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# Investigation of Certain Cognitive and Metacognitive Factors Affecting Anxiety and Depression Symptoms Through Parallel Serial Mediation Models

## *Anksiyete ve Depresyon Belirtilerini Etkileyen Bazı Bilişsel ve Üstbilişsel Faktörlerin Paralel Seri Aracılık Modelleri ile İncelenmesi*

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**ABSTRACT**

Objective: This study aims to investigate the parallel serial mediating effects of cognitive flexibility, attentional control, and worry in the relationship between rumination—which has been repeatedly proven to persist in the etiology of depression—and the symptoms of depression. This model will also be tested with anxiety symptoms.
Method: The study involved 832 university students, all emerging adults. The Personal Information Form, Ruminative Thought Style Questionnaire, Penn State Worry Questionnaire, Cognitive Flexibility Inventory, Attentional Control Scale, and Depression, Anxiety, and Stress Scale Short Form were used.
Results: In two separate parallel serial mediation analyses, where gender was included as a control variable and depression and anxiety symptoms were included as dependent variables, the findings of the significant models were consistent. Accordingly, in both models in which both depression and anxiety are predicted, while the parallel serial mediation effect of cognitive flexibility and worry was significant (respectively; B=.003, SE=.001, %95 BCa CI [.001, .005]; B=.004, SE=.001, %95 BCa CI [.003, .007]), the parallel serial mediation effect of cognitive flexibility and attentional control was not significant (respectively; B=.000, SE=.000, %95 BCa CI [-.001, .001]; B=.00, SE=.00, %95 BCa CI [-.001, .001]).
Conclusion: The findings of models that include certain cognitive and metacognitive factors seem to support the idea proposed by the transdiagnostic approach that there are common vulnerability factors in the explanation of disorders.
**Keywords:** Transdiagnostic approach, depression, anxiety, rumination, cognitive flexibility

**ÖZ**

Amaç: Bu çalışma, depresyonun etiyolojisinde varlığını koruduğu pek çok kez kanıtlanmış ruminasyon ile depresyon belirtileri arasındaki ilişkide bilişsel esneklik, dikkat kontrolü ve endişenin paralel seri aracılık etkilerini incelemeyi amaçlamaktadır. Bu model anksiyete belirtileri ile de test edilecektir.
Yöntem: Çalışmaya tamamı beliren yetişkinlerden oluşan 832 üniversite öğrencisi katılmıştır. Kişisel Bilgi Formu, Ruminatif Düşünme Biçimi Ölçeği, Penn State Endişe Ölçeği, Bilişsel Esneklik Envanteri, Dikkat Kontrol Ölçeği ve Depresyon, Anksiyete ve Stres Ölçeği Kısa Formu kullanılmıştır.
Bulgular: Cinsiyetin kontrol değişkeni, depresyon ve anksiyete belirtilerinin bağımlı değişken olarak dahil edildiği iki ayrı paralel seri aracılık analizinde de anlamlı çıkan modellerin bulguları paralellik göstermektedir. Buna göre, hem depresyon hem de anksiyetenin yordandığı her iki modelde de bilişsel esneklik ve endişenin paralel seri aracı etkisi anlamlı iken (sırasıyla; B=,003, SH=,001, %95 BCa GA [,001, ,005]; B=,004, SH=,001, %95 BCa GA [,003, ,007]), bilişsel esneklik ve dikkat kontrolünün paralel seri aracı etkisi anlamlı değildir (sırasıyla; B=,000, SH=,000, %95 BCa GA [-,001, ,001]; B=,000, SH=,000, %95 BCa GA [-,001, ,001]).
Sonuç: Söz konusu modellerin bulgularının, tanılar üstü yaklaşımın öne sürdüğü bozuklukların açıklanmasında ortak yatkınlık faktörlerinin olduğu fikrini desteklediği görülmektedir.
**Anahtar sözcükler:** Tanılar üstü yaklaşım, depresyon, anksiyete, ruminasyon, bilişsel esneklik

