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# The relationship between test anxiety, rumination, and psychological flexibility

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**Abstract**
Students' anxiety over taking tests, which play a vital role in their educational lives, is very prevalent in our country. The purpose of this study is to reveal the pattern of relationships between test anxiety, psychological flexibility, and rumination. The survey included 247 (35%) men and 458 (65%) women from Muğla Sıtkı Koçman University's several faculties. 705 individuals provided information. Test anxiety is classified as low, medium, or high. While psychological inflexibility and rumination were more prevalent in the high-test anxiety group, it can be demonstrated that being in the high-test anxiety group predicts psychological inflexibility and rumination. The relationship pattern between test anxiety, psychological flexibility, and rumination was investigated using structural equation modelling. Rumination was shown to be a significant variable in the relationship between test anxiety and psychological flexibility, the model analysed was found to be significant and all fit indexes were acceptable. Test anxiety has an important role in the individual's psychological inflexibility and rumination.

**Keywords** Test anxiety · Psychological flexibility · Rumination and structural equation modelling

## Introduction

Test anxiety is a phenomenological condition characterized by a variety of physical and behavioral responses to worry about failing examinations and other comparable evaluating settings (Zeidner, 1998). Mandler and Sarason conducted the initial studies on anxiety in test and evaluation contexts in 1952. The emotional component of test anxiety and its calming effects were the key themes of study in the 1960s. In the late 1960s, however, the emphasis changed to reducing test anxiety.

Several 1970s research studies focused on the cognitive component of test anxiety and treatments or therapies for test anxiety sufferers (Zhao, 2019). Even though it is not formally defined by the organizations that establish international standards, such as the DSM and ICD, test anxiety nonetheless earns attention in Turkey and throughout the world. Even though we can't fully call it a disorder, we can say that it belongs in the same group as other performance-related anxieties, such as those related to examinations (Elliot & McGregor, 1999), public speaking (Merritt et al., 2001), sports (Smith et al., 2006), dance-music (Tamborrino, 2001), and performance art forms.

Comprehensive epidemiological studies on prevalence rates have not been conducted since test anxiety is not classified as a disorder in the DSM-5. When the existing research is analyzed, Putwain and Daly (2014) found that 16.4% of the students in their study with a sample of school-aged children had high test anxiety, whereas Nathaniel et al. (2014) discovered that 30.4% of the students in their study with 11th-grade students had high anxiety. Similar findings were made by Thomas et al. (2018), who studied university students. In their study, they found that 25% of the students reported having significant test anxiety, and in the other two studies, the percentages were close to 30% (Methia, 2004; Talkington, 2019).

A moderate amount of anxiety improves performance, but an excessive amount of anxiety has a detrimental effect on people's and kids' performance due to the nature of anxiety disorders. The attenuating effect of test anxiety becomes much more noticeable when the evaluative nature of the

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tests is added to this negative. Test anxiety is a common trait among students, who often perform badly on examinations and get worse scores (Segool et al., 2013). Additionally, they have a higher propensity to drop out of school or fail a class (Cizek & Burg, 2006; Embse & Hasson, 2012). The best example of this influence is provided by Von der Embse et al. (2018), who conducted a meta-analysis of 238 studies from 1988 to 2018. The results of the study showed that test anxiety had a detrimental effect on students' performance on achievement tests from elementary school through college, their capacity for using cognitive, verbal, and nonverbal reasoning, how well they did on standardised tests (like the SAT and ACT), and their grade point averages.

