STATISTICAL ANXIETY IN UNIVERSITY STUDENTS: THE ROLE OF NEGATIVE PROBLEM ORIENTATION, WORRY, AND THEIR CONSEQUENCES

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ABSTRACT

Functional models of anxiety based on dispositional variables have gained scientific acceptance. Their application to investigate constructs such as statistical anxiety can facilitate understanding and intervention. This study aimed to estimate whether dispositional variables such as worry and its negative consequences mediated the relationship between negative problem orientation and statistical anxiety among university students. We evaluated survey responses from a sample of 532 students and tested a multiple mediation model. Negative problem orientation indirectly influenced statistical anxiety through the negative consequences of worry. Negative problem orientation predicted worry but did not mediate the effect on statistical anxiety. Cognitive appraisal of the adverse sequelae of worry is a key variable in the manifestations of statistical anxiety in university students.

Keywords: *Statistics education research; Statistical anxiety; Worry; Negative problem orientation.*

1. INTRODUCTION

Statistical anxiety is an important consideration for statistics teaching in part due to its emotional impact on students and because emotions affect what students learn (Schuwirth, 2012). Anxiety is a variable related to motivation, interest (Hannula, 2012), and students' beliefs about teaching, each of which can affect motivation during lessons (Hannula, 2006). Dispositional variables such as anxiety are internal attributes that influence behavior. For example, negative problem orientation, which is characterized by students' pessimistic views of the problems they face, can impair students' assessment of problem situations and their judgment of individual resources to solve them (Robichaud & Dugas, 2005).

Another dispositional element is worry, defined as an apprehensive response to expected negative events (Barlow, 2004). Students who have higher levels of worry experience greater anxiety and lower tolerance for unpredictability, which is problematic in the context of learning statistics because unpredictability is often inherent to the subject (Chew & Dillon, 2014; Williams, 2013, 2015). Research that focuses on worry has also addressed the negative consequences of experiencing worry and beliefs about the adverse effects of feeling worried. These beliefs may explain worry even when accounting for basal symptoms (e.g., palpitations, shortness of breath, excessive sweating) and recurrent obsessive ideas about the issues being faced (Sica et al., 2007). Both variables, worry and its negative consequences, are inherent elements of negative problem orientation.

To date, researchers have examined the dispositional variables of worry and negative consequences in connection with anxiety, often comparing clinical and non-clinical samples (Kertz et al., 2014). The findings from these studies have contributed to the understanding of how a negative orientation towards

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problems, worry, and its consequences (among other variables) generates complex functional interactions that explain the origin and maintenance of anxiety. Yet, appropriate explanatory models of anxiety that incorporate dispositional variables to inform strategies aimed at mitigating the impact of these variables on anxiety and its underlying causes are not widely used.

Thus, conducting studies to investigate the impact of dispositional variables on specific domains of anxiety, such as statistical anxiety, can provide valuable insights into the explanatory mechanisms of this anxious form. Such insights might contribute to the teaching of statistics and the development of healthy learning environments through, for example, educational interventions focused on reframing the presentation of statistical problems to reduce students' worry. Other applications include implementing collaborative learning strategies intended to help students overcome negative problem-solving approaches while simultaneously fostering statistical literacy and enhancing their ability to regulate emotions. Educational applications originating from the study of dispositional variables may hold promise for reducing statistical anxiety in students.

This research aimed to estimate the extent to which worry and the negative consequences of worry mediate the relationship between negative problem orientation and statistical anxiety in college students. The results contribute to understanding and eventually addressing students' high levels of statistical anxiety.

2. LITERATURE REVIEW

2.1. STATISTICAL ANXIETY

Statistical anxiety involves negative thoughts, feelings of dislike, tension, or worry related to statistical content and evaluation (Baloğlu, 2003). It is common for this form of anxiety to occur in university students with little mathematical preparation (Hedges, 2017). Such students may have had little contact with statistics during school training, which may explain why they experience more intense symptoms when confronted with complex statistical content (Onwuegbuzie & Wilson, 2003). Consequently, students' anxiety may contribute to difficulties learning statistics, postponing courses and exams, or delaying the submission of papers, resulting in poor academic performance (Macher et al., 2012).

Statistical anxiety is a multidimensional phenomenon (Onwuegbuzie & Wilson, 2003) that encompasses cognitive, emotional, and behavioral elements. Although its measurement and evaluation have sparked some controversy, it is now widely accepted that statistical anxiety manifests through three key dimensions (Chew & Dillon, 2014). Vigil-Colet et al. (2008) identified these three dimensions in a measurement model: *test anxiety* (anxiety experienced statistical knowledge is evaluated), *anxiety to ask for help* (associated with the need to consult or ask the instructor for help with the content), and *interpretation anxiety* (anxiety derived from the need to interpret statistical information). These dimensions reflect the student's negative experience with the need to study or respond to statistical evaluations.

The role of demographic factors such as age, gender, and university training programs in different fields of study has been regularly explored in relation to statistical anxiety. Regarding gender, evidence concerning the relationship between gender and statistical anxiety is often inconclusive. Although various studies have identified women as the most vulnerable group to anxiety related to statistical content (MacArthur, 2020; Macher et al., 2013; Rodarte-Luna & Sherry, 2008), other sources contradict this finding (Koh & Zawi, 2014; Van Gundy et al., 2006). There is also conflicting evidence regarding age. Some studies support the idea that statistical anxiety is more prevalent in older students (over 25 years) (Bell, 2003), whereas other sources report no significant effect of age (Beurze et al., 2013). Moreover, other studies have evaluated the influence of the type of university training program addressing different academic fields. Studies focusing on students majoring in business (Najmi et al., 2018), advertising (Fullerton & Umphrey, 2016), health sciences (Beurze et al., 2013), and psychology (Hanna & Dempster, 2009; Macher et al., 2012, 2013) consistently highlight the prevalence of statistical anxiety. Similarly, studies with multidisciplinary samples have reached similar conclusions (Condron et al., 2018), suggesting that statistical anxiety may be common and intense in students from non-mathematical fields (Chew & Dillon, 2014). The literature suggests that non-mathematics majors perceive statistics as an imposed subject that does not add value to their education, which contributes to their anxiety when confronted with it (Abbiati et al., 2021).

With regard to student learning, research suggests that university students with high statistical anxiety tend to use more superficial learning strategies and invest less effort in mastering the subject (Baloğlu et al., 2017). These students also assume procrastinating behaviors in statistics courses and when completing assignments and exams (Paechter et al., 2017). However, in the realm of dispositional variables, there are still unresolved questions about statistical anxiety. Specifically, there is a gap in understanding the cognitive processing mechanisms involved in the development and maintenance of statistical anxiety. Thus, in addition to understanding anxiety, research should focus on its cognitive substrate and behavioral effects.