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## Introduction

The categorical classification method (e.g., DSM, Diagnostic and Statistical Manual of Mental Disorders, and ICD, International Classification of Diseases), which has been in use for several decades, is based on the fulfilment of specific diagnostic criteria for each psychiatric disorder (Haslam 2003, Brown and Barlow 2005, Widiger and Crego 2018). The presence or absence of specific symptoms is used to determine whether the diagnostic criteria have been met (Regier et al. 2013). However, recent studies have indicated that there are high rates of comorbidity (Kessler et al. 2005, Özdemir 2012, Caspi et al. 2014, Jacobi et al. 2014). Despite the high prevalence rates of depression and anxiety, which are described by different symptom clusters in the DSM-5 (APA 2013) and the ICD-11 (WHO 2018), research has reported high rates of comorbidity (Hirschfeld 2001, Kessler et al. 2005, Garber and Weersing 2010, Kaiser et al. 2021, Konac et al. 2021). Indeed, the findings indicate that the co-occurrence of depression and anxiety is more prevalent than the presence of either condition alone (Groen et al. 2020, Shevlin et al. 2022). The increase in comorbidity rates has prompted researchers to examine potential underlying common causes through a transdiagnostic approach (Caspi et al. 2014, Cuijpers et al. 2023, Gökdağ et al. 2023).

In studies examining the shared vulnerability factors of depression and anxiety, rumination, defined as a repetitive negative thinking style (Nolen-Hoeksema 1991), has frequently been studied (e.g., Harvey et al. 2004, Starr and Davila 2011, Gökdağ et al. 2023). In this regard, McLaughlin and Nolen-Hoeksema's (2011) study indicated that rumination plays a role in the etiology of depression and contributes to the development of anxiety. The researchers investigated whether rumination serves as a transdiagnostic factor for depression and anxiety, and their findings yielded significant results in both adolescent and adult samples. Additionally, the literature includes studies demonstrating a negative correlation between rumination and depression and anxiety (Nolen-Hoeksema 2000, Olatunji et al. 2013, Wilkinson et al. 2013, Rickerby et al. 2024).

In addition to rumination, there are other cognitive and metacognitive factors that have been identified in relation to depression and anxiety. One such factor is cognitive flexibility, defined as the capacity to adapt coping strategies to different contexts (Dennis and Vander Wal 2010), which has been shown in numerous studies to be negatively associated with depression and anxiety (Murphy et al. 2012, Lee and Orsillo 2014, Johnco et al. 2015, Yu et al. 2019, Bardak et al. 2024). Cognitive flexibility is associated with coping strategies that facilitate adaptation to changing life conditions, which is linked to depression (Johnco et al. 2013), while difficulty in adjusting coping strategies in response to changing situations is associated with anxiety (Lyche et al. 2010). Another variable, attentional control, includes the ability to direct and focus attention and has been linked to depression and anxiety (Olafsson et al. 2011, Sportel et al. 2011, Abasi et al. 2017, Hsu et al. 2019, Shi et al. 2019, Allan et al. 2020). Attention, a central cognitive factor, has been demonstrated to be directly correlated with emotions, with many studies indicating that impairments in attentional processes play a role in the etiology of emotional disorders (Wells and Matthews 2014). Specifically, it has been proposed that deficits in attentional control, which are associated with both emotional and non-emotional stimuli, contribute to the development of disorders that are characterised by depression and anxiety (Pike et al. 2020). Worry, which plays a significant role in metacognitive theory, is characterized by repetitive negative thought content and a sense of lack of control (Borkovec et al. 1983, Wells 1995, Hirsch and Mathews 2012). Worry is often used synonymously with anxiety, but it can be distinguished from anxiety by its forward-looking nature (Zebb and Beck 1998). As with other factors, the relationship between worry and depression and anxiety is widely documented in the literature (Starcevic et al. 2007, Dar et al. 2017, Taylor and Snyder 2021).