Examining the relationship between test anxiety, rumination, and psychological flexibility reveals that practically all other anxiety disorders, including test anxiety, have cognitive characteristics associated with rumination. Numerous negative consequences of anxiety include worrying about uncertain future events (Borkovec et al., 1983). Rumination is the practice of persistently reflecting on the past (Treynor et al., 2003). Rumination and anxiety are closely related to one another and share similar cognitive mechanisms (Strongman & Burt, 2000). Despite some conceptual similarities, anxiety and rumination are distinct concepts because of how they relate to time-related focus points (i.e., the present vs. the past) (Watkins et al., 2005). Thinking about avoided events in the past, failing to perform the planned or targeted activities, and participating in avoidance behaviours can all lead to stress, psychological distress, or anxiety (Flett et al., 2012). Students' repetitive thoughts about unexpectedly low performance in past tests produce negative feelings and a tendency to focus on information about oneself, which leads to increased anxiety (Flett et al., 2016). This self-focused concentration also limits the availability of cognitive resources needed to complete academic tasks like assessments (Fernie et al., 2016). Rumination disrupts the emotional regulation processes required for people to cope with negative emotions (Wenzlaff et al., 1988), which has a negative impact on cognitive resources as well as executive functions (i.e., increases attention to negative thoughts and emotions), in addition to negative future expectations (Segal & Ingram, 1994). This means that a person who is stressed and anxious about the perceived risk of failing any examination, such as a test, may have a wide variety of negative emotional reactions.

As rumination is focused on the past and anxiety is focused on the future, the most important characteristic that the individual will likely have between these two concerns is psychological flexibility, which is a structure connected with the person's ability to manage psychological distress (Kashdan et al., 2020). Psychological flexibility, according to Hayes et al. (2005), is the ability to completely express one's ideas and feelings in the present without unnecessary defense and to adjust one's conduct permanently or temporarily in pursuit of aims and values depending on the circumstances. It also aids in the management of unpleasant life circumstances and the engagement in flexible behaviours that encourage value-oriented action (Gloster et al., 2017).

On the contrary, it is thought that psychological inflexibility and diminished psychological resilience are the root causes of mental health problems such as depression and anxiety disorders (Kashdan et al, 2020). Aydin and Yerin Guneri's (2020) research looks at the relationship between psychological inflexibility and test anxiety. In theory, the study reinforces the findings of growing psychological inflexibility with higher anxiety by demonstrating that psychological inflexibility rises with test anxiety. According to this study, the relationship between psychological inflexibility and rumination may be used to treat test anxiety. In the absence of rumination and psychological flexibility, it does not seem possible to talk about test anxiety. For this reason, the purpose of this study is to reveal the pattern of relationships between test anxiety, psychological flexibility, and rumination. Thus, this study aims to evaluate if psychological flexibility and rumination are present in the low, moderate, and high-test anxiety groups. For this purpose, the hypotheses of the research are:

1. Does ruminating differ between the low, moderate, and high-test anxiety groups?
2. Does psychological flexibility differ between the low, moderate, and high-test anxiety groups?
3. Is the structural equation modelling tested for the relationship between rumination, test anxiety and psychological flexibility significant?

## Materials and methods

### Participants

The research was carried out at Mugla Sitki Kocman University with students from education (220, 31%), science (189, 27%), and literature (295, 42%). The study group included 705 participants, including 247 (35%) males and 458 (65%) women. 170 students (24%) are freshmen, 196 students (28%) are sophomores, 189 students (27%) are juniors, and 150 students (21%) are seniors. Individuals in the sample ranged in age from 17 to 39, with a mean age of 22.5. G*Power (Faul et al., 2009) effect size of 0.02, error margin of 5%, power value of 95%, 2 tested predictors (rumination and psychological flexibility) and 2 estimated predictors (test anxiety and psychological flexibility),

are utilized to calculate the total sample size of 776. When missing data and sloppy data entry are removed from the analysis, the sample size of 705 is considered adequate. The criteria for participation in the study included being a university student, not having any psychiatric disorder, and volunteering for the study. The data were collected face-to-face in the classrooms of the students, with permission from the dean of faculties. Before data collection began, the author verbally explained to the students the aim of the research and the principles that guide data confidentiality. It was also made clear that participation in the research was voluntary, and that students were free to decline participation. A non-random, convenience sampling approach was used to identify groups.

## Procedure

The appropriate consent from the Rectorate was obtained before the study's execution, and the volunteer participants were informed throughout the study's implementation. The information was gathered jointly in the lecture halls by the students. All participants were given detailed information about the research's objectives, were told that their personal information would be kept private, that the study was strictly scientific and not for profit, and that they might decline to participate. The "West Side Test Anxiety Scale" was used to examine students' test anxiety, the "Acceptance and Action Form-II" was used to assess their psychological flexibility, and the "Ruminative Reactions Scale-Short Form" was used to assess their levels of rumination.