2.2. DISPOSITIONAL VARIABLES AND STATISTICAL ANXIETY

When discussing variables implicated in statistical anxiety, attention is often focused on attitudes, interests, motivation, and statistical performance skills, among others (Chiesi & Primi, 2020; Macher et al., 2013; Macher et al., 2015; McIntee et al., 2022; Najmi et al., 2018). However, research on dispositional variables has been limited despite its potential to contribute important insights into understanding anxiety.

Dispositional variables are traits that affect how a person behaves, thinks, and feels. These traits relate to the natural predisposition with which a person processes information (Cui et al., 2019). In this study, we suggest dispositional variables, such as pessimism, the negative beliefs associated with pessimism, and negative problem orientation, can affect how students experience and manage anxiety when faced with statistical content and learning situations. Understanding the interaction of these variables can help in comprehending statistical anxiety and subsequently designing effective interventions to alleviate statistical anxiety.

Robichaud and Dugas (2004, 2005) proposed a theoretical model to understand the dispositional variables related to anxiety. The authors suggested that certain cognitive-emotional dispositions predispose people to experience and maintain high levels of anxiety. Their model comprised three significant components: negative orientation toward the problem, worry, and the consequences of worry. These variables are described below.

Negative problem orientation When individuals encounter a problem or challenge, they use various coping mechanisms collectively referred to as problem orientation (D'Zurilla et al., 2004). This problem orientation emphasizes the ability to identify a problem, recognize potential solutions, and select the most effective approach for resolution to the problem. Problem orientation is a valuable cognitive skill for managing stress, anxiety, and conflict (Nezu et al., 2010).

From this perspective, problems are understood as any activity, situation, or task in life that is currently experienced or anticipated in the future. These problems demand a person's capacity to adapt in order to achieve adequate functioning, but immediate effective responses are not identified because of various obstacles (D'Zurilla et al., 2004). Problem orientation refers to an individual's approach to problem-solving situations, including the selection of positive or negative solution alternatives (Nezu et al., 2010). For instance, when faced with a challenging statistical task, such as interpreting standardized coefficients within a linear regression model, a student with a positive problem orientation might use a systematic problem-solving strategy. Individuals with a positive problem orientation demonstrate the ability to identify problems and gather pertinent information to solve them. They actively assess various solutions and select the most appropriate one. When encountering obstacles, they remain persistent and explore alternative solutions. On the other hand, students with a negative problem orientation tend to have a pessimistic or desperate view of a problem (D'Zurilla et al., 2004). Rather than approaching a problem methodically, negatively problem-oriented students may avoid facing the task, hesitate to seek new information, give up when faced with obstacles, or opt for hasty or ineffective solutions without adequate evaluation.

Negative problem orientation is a dispositional variable related to how people address social problems (Maydeu-Olivares & D'Zurilla, 1996). Although initially described as a two-dimensional phenomenon with emotional and cognitive components, the model of Robichaud and Dugas (2004) theoretically separates the cognitive component to differentiate it from the emotional and behavioral responses involved in negative perspectives about solving social problems. A negative problem orientation involves three elements: perception of threat, doubt about problem-solving capacity, and pessimism about the outcome (Robichaud & Dugas, 2005).

Despite its compositional nature, negative problem orientation is considered to be a unidimensional construct with a strong link to beliefs about an inability to cope effectively with problems (Ciarrochi et al., 2009). Thus, a negative problem orientation is dysfunctional and involves a low level of frustration tolerance (D'Zurilla et al., 2004). Other recent definitions describe negative problem orientation as an abnormal set of attitudes based on negative beliefs that frame problems as threats, which results in individuals doubting their ability to solve the problems (Ouellet et al., 2019). This inability to solve problems leads to difficulties in mobilizing to address the problems, leaving the problems unresolved and producing anxiety (Gosselin et al., 2005).

Negative problem orientation is a key component in the functional model of anxiety proposed by Dugas and Robichaud (2007). The authors noted that individuals with anxiety often have a clear understanding of the actions needed to solve problems but struggle to succeed due to negative thought patterns. Subsequent research suggests that negative problem orientation is related to multiple emotional disorders (Fergus et al., 2015) and is one of the main factors associated with clinical manifestations of anxiety (Ouellet et al., 2019). Additionally, negative problem orientation has been identified as a determinant of worry (Davey et al., 1996; Robichaud & Dugas, 2005).

Based on this body of literature, this study defines negative problem orientation as an unfavorable perception and evaluation of problems and one's ability to solve them. Individuals with this orientation view problems as insurmountable obstacles, doubt their abilities, and expect failure.

Worry and its negative consequences Worry, another dispositional variable, involves a series of negative thoughts related to the problems individuals encounter (Wells, 2005). Although moderate levels of worry can help people organize and process information to cope with anticipated events or situations, elevated levels of worry can lead to dysfunctional behavior. Worrying often results in emotional, mental, and physical issues and affects productivity and academic performance (Scotta et al., 2020).

The metacognitive model proposed by Wells (1995) suggests that beliefs associated with excessive worry explain why individuals approach problem situations with worry rather than employing other coping mechanisms. In this model, a distinction is made between type 1 and type 2 worry. Type 1 worry is triggered by anxious stimuli linked to positive beliefs about the outcomes of worry, leading individuals to assess the situation and actively seek potential solutions. In contrast, type 2 worry arises from the negative consequences of worrying, where individuals perceive themselves as incapable of resolving problems and anticipate a catastrophic future.

According to the model, when people face threatening situations, they activate positive beliefs about the utility of worrying, which leads worry to function as a coping strategy (Wells & Cartwright-Hatton, 2004). However, when worry becomes excessive, the symptoms experienced exceed the expectations regarding the usefulness of worrying to trigger negative beliefs about the inherent dangers associated with worrying (Koerner et al., 2015).

To relate the Wells (1995) model to statistics education, consider the example of a student who must take an important exam and is worried about his understanding of the concepts and his subsequent performance. He also believes that he is overanxious and that his anxiety may hinder him during the exam (negative belief). The constant burden of worrying, combined with negative beliefs, can lead to ineffective study strategies or a negative view of the problem, which can lead to offering less accurate answers than could be provided. This hypothetical example illustrates how, in the negative consequences of worry, individuals not only endure the unpleasant sensation of being worried but also anticipate potential catastrophic outcomes, which can lead to heightened levels of worry and intrusive thoughts. Heightened states of worry and intrusive thoughts often render attempts to eliminate or control them ineffective (Mineka, 2004).