In light of the aforementioned information, it can be posited that rumination represents a primary factor that is distinct from other variables. This assertion is supported by the numerous studies that have demonstrated a relationship between rumination and cognitive flexibility (Davis and Nolen-Hoeksema 2000, Greene 2020, Anayurt and Yalçın 2021, Altan-Atalay et al. 2022, Cenkner et al. 2023), attentional control (Hsu et al. 2015, Cox and Olatunji 2016, DeJong et al. 2019, Figueroa et al. 2019), and worry (Kircanski et al. 2015, Yılmaz 2015, Young and Dietrich 2015, Capobianco et al. 2018, McCarrick et al. 2021, Stade and Ruscio 2023). The absence of a study examining a model that includes these variables together, as well as the importance of revealing their relationships in explaining depression and anxiety symptoms on a transdiagnostic level, underscores the significance of this research. Accordingly, this study aims to investigate the mediating effects of cognitive flexibility, attentional control, and worry in the relationship between rumination and depression and anxiety. The following hypotheses are posited: Hypothesis1: There are statistically significant relationships among rumination, depression, anxiety, cognitive flexibility, worry, and attentional control. Hypothesis2: The mediating effects of cognitive flexibility, attentional control, and worry in the relationship between rumination

and depression are statistically significant. Hypothesis3: The mediating effects of cognitive flexibility, attentional control, and worry in the relationship between rumination and anxiety are statistically significant.

## Method

### Sample

In this study, the Monte Carlo Power Analysis for Indirect Effects method (Schoemann et al. 2017) was employed to determine the required sample size, as parallel and serial mediation variables were analyzed using the Bootstrapping method. According to the results of the Monte Carlo Power Analysis, a minimum sample size of 213 was determined to achieve a power of .95 at a significance level of .05. Given that the study was conducted with university students, efforts were made to ensure that the sample size as large as possible. Consequently, based on the principle of accessibility, a convenience sampling method was used, resulting in 832 university students (78.7% female) voluntarily participating, all of whom were emerging adults. The participants had an average age of 20.44 (SD = 1.85), with the majority reporting a middle-income level (n = 687). Inclusion criteria required participants to be between 18 and 25 years of age and enrolled as university students. Participants diagnosed with any psychotic or cognitive disorders (n = 4) were excluded from the study (For detailed sociodemographic characteristics, see Table 1).

**Table 1. Distributions of sociodemographic characteristics of the participants**

| Variables | Categories | Frequency | Percentage (%) |
|---|---|---|---|
| Gender | Female | 655 | 78.7 |
| | Male | 177 | 21.3 |
| Age | 18 | 125 | 15 |
| | 19 | 190 | 22.8 |
| | 20 | 153 | 18.4 |
| | 21 | 133 | 16 |
| | 22 | 100 | 12 |
| | 23 | 74 | 8.9 |
| | 24 | 33 | 4 |
| | 25 | 24 | 2.9 |
| University | Ege | 554 | 66.6 |
| | Dokuz Eylül | 38 | 4.6 |
| | Katip Çelebi | 30 | 3.6 |
| | Other | 210 | 25.2 |
| Perceived income level | Low | 126 | 15.1 |
| | Middle | 687 | 82.6 |
| | High | 19 | 2.3 |
| Family Status | Intact | 711 | 85.5 |
| | Broken | 32 | 3.8 |
| | Divorced | 61 | 7.3 |
| | Parental Loss | 28 | 3.4 |

### Procedure

The data were obtained through the utilisation of both an online survey platform and face-to-face administration. Following approval from the Ethics Committee for Scientific Research and Publication in Social and Human Sciences at Ege University (Reference Number: 01/20-119; Date: August 31, 2019), data collection commenced. The data collection process was conducted by the second and third authors, and the sample predominantly comprised university students located in İzmir. Prior to distribution, the online survey set was meticulously reviewed by the researchers to ensure both digital and linguistic accuracy. Subsequently, data were collected in group sessions held after class with the permission of the faculty, or through the distribution of the study link. Only participants who provided informed consent after receiving detailed information at the outset of the study were included.

### Measures

#### *Personal Information Form*

In this study, this form is created by the researchers was used to gather general information about participants

(e.g., age, gender, income level, history of psychiatric diagnosis).