**The west side test anxiety scale** was developed by Driscoll (2007), and Totan and Yavuz translated it into Turkish (2009). The scale, which consists of ten items in one factor to gauge students' test anxiety levels, was developed to assess the effectiveness of initiatives to reduce test anxiety. The scale consists of eleven items scored on a five-point Likert scale: (1) Never True, (2) Rarely True, (3) Occasionally True, (4) Generally True, and (5) Always True. Both explanatory factor analysis and confirmatory factor analysis were used to assess the construct validity in the Turkish adaptation. The scale's lowest possible score is 11, and its highest possible score is 55. To get the final score, all questions are inverted. High scores obtained indicate a high level of test anxiety, while low scores obtained indicate low levels of test anxiety. Even though there is no prediction point when applied to large groups, test anxiety of respondents with a standard deviation of + 1 and above may be considered high, and test anxiety of respondents with a standard deviation of -1 standard deviation and below may be considered low. The scale includes illustrative items like "I feel like I am performing poorly on crucial exams" and "I find it hard to focus on studying as an important exam draws near."

**The acceptance and action form-II** , which was developed by Bond et al. (2011) to assess psychological flexibility, was translated into Turkish by Yavuz et al. (2016) using a total of 467 individuals, of whom 207 had received a diagnosis in a clinic and 267 had not. The validity of the construct was evaluated using exploratory and confirmatory factor analyses. Both clinical and non-clinical samples yield valid and reliable results. The scale yielded results ranging from 7 to 49 points. The increase in scores on the scale suggests an increase in psychological inflexibility. The scale has no predetermined cut-off point. The scale has exemplary items such as "My painful experiences and memories make it difficult for me to live a life that I would value" and "I'm afraid of my feelings."

**Ruminative reactions scale short form** was developed by Treynor et al. (2003) by removing the items that were criticized as having overlap with depressive symptoms from the 21-item long form scale created by Nolen-Hoeksema and Morrow (1991), which assesses the degree to which people use the ruminative coping style. The scale consists of 10 items in a 4-point Likert-type format (1: never, 2: sometimes, 3: mostly, and 4: always). The adaptation of the scale to Turkish was conducted with university students by Erdur-Baker and Bugay (2010). The lowest and highest scores that can be obtained on the scale are 10 and 40, respectively. The high scores indicate an increase in ruminative responses. There are items to be given as examples on the scale, such as "How often do you think" "What did I do to deserve this?"' or "Why do I have problems, but other people don't?"

## Data analytic plan

The statistical analyses of the research were made with the JASP 0.16.04 (2022) and Jamovi (2022) programs. JASP and Jamovi are software applications built on the R (Team, 2022) programming language and R packages. While descriptive analyses, correlation analysis, and ANOVA were conducted with Jamovi software, structural equation modeling (SEM) and determination of measurement models for SEM were conducted with JASP program. JASP was used to conduct the SEM and with the Lavaan (Rosseel, 2012) package, and Lavaan used covariances matrix. Fit indices were evaluated as a result of SEM according to recommended values for an adequate model fit based on the literature: root-Mean-Square Error of Approximation (RMSEA) < 0.08; Goodness-of-Fit Index (GFI) > 0.90 (Schermelleh-Engel et al., 2003), Comparative Fit Index

**Table 1** Descriptive Statistics and Correlation Coefficients for Rumination, Test Anxiety, and Psychological Flexibility Variables

| Variables | | N | M | SD | Min | Max | PF | RUM | TA |
|---|---|---|---|---|---|---|---|---|---|
| PF | | 705 | 24,25 | 9,88 | 7 | 49 | 1,00 | | |
| RUM | | 705 | 24,03 | 5,63 | 10 | 40 | ,59** | 1,00 | |
| TA | | 705 | 32,63 | 8,57 | 11 | 55 | ,41** | 0,32** | 1,00 |
| PF | LTA | 114 | 17,89 | 9,6 | 7 | 48 | | | |
| | MTA | 479 | 24,37 | 8,9 | 7 | 49 | | | |
| | HTA | 112 | 30,19 | 10,36 | 8 | 49 | | | |
| RUM | LTA | 114 | 21,56 | 6,28 | 12 | 40 | | | |
| | MTA | 479 | 23,99 | 5,02 | 10 | 38 | | | |
| | HTA | 112 | 26,75 | 6,24 | 10 | 40 | | | |
| TA | LTA | 114 | 20,32 | 3,18 | 11 | 24 | | | |
| | MTA | 479 | 32,34 | 4,62 | 24,35 | 41 | | | |
| | HTA | 112 | 46,45 | 3,89 | 41,35 | 55 | | | |