Connections between dispositional variables and statistical anxiety The effect of dispositional variables on anxiety has been widely studied in both clinical and general populations. Evidence supports the connections among worry, associated beliefs, and the experience of generalized anxiety (Hjemdal et al., 2012; Sica et al., 2007; Yilmaz et al., 2011), and mediation models have revealed complex relationships among these variables. Penney et al. (2013), for example, reported that worry was not directly related to anxiety in university students; instead, negative beliefs mediated an indirect relationship between worry and generalized anxiety symptoms. Furthermore, Ryum et al. (2017) found a relationship between beliefs and generalized anxiety, even after controlling for the role of worry. Other evidence has verified the role of worrying in the occurrence of test anxiety symptoms (Cassady & Johnson, 2002; von der Embse et al., 2017). Moreover, worry has also been associated with the tendency to use avoidant behavior when faced with statistics content as well as weaknesses in learning and performance in the area (Faber et al., 2018).

Kertz et al. (2014) investigated the relationship between worry and anxiety intolerance by comparing a clinical sample with a group of university students. The study examined the mediating effects of various cognitive variables, including the consequences of worry and negative problem orientation. Although worry was associated with other study variables in both study groups, mediation analysis revealed that in university students, beliefs about worry (both positive and negative) served as mediators of the initial relationship between worry and intolerance. In the clinical sample, on the other hand, this mediation was fulfilled by the consequences of worry and the negative problem orientation (Kertz et al., 2014). Unfortunately, the literature has limitations because few studies have simultaneously examined these dispositional variables in student populations, particularly from a mediational perspective.

Various studies have verified the mediating relationships of cognitive variables linked to worry and anxiety. Nevertheless, these studies have focused on understanding clinical and behavioral mechanisms in the face of anxiety. Evidence suggests that negative problem orientation explains worry-related beliefs (Kertz & Woodruff-Borden, 2012), mediates the relationship between loneliness and negative affective symptoms (Chang et al., 2020), and influences the relationship between intolerance of uncertainty and emotional dysregulation in individuals with anxiety problems (Ouellet et al., 2019).

However, studies about statistical anxiety that specifically address these variables are relatively rare. Despite this, substantial progress has been made in recent years. Williams (2013) evaluated a sample of American university students, exploring the relationships among intolerance of uncertainty, worry, positive beliefs about worry, negative problem orientation, cognitive avoidance, and various manifestations of statistical anxiety, as measured by the Statistical Anxiety Rating Scale (STARS; Cruise et al., 1985). The results indicated that students with high levels of intolerance for uncertainty were more likely to experience high levels of worry and statistical anxiety (Williams, 2013). The multidimensional measurement of anxiety revealed moderate relationships between worry and variables such as interpretation anxiety ($r = .32$), statistics test and class anxiety ($r = .38$), and computation self-concept ($r = .32$). Other variables such as fear of asking for help and fear of the statistics teacher were not relevant.

Williams (2015) evaluated a new group of university students, and the results aligned with the findings from the 2013 study. Those who had a greater tolerance to uncertainty, a greater negative orientation to problems, higher levels of worry, and a tendency to assume that worry is beneficial also showed a greater propensity to develop high levels in several dimensions of statistical anxiety as measured by the STAR.

The current study shares methodological elements with previous work conducted by Williams (2013, 2015). It explores the relationships among worry, the negative consequences of worry, and negative problem orientation, with the ultimate goal of testing whether the latter is associated with statistical anxiety. However, unlike prior studies that involved multiple comparisons (Williams, 2013) or retained dimensions based on canonical correlations (Williams, 2015), this study specifically targets the identification of mediation models. Here, negative problem orientation is hypothesized to have indirect effects on statistical anxiety through the mediation of worry and its negative consequences.

Exploring the potential relationships among negative problem orientation, worry, the negative consequences of worrying, and anxiety may be relevant to statistics education. If future studies using complex mediation models were to demonstrate that dispositional variables predict statistical anxiety, as is the case for clinical trait anxiety, this could lead to valuable insights for developing models of dispositional influences within statistics education. Such models might, in turn, inform strategies aimed at improving the learning process and supporting students. By gaining a deeper understanding of the possible effects of dispositional variables, educators might be able to implement strategies that promote effective problem orientation, which could help reduce cognitive load related to statistical problems and tasks and mitigate the influence of negative beliefs associated with worry. Such understanding could potentially provide evidence to inform the development of classroom interventions and offer support for students who experience anxiety when working with statistics.

3. METHODS

3.1. DESIGN

A cross-sectional predictive design study was conducted according to the taxonomy of Ato et al. (2013). This design facilitates the exploration of functional relationships among a set of independent variables and the outcome of a dependent variable or response.

3.2 PARTICIPANTS AND STUDY CONTEXT

This study was conducted with university students from various disciplines at two universities in a large metropolitan city in Colombia (Latin America). For both universities, over 80% of enrollment is concentrated in four disciplines: basics (engineering) and economics sciences (60%); social and human sciences (17%); health sciences (10%); and educational sciences (7%) (Observatorio de la Universidad Colombiana, 2020).

In this study, (non-probability) accidental sampling (Etikan & Bala, 2017) was used to select students from the two Colombian universities across the four disciplines. This type of sampling method allows participants to be chosen based on the convenience of specific demographic characteristics predefined by the researcher. In this study, participants were selected without regard to gender or age. However, a key criterion for inclusion was that the students had completed both descriptive and inferential statistics courses as part of their university education, regardless of the performance achieved. This approach excluded individuals who had not yet completed statistics classes in their university studies. Access to the pool of potential participants was obtained through direct contact in classrooms after requesting authorization from instructors to explain the objective of the study and its research protocol.

Informed consent was obtained from participants, adhering to the study protocol that ensured the protection and care of human participants and had received approval from the research institution. The explanation of consent made clear that participation did not offer economic or academic incentives but was voluntary, free, and autonomous. Table 1 displays the demographic characteristics of the sample.

Table 1. Demographic characteristics of participants

Age	*n*	*%*	*M (SD)*
Total sample	532	100	21.11 (3.46)
Men	190	35.7	21.20 (3.32)
Women	342	64.3	21.07 (3.54)
Field of Study	*n*	*%*	
Basic and Economic Sciences	130	24.4	-
Health Sciences	123	23.1	-
Human and Social Sciences	160	30.1	-
Education Sciences	119	22.4	-

3.3 MEASURES

Research instruments to measure worry, consequences of worrying, negative problem orientation, and statistical anxiety were administered to participants in a group, face-to-face manner. The properties of the instruments used are described below.