### *Ruminative Thought Style Questionnaire*

Developed by Brinker and Dozois (2009), this scale aims to measure individuals' tendencies toward ruminative thinking. The 20-item scale assesses the extent to which uncontrollable, repetitive, and intrusive thoughts characterize individuals using a 7-point Likert scale. Adapted to Turkish by Karatepe (2010), the scale has high internal consistency (α = .92) and test-retest reliability (α = .84). High scores on the scale indicate a greater tendency toward ruminative thinking. The Cronbach's alpha internal consistency coefficient for this study was found to be .93.

### *Penn State Worry Questionnaire*

Developed by Meyer et al. (1990) to assess levels of excessive, persistent, and uncontrollable worry, this 16-item scale uses a 5-point Likert scale. In the Turkish reliability study conducted by Yılmaz et al. (2008), Cronbach's alpha reliability coefficients were measured as .92 and .68 for the presence and absence of worry factors, respectively. The same study confirmed the two-factor structure of the scale. Higher total scores indicate higher levels of worry. The Cronbach's alpha internal consistency coefficient for this study was .93.

### *Cognitive Flexibility Inventory*

Developed by Dennis and Vander Wal (2010), this scale aims to measure individuals' cognitive flexibility, or their ability to generate alternative, appropriate, adaptive, and balanced thoughts in challenging situations. The Turkish adaptation and reliability study was conducted by Gülüm and Dağ (2012). The 20-item scale consists of two subscales (alternatives and control) and is measured on a 5-point Likert scale. In the adaptation study, Cronbach's alpha values were found to be .90 for the entire scale, .89 for the alternatives subscale, and .85 for the control subscale (Gülüm and Dağ 2012). Higher scores indicate increased cognitive flexibility, and the Cronbach's alpha coefficient for this study was .90.

### *Attentional Control Scale*

The scale developed by Derryberry and Reed (2002) aims to measure individuals' self-assessment ability in attentional control. The Turkish adaptation, validity, and reliability study was conducted by Altan Atalay et al. (2024). The scale, which consists of a total of 20 items and two factors (focusing and shifting), is in a 4-point Likert scale. Given the inconsistencies in the literature regarding the factor structure, the scale was examined in its original structure. In the adaptation study, Cronbach's alpha values were found to be .88 for the entire scale, .83 for the focusing dimension, and .85 for the shifting dimension. When test-retest reliability was examined, coefficients of .77 for the entire scale, .69 for focusing, and .74 for shifting were obtained. Higher scores on the scale indicate impairments in attentional control (Altan Atalay et al. 2024). For this study, the Cronbach's alpha coefficient of the scale is .79.

### *Depression, Anxiety, and Stress Scale - Short Form*

Developed by Lovibond and Lovibond (1995) as a long form with 42 items (14 each for depression, anxiety, and stress dimensions), the scale has a validated short form that retains the same measurement properties (Brown et al. 1997). The short form measures each of the depression, anxiety, and stress dimensions with seven items, totaling 21 items, on a 4-point Likert scale. In the Turkish validity and reliability study by Sarıçam (2018), Cronbach's alpha internal consistency coefficients were found to be .87 for the depression subscale, .85 for the anxiety subscale, and .81 for the stress subscale. Higher scores on each dimension indicate higher levels of respective symptoms. In this study, the Cronbach's alpha coefficient for the depression subscale was .87, and .82 for the anxiety subscale.

## Statistical Analysis

The data obtained from the measurement instruments were analyzed using IBM SPSS Statistics version 25.0. Prior to the analyses, the scale scores of the participants were meticulously examined and evaluated within the acceptable range of -2 to +2 for skewness and kurtosis, in accordance with the normal distribution assumptions (George and Mallery 2010). Based on this examination, it was concluded that the normal distribution assumption was satisfied for all variables. To assess potential differences between online (n = 390) and face-to-face (n = 442) data collection methods, an independent samples t-test was conducted, revealing no significant differences between these groups ($p > .05$). Following this, descriptive characteristics (such as age, gender, and socioeconomic status) were reviewed. Pearson Correlation Analysis was then conducted to explore relationships

among all variables. To test the study hypotheses, a Parallel Serial Mediation Analysis (Model 81) was conducted using the SPSS Process Macro version 4.2 (Hayes 2022). Finally, two separate Parallel Serial Mediation Analyses were conducted, with depression and anxiety symptoms serving as the dependent variables, rumination as the independent variable, and cognitive flexibility, worry, and attentional control as mediators. Considering the significant gender-based differences observed in some variables and the imbalance in gender distribution, gender was included as a control variable in the parallel serial mediation analyses.