***p < .01; PF: Psychological Flexibility; RUM: Rumination; TA: Test Anxiety; LTA: Low Test Anxiety; MTA: Moderate Test Anxiety; HTA: High Test Anxiety*

(CFI) ≥ 0.95, The Standardized Root Mean Square Residual (SRMR) ≤ 0.08 (Keith, 2019; Kline, 2015), and Tucker–Lewis index (TLI) ≥ 0.90 (Keith, 2019). The Pearson correlation method was used to correlate the test anxiety, psychological flexibility, and rumination scores of volunteer participants. ANOVA was used to identify variations in psychological flexibility and rumination. The "tukey" approach from post hoc testing was utilized to determine which groups the difference in the ANOVA analysis originated from. The Westside Test Anxiety Scale determined test anxiety groups by adding and subtracting one standard deviation from the mean to determine the low-moderate-high categories. Test anxiety has a mean of 32.635 and a standard deviation of 8.573. When one standard deviation was subtracted from 32.635, the result was 24.062, and values below this were accepted as low-test anxiety. When one standard deviation was added to 32.635, the result was 41.208, and values above this were accepted as high-test anxiety, while other values were accepted as moderate test anxiety.

## Results

### Correlations and descriptive statistics

This section discusses the descriptive statistics of participants. Table 1 shows the correlation coefficients for the variables test anxiety, psychological flexibility, and rumination.

There is a significant and positive correlation between psychological flexibility and rumination variables ($r = .59$, $p < .01$), psychological flexibility and test anxiety ($r = .41$, $p < .01$), and rumination and test anxiety ($r = .32$, $p < .01$), as shown in Table 1. In other words, when test anxiety rises, so do rumination and psychological inflexibility. Table 1 also shows test anxiety levels ranging from low to moderate to high. When the test anxiety variable is split into low-moderate-high test anxiety, 14 individuals (16%) go into the low category, 479 people (68%) fall into the moderate category, and 112 people (16%) fall into the high category. Figure 1 shows the histograms for the variables test anxiety, psychological flexibility, and rumination.

In Fig. 1, the histograms show that, while psychological flexibility appears to be skewed to the right, test anxiety and rumination variables are regularly distributed. The variables were assumed to have a normal distribution. When the histograms are examined to discover how the variables of psychological flexibility and rumination were distributed among the test anxiety groups, both variables show a difference. An ANOVA analysis was done to test if the differences were statistically significant.

### ANOVA

Table 2 shows the results of an ANOVA analysis to see if psychological flexibility and rumination factors differ in terms of low-moderate-high test anxiety.

According to Table 2, the mean psychological flexibility score for students in the low-test anxiety group was 17.89, for those in the moderate exam anxiety group, it was 24.37, and for those in the high exam anxiety group, it was 30.19. The difference between these mean values was found to be statistically significant ($F_{(2)} = 49.93$, $p < .001$). The mean rumination score for students in the low-test anxiety group was 21.56, the mean rumination score for students in the moderate test anxiety group was 23.99, and the mean rumination score for students in the high-test anxiety group was 26.75. When rumination values were examined, the difference in these increases was found to be statistically significant ($F_{(2)} = 25.69$, $p < .001$). The visual representations of the post hoc ANOVA analysis results are shown in Fig. 2.