Worry The Penn State Worry Questionnaire (PSWQ) (Meyer et al., 1990) was used to measure worry. This instrument consists of 16 items on a five-point Likert scale (1= “not at all typical of me,” 5= “very typical of me”). The PSWQ was designed with a university population, which allows its application to an adult population. The items assess difficulty in controlling worry, subjective perception of worry, and how worry interferes with daily life. The instrument is supported by a one-dimensional factorial solution with high internal consistency scores (α = .93), with higher scores indicating a greater tendency to worry.

The PSWQ was selected due to its widespread use in measuring worry, with validation in both clinical and non-clinical populations (Brown et al., 1992). This questionnaire assesses worry globally without limiting the focus to contextual or specific concerns, making it suitable for measuring worry in the context of statistical anxiety.

Consequences of worrying The Negative Consequences of Worry (NCW) subscale of the Consequences of Worrying Scale (COWS) (Davey et al., 1996) was employed. This subscale includes two second-order factors that separately assess positive and negative consequences. However, for this study, only the NCW subscale that focuses on negative consequences was used.

The NCW subscale was selected for its ability to assess how persistent worries can negatively affect people's well-being and daily activities. The instrument has been validated with the adult population and showed direct correlations with PSWQ scores (Davey et al., 1996), which supports their joint use of COWS and PSWQ for a more comprehensive assessment of the impact of worry.

The subscale consists of 17 items on a five-point Likert-type scale and identifies three factors: (a) *Worrying disrupts effective performance,* composed of eight items; (b) *Worrying exaggerates the problem,* composed of five items; and (c) *Worrying causes emotional discomfort,* composed of four items. During the development of the scale, factor loading for the items ranged from .54 to .77, explaining 58.6% of the variance (Davey et al., 1996).

Negative problem orientation The Negative Problem Orientation Questionnaire (NPOQ) (Gosselin et al., 2001), originally designed for French-speaking university students, was used to measure negative problem orientation. In this study, we used the English-adjusted and psychometrically revised version (Robichaud & Dugas, 2005) of the questionnaire that consists of 12 items on a five-point Likert scale (1 = "not at all true of me," 5 = "extremely true of me"), organized in a one-dimensional factorial solution. Robichaud and Dugas (2005) reported high internal consistency (α = .92) and high test-retest reliability (r = .80, p < .01).

The NPOQ was selected for demonstrating usefulness for evaluating clinical and non-clinical populations, as well as for having the ability to measure negative orientation toward problems by posing daily life situations (Kertz et al., 2014), which makes it useful in multiple contexts.

Statistical anxiety The Statistical Anxiety Scale (SAS) (Vigil-Colet et al., 2008) was used to measure statistical anxiety. The Spanish version of this instrument is widely utilized in research with Spanish-speaking populations (Oliver et al., 2014; Sesé et al., 2015), and the instrument is among the three internationally recommended scales for measuring statistical anxiety due to its high degree of consistency (Chew & Dillon, 2014). The instrument is comprised of 24 Likert-type scale items (1 = "no anxiety," 5 = "a lot of anxiety") organized into three factors, each consisting of eight items. The first factor is *Test Anxiety* (α = .874); the second factor is *Anxiety to Ask for Help* (α = .924); and the third factor is *Interpretation Anxiety* (α = .819). Higher scores on the scale indicate higher levels of anxiety.

To ensure the cultural and contextual adjustment of the instruments, two native speakers of each language, who are also translation experts, conducted an English-Spanish-English back-translation. This process was applied to all questionnaires except the SAS, which already had an established Spanish version. Initially, an expert translator translated the instruments into Spanish, after which a second expert conducted a back-translation from Spanish to the original language and revised its linguistic properties. Adaptations were made to address any linguistic properties that arose during the review process. This approach ensures better cultural adaptation and facilitates comparisons of results across different cultural contexts (Maneesriwongul & Dixon, 2004). The translated and revised version was adapted before being administered to participants, followed by a review of the psychometric properties through factorial analysis to ensure the reliability and construct validity of the measurements.

3.4. ANALYSES

Adequacy of the measures Based on the data collected from the 532 participants, two databases were generated by randomly selecting cases, ensuring that there were no missing data. In the first database, 45% (n = 241) of the cases were included to perform Exploratory Factor Analysis (EFA) to test the factorial structure proposed by the original versions of the instruments. The data did not show multivariate normality (Mardia's rule; Mardia, 1970), indicating potential violations of the assumptions necessary for certain statistical tests. This lack of normality suggests that the data may have bias or outliers, which could affect the results of the analysis. Consequently, alternative analysis methods must be applied instead of the traditional strategy based on maximum likelihood estimation. To address these issues, Confirmatory Factor Analysis (CFA) was performed with the second database that included data from 55% (n = 291) of the participants. This CFA utilized polychoric matrices, parallel analysis (Timmerman & Lorenzo-Seva, 2011), and the Unweighted Least Squares (ULS) method, which is appropriate for dealing with the non-compliance of distributive assumptions often encountered with ordinal measures (Jöreskog, 2003; Morata-Ramírez et al., 2015). Additionally, items with small factor loadings ($\lambda < .40$) were removed (Lloret-Segura et al., 2014).

The fit of all instruments was assessed using CFA, and internal consistency scores were calculated. To assess factorial fit, the chi-square test on degrees of freedom (χ^2/df, where χ^2/df <5 is acceptable, χ^2/df $\leq$ 3 is good, and χ^2/df $\leq$ 2 is very good) was calculated (West et al., 2012). Also calculated were error-based measures of fit such as the Root Mean Square Error of Approximation (RMSEA) with expected values less than .08, indicating acceptable model fit and 90% confidence intervals (Browne & Cudeck, 1992). Additionally, the Standardized Root Mean Square Residual (SRMR) was used, with values also less than .08, suggesting a good fit (Hu & Bentler, 1999; West et al., 2012). Goodness-of-fit indices were computed to compare the observed data model in the study with the reference model (Goretzko et al., 2024), which proposes the mediation of worry and its negative consequences in the relationship between negative problem orientation and statistical anxiety. These measures were the Comparative Fit Index (CFI) and the Tucker-Lewis Index (TLI), for which values greater than .90 are acceptable and greater than .95 are good (Kline, 2016). Finally, the internal consistency scores were evaluated using Cronbach's Alpha and MacDonald's Omega, with acceptable values > .70 (Stensen & Lydersen, 2022).

The analyses derived from the combinations of EFA and CFA resulted in retaining a one-dimensional structure with seven items for the PSWQ, a result similar to that obtained in the factorial extraction of the NPOQ, whose one-dimensional solution also retained seven items. The SAS demonstrated a structure similar to the original version except for a two-item deletion ($\lambda < .40$). In contrast, the NCW subscale factorial models indicated a one-dimensional solution with eight items rather than the three-factor solution. The summary of the results is presented in Table 2, where the goodness-of-fit statistics indicate evidence of validity in the measurement models, and the internal consistency values indicate reliability in the measurement.