## Results

Prior to the main analyses concerning the primary aim of the study, Pearson correlation analyses were conducted to examine the relationships between the variables included in the Parallel Serial Mediation model. As shown in the table, the relationship between gender and worry was significant ($r = -.18$, $p < .001$), whereas all other relationships between variables were found to be significant ($p < .001$, Table 2).

**Table 2. The means and standard deviations of the variables, along with the Pearson correlation coefficients between the variables**

| Variables | $\bar{x}$ | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|---|
| 1. Gender | - | - | - | | | | | | |
| 2. Rumination | 95.32 | 22 | -.06 | - | | | | | |
| 3. Cognitive Flexibility | 76.27 | 10.94 | .02 | -.33** | - | | | | |
| 4. Worry | 50.02 | 13.94 | -.18** | .60** | -.36** | - | | | |
| 5. Attentional Control | 45.19 | 4.75 | .06 | .29** | -.10** | .17** | - | | |
| 6. Depression | 6.67 | 5.01 | .01 | .44** | -.35** | .42** | .25** | - | |
| 7. Anxiety | 5.57 | 4.41 | -.04 | .48** | -.31** | .53** | .23** | .67** | - |

**p< .001

**Table 3. Results of two separate parallel serial mediation analyses with depression and anxiety symptoms as the dependent variables**

| | B | SE | t | %95 CI | %95 CI | R2 | F |
|---|---|---|---|---|---|---|---|
| | | | | LL | UL | | |
| Dependent variable: Cognitive Flexibility | | | | | | .11 | 52.09** |
| Constant | 92.12** | 1.95 | 47.32 | 88.3 | 95.94 | | |
| Gender | -.01 | .85 | -.01 | -1.67 | 1.65 | | |
| Rumination | -.17** | .02 | -10.19 | -.20 | -.13 | | |
| Dependent variable: Worry | | | | | | .41 | 193.24** |
| Constant | 41.23** | 3.88 | 10.61 | 33.60 | 48.85 | | |
| Gender | -4.78** | .88 | -5.45 | -6.50 | -3.06 | | |
| Rumination | .34** | .02 | 18.81 | .30 | .37 | | |
| Cognitive Flexibility | -.23** | .04 | -6.39 | -.30 | -.16 | | |
| Dependent variable: Attentional Control | | | | | | .09 | 27.01** |
| Constant | 38.06** | 1.65 | 23.10 | 34.83 | 41.29 | | |
| Gender | .88 | .37 | 2.35 | .15 | 1.61 | | |
| Rumination | .06** | .01 | 8.32 | .05 | .08 | | |
| Cognitive Flexibility | .00 | .02 | .03 | -.03 | .03 | | |
| Dependent variable: Depression | | | | | | .28 | 63.5** |
| Constant | -1.83 | 2.07 | -.89 | -5.89 | 2.22 | | |
| Gender | .60 | .36 | 1.68 | -.10 | 1.3 | | |
| Rumination | .05** | .01 | 5.57 | .03 | .07 | | |
| Cognitive Flexibility | -.09** | .02 | -5.94 | -.12 | -.06 | | |
| Worry | .07** | .01 | 5.35 | .05 | .10 | | |
| Attentional Control | .13** | .03 | 4.11 | .07 | .20 | | |
| **Total Effect** | .10** | .01 | 14.00 | .09 | .11 | .19 | 97.97** |
| Dependent variable: Anxiety | | | | | | .35 | 87.16** |
| Constant | -5.45** | 1.73 | -3.15 | -8.84 | -2.06 | | |
| Gender | .36 | .30 | 1.20 | -.23 | .95 | | |
| Rumination | .04** | .01 | 5.37 | .03 | .05 | | |
| Cognitive Flexibility | -.04** | .01 | -3.42 | -.07 | -.02 | | |
| Worry | .12** | .01 | .10 | .09 | .14 | | |
| Attentional Control | .09** | .03 | 3.41 | .04 | .15 | | |
| **Total Effect** | .10** | .01 | 15.70 | .08 | .11 | .23 | 124.03** |