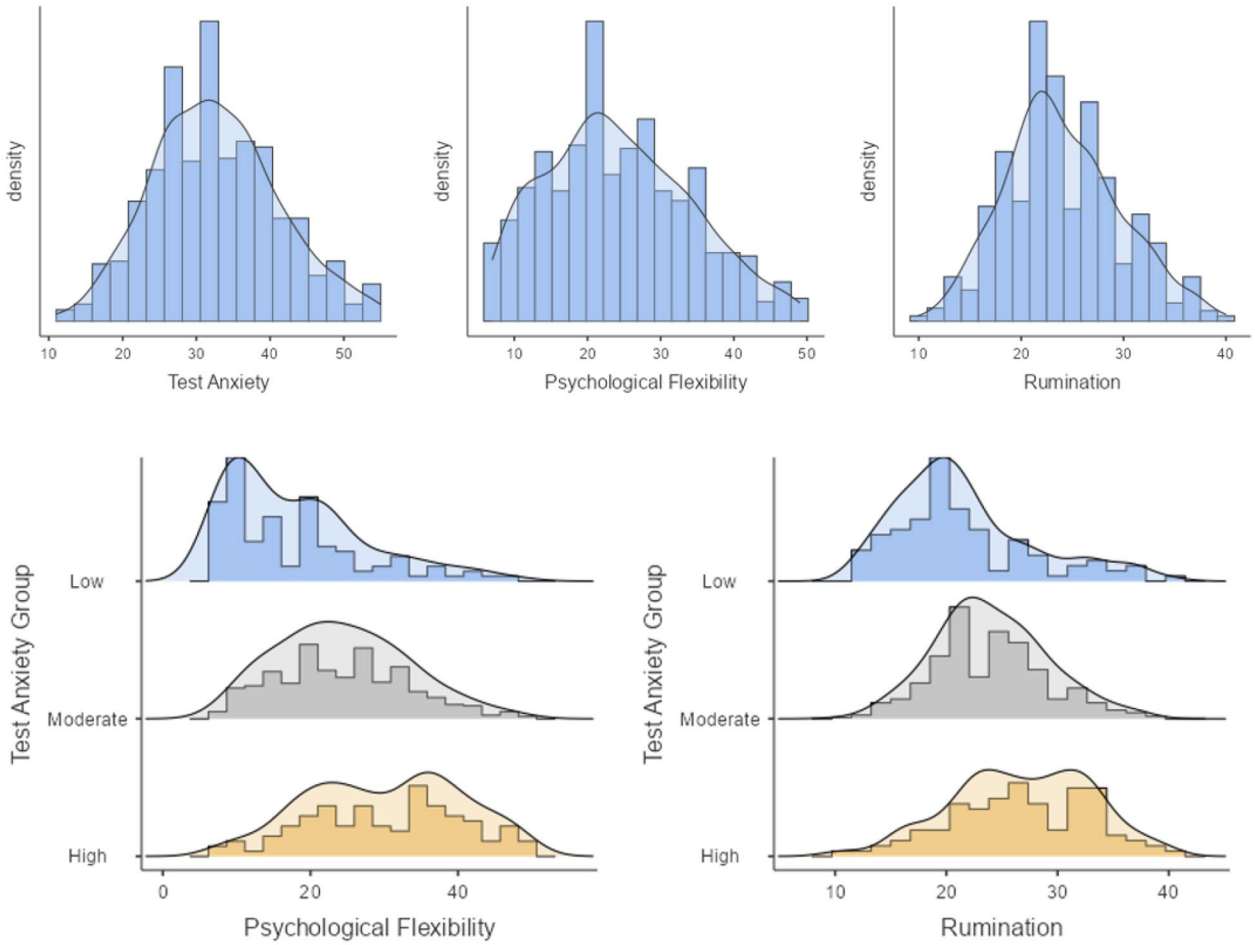


**Fig. 1** Test Anxiety, Psychological Flexibility, and Rumination Histograms

**Table 2** ANOVA Results for the Test Anxiety, Psychological Flexibility, And Rumination Variables

| Variables | LTA | | MTA | | HTA | | ANOVA | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | M | SD | M | SD | M | SD | F | P | Post Hoc (Tukey) | Partial $\eta^2$ |
| PF | 17.89 | 0.87 | 24.37 | 0.42 | 30.19 | 0.88 | 49.93 | < 0.001 | LTA < MTA < HTA | 0.12 |
| RUM | 21.56 | 0.51 | 23.99 | 0.25 | 26.75 | 0.51 | 25.69 | < 0.001 | LTA < MTA < HTA | 0.07 |