Spearman's correlation coefficient was used to identify the possible influence of age, as well as to calculate the relationships between dispositional variables and statistical anxiety. This coefficient is suitable for assessing relationships in non-normally distributed data (Field, 2013) and capturing monotonic relationships (Rebekić et al., 2015). The Fisher Z transformation was applied to approximate the sampling distribution of Spearman's correlation to normality, facilitating the comparison of correlations. This transformation enables the construction of confidence intervals to assess hypotheses about differences between correlations (Cox, 2008). In large samples, Fisher's Z helps to estimate the ranges in which the real population correlation is likely to be found (Cox, 2008).

The main analysis focused on the design of a multiple mediation model (MacKinnon, 2008) using negative problem orientation (NPO) as the independent variable and statistical anxiety (SAS) as the response variable. The mediation analysis involves using a response variable, which, in this case, has been defined as the cumulative sum of anxiety subscales, providing an overall score. In this manner, statistical anxiety is measured as a global phenomenon based on the global score of the SAS. Worry (WOR) and negative consequences of worry (NCW) were included as mediators in the model.

Table 2. Psychometric properties of the instruments applied to Colombian university students

Exploratory Factor Analysis (n = 241)				
	PSWQ	*NPOQ*	*NCW*	*SAS*
KMO	.92	.94	.94	.87
Bartlet's sphericity test	2243.4	2707.5	1930.4	2669.1
AVE	65.7%	70.1%	55.1%	70.1%
Items	7	7	8	22
Confirmatory Factor Analysis (n = 291)				
	PSWQ	*NPOQ*	*NCW*	*SAS*
χ^2/df	1.49	1.42	1.60	1.52
CFI	.998	.999	.988	.997
TLI	.999	.998	.984	.996
RMSEA [CI90%]	.017 [.000, .066]	.038 [.000, .073]	.050 [.009, .081]	.031 [.024, .038]
RMSR	.030	.032	.024	.048
Internal consistency analysis				
α F1	—	—	—	.937
α F2	—	—	—	.844
α F3	—	—	—	.929
α global	.897	.914	.912	.947
ω F1	—	—	—	.938
ω F2	—	—	—	.847
ω F3	—	—	—	.930
ω global	.898	.915	.913	.947

Note. KMO = Kaiser-Meyer-Olkin; AVE = Average variance extracted; χ^2/df = Chi-squared degree of freedom; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation; RMSR = Root Mean Square of Residuals; PSWQ = Penn State Worry Questionnaire; NPOQ = Negative Problem Orientation Questionnaire; NCW = Negative Consequences of Worrying; SAS = Statistical Anxiety Scale

The variables are defined as follows:
X = NPO (independent variable)
M_1 = WOR (first mediator)
M_2 = NCW (second mediator)
Y = SAS (dependent variable)

The three paths of influence from the independent variable to the dependent variable include one equation (3) for the direct effect of NPO on SAS regardless of the mediator, plus two indirect effect equations, (1) from the independent variable through the WOR mediator and (2) from the independent variable through the NCW mediator. These three partial contributors to the dependent variable Y can be combined into one overall equation (4).

(1) $$Y_1 = b_1M_1 + e_{Y1}$$
(2) $$Y_2 = b_2M_2 + e_{Y2}$$
(3) $$Y_3 = c'X + e_{Y3}$$
(4) $$Y = b_1M_1 + b_2M_2 + c'X + e_Y$$

In these equations, b_1 and b_2 represent the effects of WOR and NCW on SAS, respectively; c' represents the direct effect of NPO on SAS, regardless of the mediators; and e_{Yi}, are the corresponding error terms for each equation, collectively captured in the combined equation as simply e_Y. This analysis is based on a parallel multiple mediation model, which allows for evaluation of the impact of the WOR and NCW mediators on the relationship between NPO and SAS.

Using the JASP version 0.17.1 software (JASP team, 2023), the mediation analysis procedure was extracted from the SEM (Structural Equation Modeling) model. The model was estimated using the ULS (Unweighted Least Squares) method, which is useful when analyzing non-normal data because it is based on robust estimates (Kline, 2016). For indirect effects, 95% confidence intervals were calculated using the bootstrapping percentile method with 5000 samples. Bootstrapping is a widely recommended approach to estimating confidence intervals in mediation analysis, especially when normality assumptions are violated (Preacher & Hayes, 2008).

To address the limitations of the often-debated concept of 'statistical significance' (Wasserstein et al., 2019), we used alternative measurement strategies in addition to the identification of p-values and confidence intervals. Although authors like Colquhoun (2019) advocated for alternative measures to address the shortcomings of *p*-values in supporting scientific findings, continuing to report this statistic is suggested due to its familiarity, accompanied by complementary calculations.

In this study, we follow the recommendations of Greenland (2019) by reporting continuous *p*-values rather than using dichotomous thresholds such as (‘$p < .05$’) to avoid classifying results strictly as ‘significant’ and ‘not significant.’ Similarly, Valentine et al. (2015) emphasized the importance of disaggregating continuous descriptive data by including measures of variability (e.g., coefficient of variation) and calculating effect sizes, along with careful interpretation. In our analysis, we strive to ensure that the reported effect sizes and variability measures are contextualized within the obtained findings, allowing for a more nuanced understanding of the results and their implications.

4. RESULTS

The main findings of the study are described below. The section begins by evaluating the possible effects of demographic variables and then presents the correlations between the studied dispositional variables. Finally, the findings related to the mediation model are presented.

Initially, demographic characteristics, such as gender, age, and field of study, were considered to be potentially influential factors in the functional relationships between the study variables. Table 3 presents the analysis results related to gender, whereas Table 4 collects the results for age and field of study. The separation of the results responds to the use of different statistical methods because gender is a dichotomous variable, whereas age and field of studies include more than two categories. Table 3 presents descriptive statistics for each variable evaluated, including the mean scores, the standard deviation, and the corresponding confidence intervals. It also shows a comparative analysis between men and women with the respective effect size using the biserial rank correlation coefficient (r_{rb}).

The mean scores of all variables are higher in the group for men, as indicated by both the point estimates and the confidence intervals (e.g., SAS_{men}: M = 61.85, 95% CI [59.17, 64.54] vs. SAS_{women}: M = 58.02, 95% CI [56.13, 59.92]). According to the confidence intervals, although the group of men has higher mean scores, the overlap between the intervals suggests that these differences may not be statistically relevant. The coefficient of variation (CV) indicates a minimum variability between genders for the SAS variables (CV_{men} = 30.5% vs. CV_{women} = 30.8%) and a slightly higher variability for NPO (CV_{men} = 34.5% vs. CV_{women} = 36.3%). The widest variability between genders is registered in NCW (CV_{men} = 25.6% vs. CV_{women} = 30%) and WOR (CV_{men} = 23.9% vs. CV_{women} = 27.8%). Although there is some variability in the scores between men and women, the calculated coefficients suggest that such variability is relatively consistent between the genders.