**$p$<.001; Unstandardized beta coefficients are provided. The effect of gender has been controlled for. Bootstrap sample size: 5000.; CI: Confidence Interval

The findings from the two separate Parallel Serial Mediation Analyses (Model 81), in which gender was controlled and depressive and anxiety symptoms served as dependent variables, are presented in Table 3. According to the results, ruminative thinking significantly predicted cognitive flexibility in a negative direction [$F(2, 829) = 52.09$, $R^2 = .11$, $p < .001$]; cognitive flexibility significantly and negatively predicted worry, while ruminative thinking positively predicted worry [$F(3, 828) = 193.24$, $R^2 = .41$, $p < .001$]. When examining the predictors of attentional control, it was found that ruminative thinking positively predicted attentional control, but the predictive power of cognitive flexibility was not significant [$F(3, 828) = 27.01$, $R^2 = .09$, $p < .001$]. The first model, which controlled for gender, explained 28% of the variance in depressive symptoms [$F(5, 826) = 63.50$, $R^2 = .28$, $p < .001$]. According to this model, ruminative thinking, worry, and attentional control positively, while cognitive flexibility negatively, predicted depressive symptoms. Subsequently, a similar model that also controlled for gender accounted for 35% of the variance in anxiety symptoms, yielding findings similar to those of the first model in terms of the direction and effect of the predictors [$F(5, 826) = 87.16$, $R^2 = .35$, $p < .001$].

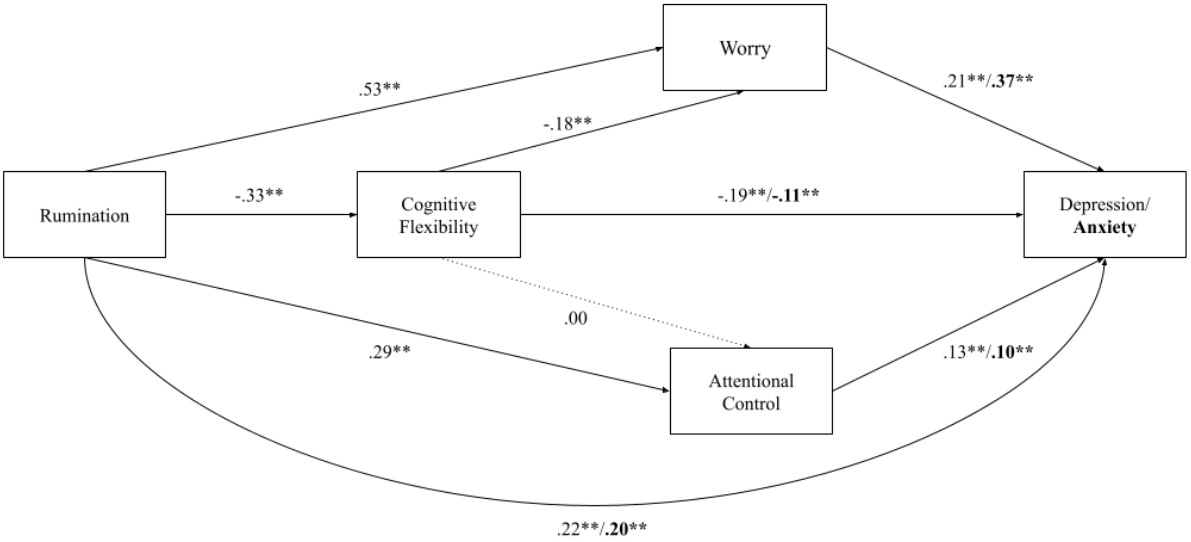


**Figure 1. Results related to parallel serial mediation models (Model 81, Hayes 2022)**

**p<.001; The effect of gender has been controlled. Standardized beta coefficients are provided. Dashed lines represent non-significant paths. Coefficients in the model with anxiety symptoms as the dependent variable are in bold.