*Psychological Flexibility; RUM: Rumination; TA: Test Anxiety; LTA: Low Test Anxiety; MTA: Moderate Test Anxiety; HTA: High Test Anxiety*

**Fig. 2** Post-Hoc ANOVA Results

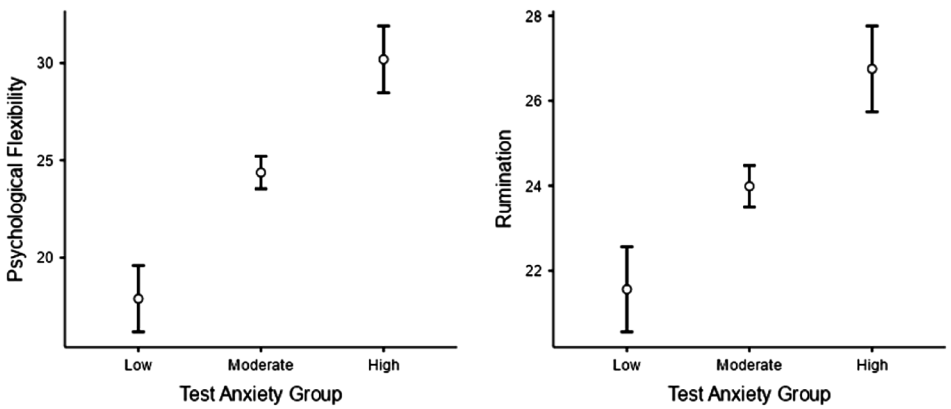

**Table 3** Fit indexes of SEM and measurement models

| | $X^2$ | df | CFI | TLI | SRMR | RMSEA | 95% CI | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Lover | Upper |
| TA | 317,41 | 44 | 0,90 | 0,88 | 0,046 | 0,090 | 0,084 | 0,104 |
| PF | 170,77 | 14 | 0,94 | 0,91 | 0,040 | 0,130 | 0,109 | 0,143 |
| RUM | 247,54 | 35 | 0,90 | 0,87 | 0,051 | 0,093 | 0,082 | 0,104 |
| ALL | 1248,347 | 347 | 0,89 | 0,88 | 0,049 | 0,061 | 0,057 | 0,064 |
| SEM | 1034,992 | 344 | 0,92 | 0,91 | 0.045 | 0,053 | 0,050 | 0,057 |

*TA: Test Anxiety; PF: Psychological Flexibility; RUM: Rumination; CI: Confidence Interval; df: Degrees of Freedom; CFI: Comparative Fit Index; TLI: Tucker-Lewis Index; RMSEA: The Root Mean Square Error of Approximation; SRMR: Standardized Root Mean Square Residual.*

**Table 4** SEM Analysis for pattern of psychological flexibility in the relationship between test anxiety and rumination

| Predictor | Outcome | Est | SE | z-value | p | 95% CI | | Std.Est | $R^2$ |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lower | Upper | | |
| RUM | PF | 0.679 | 0.058 | 11.672 | < 0.001 | 0.565 | 0.793 | 0.605 | 0.14 |
| TA | PF | 0.366 | 0.068 | 5.342 | < 0.001 | 0.232 | 0.500 | 0.221 | 0.52 |
| | RUM | 0.560 | 0.080 | 6.974 | < 0.001 | 0.403 | 0.718 | 0.380 | |

*TA: Test Anxiety; PF: Psychological Flexibility; RUM: Rumination; Std.Est = Standardized Estimated; Est = Estimated; SE: Standart Error; CI = Confidence Interval*

Figure 2 depicts the differences in psychological flexibility and rumination between the low-moderate-high groups. The high-test anxiety group has the highest psychological flexibility and rumination means, whereas the low-test anxiety group has the lowest. In other words, people suffering from test anxiety ruminate more and have higher psychological inflexibility than the other two groups.

### SEM variable analysis

Before beginning the SEM analysis, the fit indices of the measurement models of the to-be-tested model were reviewed separately and together. The results are also given in Table 3.

When Table 3 is examined, it is seen that the measurement models of the model to-be-tested first have acceptable values separately and as a whole. After calculating the fit indexes of the measurement models, SEM analysis was conducted to determine the relationship pattern between test anxiety, psychological flexibility, and rumination; the results are presented in Table 4.

