlier research linking cognitive biases toward uncertainty with heightened anxiety and depression (Carleton et al., 2012; Boelen & Reijntjes, 2009; Rettie & Daniels, 2020). When faced with uncertainty, individuals may struggle to identify protective factors for their psychological health, particularly when frustrated psychological needs hinder their coping mechanisms. When combined with frustrated autonomy needs, university students facing academic uncertainties, changes in social relationships, and concerns about the future might experience more pronounced effects on their mental health.

A notable finding is that perceived uncertainty did not significantly predict depression or anxiety in this study. This outcome may reflect the situational and transient nature of perceived uncertainty compared to the more dispositional quality of intolerance of uncertainty. The lack of a significant effect of perceived uncertainty in this study may suggest that this variable is not as directly influential as others. To explore this further, we conducted parallel mediation analyses using bias-corrected bootstrapping. The results indicated full mediation, whereby perceived uncertainty affected both depression and anxiety indirectly through its positive associations with intolerance of uncertainty and frustrated need for autonomy. These findings suggest that the detrimental effects of uncertainty on mental health are primarily channeled through individuals' dispositional responses (i.e., intolerance of uncertainty) and the frustration of their basic psychological needs. This finding is consistent with the notion that uncertainty can indirectly affect mental health by impairing fundamental psychological processes (Li & Song, 2024; Sahib et al., 2024, Potterton et al., 2022). The integration of a mediation model represents a significant contribution to this study. By showing that the relationship between perceived uncertainty and mental health outcomes is fully mediated, our findings underscore the importance of targeting cognitive and motivational mechanisms in interventions. Specifically, strategies aimed at enhancing tolerance for uncertainty and bolstering autonomy-supportive environments may prove effective in mitigating depression and anxiety among university students.

Despite the strengths of our study, several limitations warrant mention. Upon reviewing the relevant literature, no studies have been identified that focus on how uncertain the current situation is perceived to be. In this respect, the present study has an exploratory nature. Additionally, university students, who are in a transitional developmental phase, may perceive sources of uncertainty differently. The measurement tool used in this study focused on participants' general perceptions of uncertainty. However, the specific sources of uncertainty or problems perceived by this particular developmental group may differ. Indeed, some studies have identified academic anxiety, family and relationship issues,

and academic success as key problem areas for university students (Köksal & Topkaya, 2021; Lassarre et al., 2003; McMillin et al., 2020). Therefore, the expected effects may not have been observed in this study. Additionally, the cross-sectional design precludes causal inferences regarding the observed relationships. Future research employing longitudinal designs would allow for a more precise determination of the temporal dynamics between uncertainty, autonomy frustration, and psychological distress.

Conclusion

In conclusion, our study contributes to the literature by clarifying the differential roles of perceived uncertainty, intolerance of uncertainty, and frustrated need for autonomy in predicting depression and anxiety among university students in Türkiye. The findings emphasize that interventions focusing on reducing uncertainty intolerance and enhancing autonomy support may be critical for improving students' mental health, particularly in times of global stress. Considering that being in an environment where the need for autonomy is supported has important consequences such as psychological health and academic success (e.g., Jiang & Tanaka, 2021; Mouratidis et al., 2017; Song et al., 2015), it is important and necessary for individuals to satisfy their need for autonomy independent of social constraints. Ensuring that individuals can satisfy their autonomy needs independently of social constraints is crucial for their psychological and academic development. Besides, the impact of perceived uncertainty on mental health can vary, with factors like resilience, support systems, and coping strategies influencing its effects. Future research should further investigate these mediating mechanisms while simultaneously elucidating the complex interplay between perceived uncertainty and individual differences in uncertainty tolerance, with particular emphasis on the broader cultural contexts in which these psychological processes occur in light of the contextual implications of the need for autonomy.

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