Table 3. Descriptive statistics of the variables according to gender and test of differences for two independent samples

			Mean 95% CI			*SD 95% CI*					
Variable	*Group*	*M*	*Lower*	*Upper*	*SD*	*Lower*	*Upper*	*CV*	*U*	r_{rb}	*95% CI*
SAS	Men	61.85	59.17	64.54	18.90	17.21	20.38	.305	36410.5	.121	[.019, .220]
	Women	58.02	56.13	59.92	17.91	16.74	19.03	.308			
WOR	Men	23.87	23.05	24.68	5.72	5.10	6.26	.239	36757.0	.131	[.030, .230]
	Women	22.34	21.68	23.00	6.23	5.79	6.63	.278			
NCW	Men	23.96	23.09	24.83	6.14	5.50	6.75	.256	36150.5	.113	[.011, .212]
	Women	22.59	21.87	23.31	6.79	6.33	7.23	.300			
NPO	Men	20.84	19.81	21.86	7.19	6.57	7.72	.345	35257.0	.085	[.017, .186]
	Women	19.86	19.10	20.63	7.22	6.75	7.61	.363			

Note. SAS = Statistical anxiety; WOR = Worry; NCW = Negative consequences of worry; NPO = negative problem orientation; M = mean; SD = Standard deviation. CI = Confidence Interval; CV = Coefficient of Variation; U = Mann-Whitney U test; r_{rb}= Rank-Biserial Correlation (effect size)

In addition, although mean differences were observed in the four variables, the values of the biserial rank coefficient were relatively low, especially in NPO (r_{rb} = .085, 95% CI [.017, .186]). This result suggests that the observed differences in the scores of the dispositional variables between men and women may not have practical relevance. Additionally, although the BRC for WOR was slightly higher

(r_{rb} = .131, 95% CI [.030, .230]), the effect size is still small according to the interpretative criteria of the literature (Cohen, 1988). The confidence intervals reinforce this conclusion, including values close to zero, indicating a possible lack of practical differences between the genders.

It is important to note that the scales for each variable differ, indicating that means and standard deviations should only be compared within the same variable group. For instance, SAS is measured on a scale from 24 to 120, whereas WOR is measured on a scale from 16 to 80. Therefore, direct comparisons across variables are inappropriate.

Age did not show any meaningful relationship with the variables studied, as indicated by the low Spearman correlation coefficient values reported in Table 4. The results reveal very weak relationships whose intensity (defined by the coefficient value) ranges between 1.4% for WOR (being the lowest) and 7.4% for NPO (being the highest). These low coefficients suggest that age does not substantially explain the variability in the dispositional variables under study. A similar result was identified concerning the field of studies because Kruskal-Wallis's test presented a small statistic accompanied by high *p*-values, which suggests that there are no differences in the scores of SAS, WOR, and NCW between the different disciplines compared. Differences were observed only about NPO; however, the analysis of the magnitude of the effect with the ε^2 statistic shows a very small difference (.018). Although the analysis identifies differences between the groups, these only represent approximately 1.8% of the total variability in the NPO scores, indicating that the educational discipline of university students only explains a small part of the variation of the negative orientation to the problem.

The correlation analysis (see Table 5) reveals positive relationships among all the study variables. These relationships range from moderate ($.30 \leq |r_{xy}| < .50$) to strong ($.50 \leq |r_{xy}| < 1.0$) according to the interpretation criteria of Cohen (1988). The results indicate that SAS is positively related to WOR, NCW, and NPO. As the scores of the dispositional variables increase, an increase in the statistical anxiety scores is also observed. The 95% confidence intervals suggest an interval of values for the true population correlation, indicating that the strongest relationship occurs between SAS and NCW with a correlation coefficient of .453 [.381, .527]. The analysis of the Fisher's *z* values shows that the magnitude of the relationship is moderate since values at or above .400 are obtained for the three dispositional variables.

In addition, direct or positive relationships have been identified between these dispositional variables, suggesting that the interaction between them implies an increase in their scores. The correlation between NPO and NCW stands out, with their associated Fisher's *z* value suggesting a very strong relationship magnitude (.883). Although the relationship between NPO and WOR is lower than that observed with NCW, it is still relevant, showing a strong magnitude with a Fisher's *z* value of .699.

Table 4. Analysis of the relationship between the study variables and the demographic characteristics (age and discipline)

	Spearman's Rho	Kruskal-Wallis H-test and average range per disciplines					
	Age	$\chi^2_{[df = 3]}$	ε^2	Basic and Economic Sciences	Health Sciences	Human and Social Sciences	Sciences of Education
SAS	.055	5.410, *p* = .144	.010	255.55	247.75	272.74	289.46
WOR	-.014	2.923, *p* = .404	.006	272.00	283.20	253.66	260.49
NCW	-.033	0.465, *p* = .926	.001	266.67	274.17	264.09	261.64
NPO	-.074	9.809, *p* = .020	.018	285.63	289.29	240.33	257.24

SAS = Statistical anxiety; WOR = Worry; NCW = Negative consequences of worry; NPO = negative problem orientation, ε^2 = effect size

Table 5. Correlations between dispositional variables and statistical anxiety

Variable	*Statistics*	*SAS*	*WOR*	*NCW*
SAS	Spearman's Rho [95%CI]	—	—	—
	Fisher's z	—	—	—
WOR	Spearman's Rho [95%CI]	.380 [.302, .460]	—	—
	Fisher's z	.400	—	—
NCW	Spearman's Rho [95%CI]	.453 [.381, .527]	.664 [.601, .718]	—
	Fisher's z	.488	.799	—
NPO	Spearman's Rho [95%CI]	.431 [.354, .503]	.604 [.537, .667]	.708 [.652, .757]
	Fisher's z	.461	.699	.883

Note. SAS = Statistical anxiety; WOR = Worry; NCW = Negative consequences of worry; NPO = negative problem orientation

Subsequently, a parallel multiple mediation model (1) was conducted to examine whether WOR and NCW mediate the relationship between NPO and SAS. This model assesses both indirect effect indices of the mediating variables and the total mediation effect. Additionally, the analysis provides the percentage of mediation, which represents the proportion of the relationship between the independent and dependent variables explained by the mediating variables (Hayes, 2018). Table 6 displays the estimates of the mediation model's pathway.