As shown in Table 4, the latent variable test anxiety appears to predict to significantly and positively predict rumination ($\beta = 0.380$, $p < .001$) and psychological flexibility ($\beta = 0.221$, $p = .001$). Similarly, rumination predicts psychological flexibility in a significant and positive way ($\beta = 0.221$, $p = .001$). In the tested model's psychological flexibility variable, anxiety and rumination explain 52% of the tests, whereas rumination accounts for 14%. All compliance indeces have been given acceptable values for the tested model. ($X^2 = 1034.992$; df = 344; RMSEA = 0.053 [CI = 0.050–0.057]; CFI = 0.92; TLI = 0.91; SRMR = 0.045)

## Discussion

According to the study's findings, test anxiety, rumination, and psychological inflexibility are all positively correlated with one another. When exam anxiety increases, so do rumination and psychological inflexibility. Furthermore, there is a statistically significant difference in rumination and psychological inflexibility between the low, moderate, and high-test anxiety groups. The group with the highest ruminating score has significant test anxiety, whereas the group with the lowest score has moderate test anxiety. Similarly, it was revealed that groups with high test anxiety had the highest levels of psychological inflexibility, whereas those with low test anxiety had the lowest levels of psychological inflexibility. There is a significant independent variable between test anxiety and rumination.

Test anxiety and rumination were shown to be positively associated. This result supports the findings of Aydin and Yerin Guneri's (2020) study, which found a relationship between rumination and cognitive test anxiety. Furthermore, the findings of the study suggest that there is a positive and persistent relationship between rumination and anxiety disorders (Carlucci et al., 2018; Constantin et al., 2018; Riley et al., 2019; Valenas & Szentagotai-Tatar, 2015; Yu et al., 2015). Furthermore, ruminating differs between test anxiety levels (low, moderate, and high), and this difference is statistically significant.

Even though previous research revealed that ruminating increased with anxiety, no comparable results could be found because test anxiety was not defined by the DSM or another recognized authority and the measuring methods lacked a cut-off point. According to Hayes et al., (2012), one of the predictors of an individual's well-being is full

awareness of the present moment. A stressful event, such as an exam, may cause the individual to lose awareness of the present moment. Because people may suffer anxiety as a result of catastrophe scenarios related to the time following or during a test, and they may be worried about terrible ideas. Ruminative thinking causes an individual to become disconnected from the present moment, causing them to shift their attention away from problem solving and instead focus on their own thoughts and behaviours while repeatedly reflecting on the specifics of events, their emotional state, and the potential causes and effects of a problem, as Nolen-Hoeksema (2012) notes. Rumination will be one of the primary sources of its discomfort since such a way of thinking will constantly create negative cognitions, making it hard to find solutions to issues. Gerend and Shepherd (2013), for example, suggest that rumination is a constant personality trait that limits communication, motivation, and active behaviour by creating repeated and negative contemplation. Individuals who ruminate continue to display these behaviours in reaction to negative events even after the concerning component has passed and the present situation has changed. Central examinations may have a significant impact on people's lives, especially in some countries (such as Turkey, India, and South Korea). As they focus their attention on their own thoughts, behaviours, and emotions, individuals will become disassociated from their performance, the one component over which they have influence during the test. Furthermore, they will continue to repeat exam-related thoughts such as "Can I do it?" and "Can I get through this?" When people have an examination experience that falls short of their expectations, rumination becomes more visible. In truth, this is a vicious loop since stressful events cause people to ruminate, and people might strive to avoid stressful situations to prevent rumination (Kashdan et al., 2020). They are unable to escape the exam, which is a distinguishing feature of test anxiety. This causes people to think more about the future.