In the relationship between ruminative thinking and depressive symptoms, where gender was included as a control variable, cognitive flexibility (B = .02, SE = .00, 95% BCa CI [.01, .02]), worry (B = .03, SE = .01, 95% BCa CI [.02, .04]), and attentional control (B = .01, SE = .00, 95% BCa CI [.00, .01]) each had a mediating role. In the same relationship, the parallel serial mediation effect of cognitive flexibility and worry was significant (B = .003, SE = .001, 95% BCa CI [.001, .005]), whereas the parallel serial mediation effect of cognitive flexibility and attentional control was not significant (B = .000, SE = .000, 95% BCa CI [-.001, .001]). Both the total (B = .10, SE = .01, 95% BCa CI [.09, .11]) and direct effects (B = .05, SE = .01, 95% BCa CI [.03, .07]) of ruminative thinking on depressive symptoms were significant. Similar findings were observed in the parallel serial mediation model where anxiety symptoms served as the dependent variable. In the relationship between ruminative thinking and anxiety symptoms, controlling for gender, cognitive flexibility (B = .01, SE = .00, 95% BCa CI [.00, .01]), worry (B = .04, SE = .01, 95% BCa CI [.03, .05]), and attentional control (B = .01, SE = .00, 95% BCa CI [.00, .01]) each had a mediating role. In this relationship, the parallel serial mediation effect of cognitive flexibility and worry was significant (B = .004, SE = .001, 95% BCa CI [.003, .007]), whereas the parallel serial mediation effect of cognitive flexibility and attentional control was not significant (B = .000, SE = .000, 95% BCa CI [-.001, .001]). Both the total (B = .10, SE = .01, 95% BCa CI [.08, .11]) and direct effects (B = .04, SE = .01, 95% BCa CI [.03, .05]) of ruminative thinking on anxiety symptoms were found to be significant (Figure 1).

## Discussion

In this study, transdiagnostic factors common to depression and anxiety were examined through two separate parallel serial mediation models, with depressive and anxiety symptoms as the dependent variables. Gender was controlled for in both models, with rumination included as the independent variable, and cognitive flexibility, worry, and attentional control as mediators. The analyses yielded similar results for both models, which were found to be significant.

In both models aimed at explaining depressive and anxiety symptoms through rumination, the mediating effects of cognitive flexibility, worry, and attentional control were significant. However, in the same relationships, the parallel serial mediation effect of cognitive flexibility and worry was significant, while the parallel serial mediation effect of cognitive flexibility and attentional control was not. These findings support the transdiagnostic approach's assertion that shared mechanisms operate across different symptoms/diagnostic groups. Indeed, each factor included in this study has been discussed in the literature as a transdiagnostic trait (Hsu et al. 2015, Hsu et al. 2019, Guerreiro et al. 2024).

Rumination and worry, frequently discussed in the transdiagnostic literature (Wells and Matthews 1994, Ehring and Watkins 2008), are differentiated by their temporal focus. Although rumination is past-oriented and worry future-oriented (Watkins et al. 2005), theorists have begun to emphasize the conceptual overlap between these constructs (Fresco et al. 2002, Harvey et al. 2004, McLaughlin et al. 2007, Joubert et al. 2022). Although worry has traditionally been associated with anxiety and rumination with depression, studies have shown that both worry and rumination are significantly associated with symptoms of depression and anxiety (McLaughlin and Nolen-Hoeksema 2011, Olatunji et al. 2013, Yılmaz 2015). Borkovec et al. (1998) suggested that worry is not merely an anxious experience but also contributes to depressive effects, a notion supported by Chelminski and Zimmerman (2003), who found that worry scores in major depressive disorder, while not as high as those in generalized anxiety disorder, were comparable to scores in other anxiety disorders. Given this temporal differentiation and the relationships with both depression and anxiety, the placement of these constructs in the model appears justified and aligns with the study's findings.