Table 6. The mediation model uses NPO as a predictor, SAS as the dependent variable, and WOR and NCW as mediators with standardized estimates

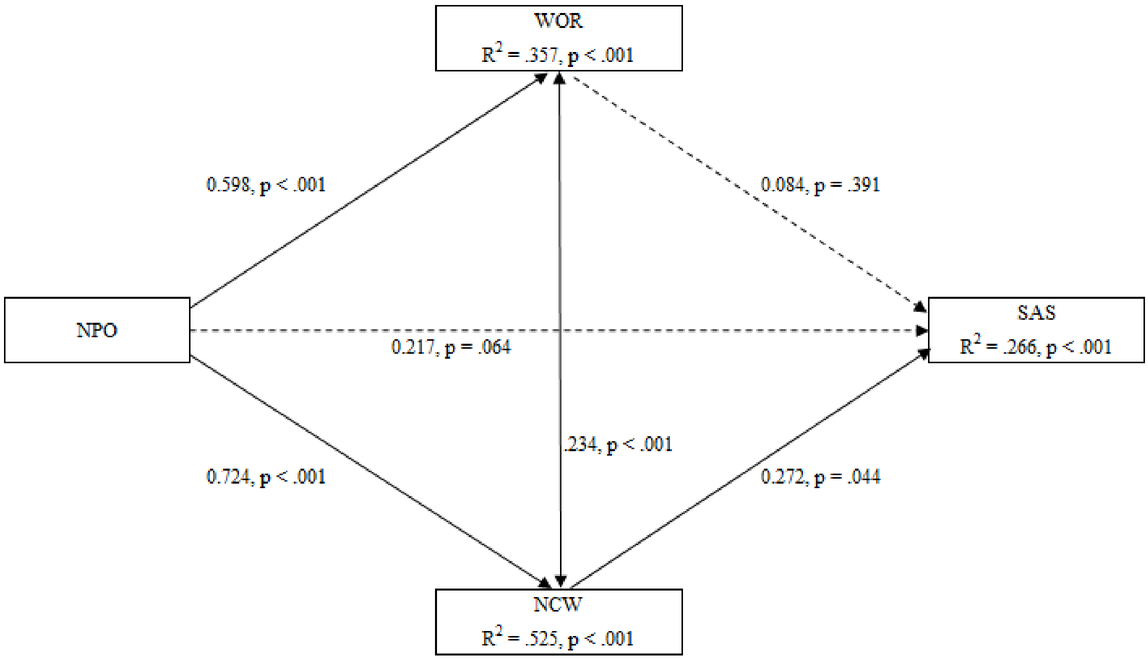
Mediation estimators							95% CI					
Effect						*Estimate (β)*	*Lower*	*Upper*	*SE*	*Z*	*p*	*% Mediation*
Directs	NPO	→	SAS			0.217	-0.013	0.447	0.117	1.850	.064	
Indirects	NPO	→	WOR	→	SAS	0.050	-0.015	0.120	0.059	0.858	.391	10.75%
	NPO	→	NCW	→	SAS	0.197	0.112	0.295	0.098	2.011	.044	42.36%
Totals	NPO	→	SAS			0.465	0.377	0.540	0.048	9.711	<.001	
Covariance of errors						$\sigma_{WOR, NCW}$	*Lower*	*Upper*	*SE*	*Z*	*p*	
	WOR	↔	NCW			0.234	0.180	0.291	0.062	3.744	<.001	

Individual path coefficients			95% CI				
			Estimate	*Lower*	*Upper*	*SE*	*Z*	*p*
WOR	→	SAS	0.084	0.028	0.194	0.099	0.850	.395
NCW	→	SAS	0.272	0.156	0.409	0.136	2.002	.045
NPO	→	SAS	0.217	0.099	0.330	0.117	1.850	.064
NPO	→	WOR	0.598	0.514	0.673	0.051	11.821	<.001
NPO	→	NCW	0.724	0.662	0.783	0.054	13.517	<.001

Note. SAS = Statistical anxiety; NPO = negative problem orientation; WOR = Worry; NCW = Negative consequences of worry; SE = Standard Error; CI = Confidence Interval, $\sigma_{WOR, NCW}$ = Covariance of errors between WOR and NCW

The results indicate that a direct effect of NPO on SAS was not observed (β = 0.217, 95% CI [-0.013, 0.447]) because the confidence intervals include zero, suggesting the absence of an appreciable direct impact between these variables. However, an indirect effect was identified through NCW (β = 0.197, 95% CI [0.112, 0.295]), indicating that NCW mediates the relationship between NPO and SAS. In contrast, there is no evidence of an indirect effect through WOR because the coefficient (β = 0.050, 95% CI [-0.015, 0.120]) includes zero, suggesting that WOR does not directly influence SAS. Despite this, the total effect of NPO on SAS (β = 0.465, $p < .001$) remained relevant, although most of this effect can be explained by the mediating role of the NCW, given that 42.36% of the total effect was mediated by NCW.

Figure 1 illustrates the normalized estimates of the mediation model. The coefficient of determination (R^2) values for each dependent variable have been included in the representation. The R^2 statistic indicates the proportion of the variability of the dependent variable that is explained by the set of variables included in the model, and its values are obtained from the regression analysis performed within the mediation model. Although the coefficients of the paths have been described in Table 6, the R^2 values provide an additional analysis of the predictive quality of the model compared to the WOR, NCW, and SAS scores.



Note: NPO = negative problem orientation; WOR = Worry; NCW = Negative consequences of worry; SAS = Statistical anxiety. Solid line: supported effect, Dotted line: unsupported effect
The total specific effect of NOP on SAS has a value R^2 = .216. In the model, R^2 = .266 represents the total variance explained which includes the covariance between WOR and NCW (.234) and all direct and indirect effects between the variables in addition to the total effect of NOP.

Figure 1. Multiple total mediation plots

5. DISCUSSION

This study examined the impact of negative problem orientation on statistical anxiety, exploring the mediating roles of worry and its negative consequences. The results initially dismissed the influence of demographic variables, indicating that these variables do not impact the study variables, particularly anxiety. These findings align with previous research that debunked gender-related differences (Koh & Zawi, 2014; Van Gundy et al., 2006) and age associations (Beurze et al., 2013) in the experience of statistical anxiety. The clarity regarding the role of demographic variables in statistical anxiety continues to warrant further investigation. Large-scale cross-cultural studies and the study of diverse variables beyond population characterization are important for advancing our understanding in this area.

This research builds upon previous studies (Williams, 2013, 2015) in which cognitive models of generalized anxiety have been applied to investigate the anxious experience in a specific domain, such as learning statistics. These models are based on the analysis of complex cognitive constructs in both clinical and non-clinical populations, offering valuable conceptual and empirical insights into anxiety (Koerner & Dugas, 2006; Wells, 1997, 2005, 2010).