Test anxiety was positively and significantly correlated with psychological inflexibility. This finding is consistent with the findings of Aydin and Yerin Guneri's study, which discovered a relationship between psychological inflexibility and cognitive test anxiety (2020). The findings of the study also support the assumption that psychological inflexibility and anxiety have a favorable relationship (Berryhill et al., 2018; Davis et al., 2020; Gallego et al., 2020; Huang et al., 2021; Landi et al., 2020; Masuda et al., 2014; Masuda & Tully, 2012; Simon & Verboon, 2016; Tavakoli et al., 2019; Tirch et al., 2012; Wielgus et al., 2020). Moreover, psychological inflexibility differs between those with low, moderate, and high test anxiety, and this difference is statistically significant. Similarly, Simon and Verboon's (2016) study found that those with high levels of anxiety belonged to the high-test anxiety category.

Rumination and psychological inflexibility were found to have a positive relationship. This conclusion is consistent with the findings of Aydin (2016, 2017), and Aydin and Yerin Guneri, who identified a positive relationship between rumination and psychological inflexibility (2020). Ruminating, according to Hayes and Smith (2005), is a coping method used to avoid inner experiences and can divert individuals from their valued lives, despite the fact that Joormann et al. (2006) suggest that ruminating can occasionally be effective in problem resolution. While such methods may be initially useful and relieving for the individual, they may eventually become a barrier to living a meaningful and useful life.

Individuals disconnect from the present moment, according to Flaxman et al. (2010), when negative emotions and thoughts from previous incarnations appear in the present, preventing them from taking action that would be helpful at that point. When taking an exam, people may dwell too much on their past experiences and have bad emotions and thoughts. An individual who has failed previous tests attempts to overcome their failures and inability to perform well. As they strive to solve this problem, they may become more inflexible psychologically (such as through experiential avoidance or breaking from the moment). As a result, there is a higher probability of failure (Aydin, 2017).

According to Hayes and Smith (2005), an individual with high test anxiety may become separated from the present moment, lose psychological flexibility, and become more inflexibility by focusing on the performances, feelings, and thoughts of individuals who they perceive as having performed poorly in the past. The main implications of these findings might be that if ruminating and psychological inflexibility are important actors in test anxiety, it would be beneficial to work on stopping rumination and increasing psychological flexibility. Thus, a decrease in test anxiety can be observed. As psychological flexibility is the ability to contact the present moment, a more fully conscious being, and behaviors when doing so serves valued ends, readers might consider discovering their values and taking actions according to their values, practicing to connect to the present moment, and accepting practices for unpleasant thoughts.

## Limitations and future research

One of the limitations of the study is the difficulty of determining the temporal priority and stability of an effect across time. When performing longitudinal research, it will be crucial to evaluate the constancy of the relationship pattern

between test anxiety, psychological flexibility, and rumination across time, as well as the presence of two-way pathways. In future studies, alternative methodologies, such as behavioural or psycho-physiological evaluation, as well as observational techniques, as recommended elsewhere, should be adopted. In this study, psychological flexibility was investigated as a potential effect on the relationship between test anxiety and rumination. However, the effects of additional socio-demographic factors were not investigated. Future studies should investigate characteristics such as academic achievement, educational background, and other individual differences such as religious and cultural preferences. The findings suggest that addressing negative recurring thoughts about test anxiety, especially in people who ruminate and are psychologically flexible, may reduce ruminating and psychological flexibility.

Additionally, the cross-sectional design of this study demonstrates that rumination, psychological flexibility, and test anxiety are all correlated. It is necessary to conduct a study that shows how these variables change in CBT applications. My sample was made up of undergraduate students, which limited the findings' application to other populations. Furthermore, future studies in this field should employ a more diverse sample (e.g., a wider age and educational level range). The applicability will also be improved by determining how the variables vary in the clinical sample and among middle-school students taking the central examinations. Comparing clinical and non-clinical samples in particular will significantly increase the amount of literature.

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**Data Availability** The datasets generated during and/or analysed during the current study are available in the https://osf.io/ repository, https://osf.io/qhw9z/

## Declarations

**Conflict of Interest** I have NO affiliations with or involvement with any organization or entity with a financial or non-financial interest (such as honoraria, educational grants, participation in speakers' bureaus, membership, employment, consultancies, stock ownership, or other equity interests, and expert testimony or patent-licensing arrangements) in the subject matter or materials discussed in this manuscript.

**Ethical Approval** The Muğla Sıtkı Koçman University, Social and Human Sciences Ethics Committee, approved this study with application number 210018 dated 08.01.2021.

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