Cognitive flexibility has also been considered a transdiagnostic process in the literature (Grant and Chamberlain 2023). Studies indicate that cognitive impairments are prevalent among depressed individuals (Deveney and Deldin 2006), affecting multiple cognitive domains such as attention, memory, and executive functions (Carvalho et al. 2014). Due to the rigid cognitive patterns characteristic of depressed patients (Moore 1995), the negative relationship between cognitive flexibility and depression has been widely documented (Gündüz 2013, Yu et al. 2019, Wu et al. 2021). The relationship between cognitive flexibility and anxiety has also been explored in some studies (Curran et al. 2019, Bayrak Kahraman 2022, Park et al. 2022). While many studies emphasize that rumination is associated with inadequate cognitive flexibility (Nolen-Hoeksema 1991, Davis and Nolen-Hoeksema 2000), some have suggested the opposite effect. For example, Koster et al. (2011) argued that rumination hampers cognitive flexibility, making it harder for individuals to disengage from negative stimuli, thus creating a vicious cycle that exacerbates depression. These findings support the role of cognitive flexibility in the current model.

A notable finding of this study concerns attentional control. Although attentional control played a mediating role in the relationships between rumination and both depressive and anxiety symptoms, its parallel serial mediating role alongside cognitive flexibility was not significant. In other words, the mediating role of attentional control disappears when cognitive flexibility is included in the analysis. Studies focusing on depressive and anxiety symptoms, rumination, and attentional control offer both supporting and contradicting evidence for this finding. For instance, in a study investigating the mediating role of rumination in the relationship between subdimensions of attentional control and depression, significant findings were obtained for the shifting subdimension but not for focusing (Dejong et al. 2019). Similarly, in a clinical sample, Hsu et al. (2015) found that attentional control was a significant predictor of depression, but its effect disappeared when rumination was included in the model. In that study, rumination significantly mediated the relationships between attentional control and both depression and anxiety scores, whereas attentional control did not significantly mediate the relationship between rumination and either depressive or anxiety scores. The use of attentional control subdimensions in the first study and the limited clinical sample in the second may help explain these discrepancies. Furthermore, cognitive flexibility primarily involves adapting or shifting in response to a change or shift at the level of attentional control or task representation (Canas et al. 2006). It requires heightened attentional control to detect a change in a situation and respond accordingly. Thus, attentional control likely plays a substantial role in cognitive flexibility, enabling individuals to respond to changing situations by focusing and managing attention, which in turn enhances cognitive flexibility. This suggests that the mediating role of attentional control may lose significance in the presence of cognitive flexibility due to the similarity in the nature of these constructs.

While numerous studies have examined these factors individually, this study provides a fresh perspective on transdiagnostic research by testing and comparing two models in a large sample. Additionally, by incorporating various variables in the relationship between rumination and depressive and anxiety symptoms, this study contributes to the growing body of literature. However, some limitations should be noted. First, gender was

treated as a control variable, effectively eliminating its effect, nevertheless, more detailed findings might be obtained in samples with a more balanced gender distribution. Furthermore, the use of self-report measures constitutes another limitation of this study. Future studies that include both self-report and behavioral measures of cognitive flexibility and attentional control (e.g., the Wisconsin Card Sorting Test, Stroop Test) may provide stronger insights into the relationships among these transdiagnostic factors. This study also involved emerging adults in a university student sample, limiting the generalizability of the findings to other age groups and clinical samples. Future studies incorporating participants across the lifespan and/or from different diagnostic groups through diverse research designs would enhance the generalizability of findings and yield more specific results.

## Conclusion

The findings of the models, which included cognitive (attentional control and cognitive flexibility) and metacognitive (rumination and worry) factors, underscored the shared underlying traits of psychiatric disorders/symptom groups. This commonality or similarity highlights the necessity of adopting a dimensional approach, moving beyond traditional categorical classification systems, to support the expanding transdiagnostic perspective. The findings of this study will inform intervention and especially prevention programs addressing depressive and anxiety symptoms. In conventional methods, treatment for depression and anxiety, which are known for their high comorbidity rates, can be lengthy and complex, in this regard, transdiagnostic approaches that focus on shared vulnerability factors have demonstrated more effective treatment protocols. The evidence of these shared factors across various studies suggests that transdiagnostic psychotherapy applications could become more widespread.

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