Our approach has focused on the negative orientation of problems and the mediating roles of worry with the negative consequences of worrying, given its importance in the anxiety literature (Chang et al., 2020; Kertz & Woodruff-Borden, 2012; Ouellet et al., 2019; Robichaud & Dugas, 2004, 2005), for the specific domain of statistical anxiety (Williams, 2013, 2015). Throughout our research, we found that the negative orientation of the problem has a direct and positive influence on worry, aligning with existing research contributions (Davey et al., 1996; Robichaud & Dugas, 2005).

However, worry alone does not explain the anxiety experienced by university students when dealing with statistical content and situations. As a result, worry does not serve as a mediator in the relationship between negative problem orientation and statistical anxiety. Previously, Penney et al. (2013) also did not find functional effects of worry on experiencing anxiety in university students. Although the work of these authors focused on generalized anxiety, Penney et al. concluded that the key factor in dealing with anxious symptoms is negative beliefs about worry as uncontrollable and dangerous. In this way, the authors described that worry only acts on anxiety indirectly through the effect of beliefs related to the negative consequences of worrying.

Our findings are consistent with Penney et al.'s perspective because, in addition to the absence of an effect of worry on statistical anxiety, no direct effect was identified on it due to the negative problem orientation. The context of our analysis is relevant because it focuses on a population of university students as opposed to clinical populations in which it has been confirmed that negative problem orientation plays a crucial role in the symptomatic experience (Fergus et al., 2015; Ouellet et al., 2019). Unlike generalized anxiety disorder, which presents clinical signs, statistical anxiety is a specific form of apprehensive response generated by stimuli associated with content and situations that involve statistics. Therefore, people should not experience permanent symptoms of anxiety from statistical anxiety. In samples where anxiety is a clinical problem, the effect of negative problem orientation is not evidenced in university students (Kertz et al., 2014). In people with clinical signs, individuals commonly experience issues with greater functional deterioration; these people amplify catastrophic beliefs about problems and negative beliefs about their problem-solving abilities (Kertz et al., 2014).

The connection between negative problem orientation and statistical anxiety lies in the mediating role of beliefs about the negative consequences of worry. These beliefs have been linked to anxiety (Ryum et al., 2017) and to negative problem orientation, even from childhood (Kertz & Woodruff-Borden, 2012). Our findings support the argument that harmful beliefs about worry may be a crucial factor in sustaining anxious symptoms (Wells, 1997, 2005).

Such beliefs focus on the consequences of worry, which interfere with adequate performance and delay obtaining satisfactory solutions, often due to a lack of confidence in solving a variety of problems (Davey, 1994). Furthermore, among the negative consequences of worrying is a tendency to catastrophize (Davey et al., 1996), where individuals magnify the extent of problems and subsequently experience emotional discomfort such as anxiety. This view of the negative consequences of worry aligns with the core components of negative problem orientation, which, as we have seen, includes the perception of the problem as a threat, doubts related to one's ability to solve problems, and a tendency to be pessimistic about results (Robichaud & Dugas, 2005). These phenomena seem to complement each other, forming the mediating role described in our study.

5.1. LIMITATIONS AND FUTURE LINES OF ACTION

This study has some limitations. First, the use of accidental sampling limits the generalizability of the results. Future research could benefit by using random selection methods to expand the sample. Second, participants were selected regardless of their previous performance in statistics. Future research could consider the role of prior academic performance as a potential factor influencing statistical anxiety. Additionally, it would be crucial to control for any effects derived from teaching approaches employed by instructors or the characteristics of their relationships with the students because these may also influence the students' anxiety levels.

In this regard, future work can explore another series of relationships not considered in this research, including the role of variables such as intolerance to uncertainty or cognitive avoidance. These variables have been described as important for understanding worry among individuals with clinical anxiety problems (Koerner & Dugas, 2006). Recent studies have also suggested that these variables interact with negative problem orientation as determinants of worry (Ouellet et al., 2019). Integrating these variables may offer new analytical scenarios to consider the functional effects of the cognitive framework on statistical anxiety.

5.2. IMPLICATIONS FOR PRACTICE

Understanding the dispositional mechanisms underlying statistical anxiety might help improve the teaching process. The results of this study suggest that negative beliefs about worry serve as mediators between negative problem orientation and statistical anxiety. Therefore, designing interventions aimed at modifying these beliefs to reduce anxiety may be beneficial. Although this study does not address specific teaching strategies, the results suggest that intervening in students' negative beliefs about their problem-solving ability in statistics might help to create a positive learning environment. By fostering a mindset that encourages reflection and critical thinking, educators might help to reduce the emotional burden associated with learning statistics (Putwain et al., 2013). When real-world problems are used in the classroom, students may find statistical concepts more accessible and applicable. Practical examples, manipulative activities, collaborative work, and teaching that attends to signs of anxiety may reduce the complexity of abstract, algorithm-laden problems, potentially alleviating some anxiety associated with learning statistics (Pan & Tang, 2005). Although the impact on critical thinking skills was not specifically investigated in this study, framing problems in meaningful, real-world contexts may encourage students to engage more with the material. This approach may help students feel more confident when solving practical problems, although further research is needed to confirm these effects on anxiety and personal growth.

Additionally, considering that negative beliefs about worry mediate the effect of negative problem orientation on statistics, an implication of this study is the importance of providing classroom interventions that foster a sense of security and trust in students. Educators can achieve this by encouraging the active participation of students rather than having students remain as passive actors in a traditional teaching framework (Chew & Dillon, 2014). Providing constructive feedback and instilling beliefs in students' abilities to succeed in statistics are also effective alternatives that educators can use (He et al., 2023).

The implicit connection between emotional processes and statistical anxiety should not be ignored. As we have observed, statistical anxiety carries significant emotional implications for students (Macher et al., 2012; Onwuegbuzie & Wilson, 2003), which can coexist with the stress load that dispositional variables add. Creating educational environments where emotional experiences are openly addressed might help students feel secure and encourage them to express their concerns. Building on previous work, Williams (2015) reviewed the use of humor as a pedagogical strategy aimed at improving the classroom environment and helping students to approach statistical problems and tasks more calmly. In combination with other positive forms of teacher-student relationships, generating a relaxed atmosphere can contribute to statistics lessons in which students feel more motivated and confident.

In summary, the implications of this study highlight that statistics instructors may consider factors beyond intellectual understanding when addressing students' experiences with statistics. Although interventions were not directly addressed in this study, the results may suggest that strategies focused on reducing anxiety, such as those reducing the impact of dispositional variables, may be beneficial for students. While the exact outcomes of these approaches have not yet been fully explored, they offer the potential to foster a more supportive learning environment.

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