To behave or not (un)ethically? The meditative effect of mindfulness on statistics anxiety and academic dishonesty moderated by risk aversion

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Abstract

Despite the growing interest in mindfulness in higher education, the literature on its relation to decision-making under risk (i.e. academic misconduct) and statistics anxiety is scarce. The present research shall fill this gap. Based on the prospect theory, we assessed the mediating effect of mindfulness on the relationship between statistics anxiety and academic dishonesty moderated by risk aversion. Data were collected from 791 undergraduate students in six Israeli academic institutions studying for bachelor's degrees in social sciences. Questionnaires included the following measures: risk behaviour according to the prospect theory framework, Mindful Attention Awareness Scale, Statistics Anxiety Rating Scale, Academic Misconduct Scale and sociodemographic variables. Correlations among these variables were explored. The data was analysed using Structural Equation Modelling (SEM). The results indicate that the variance in academic dishonesty is explained by students' statistics anxiety with a mediation of Mindfulness moderated by Risk Aversion. Mindfulness negatively affects Academic Dishonesty, while Risk Aversion has a significant positive effect on Mindfulness. Finally, among individuals with high statistics anxiety, Risk Averse individuals show significantly higher Mindfulness than Risk Seekers. We conclude that mindfulness-based interventions might be a constructive tool to reduce risk-taking and promote ethical decision-making among individuals who experience high levels of statistics anxiety. Furthermore, developing mindful skills may help individuals with higher anxiety levels neutralize these unwanted feelings and get along with their learning tasks. Hence, avoid academic unethical behaviours.

Keywords: Mindfulness, Statistics anxiety, Academic dishonesty, Academic integrity, Risk aversion

Introduction

Transiting into post-secondary education (tertiary, college, or university) is a meaningful milestone for many young adults (Hirshberg et al. 2022). Many manage well, while others experience anxiety, stress, or depression (Parsons et al. 2022) due to academic

pressures or poor coping behaviour (Smit & Stavrulaki 2021). Some scholars assert that anxiety is associated with avoidance behaviour (Hasty et al. 2021) and that individuals tend to avoid or reduce their fear of failure (Widhiastuti & Kanaka 2021), which may lead to fraudulent and counterproductive academic behaviours (Cuadrado et al. 2020). Counterproductive academic behaviour, such as academic dishonesty, is a complex phenomenon affecting educational institutions worldwide (Salgado et al. 2022). The research determined that global rates of academic misbehaviour worsened significantly (Eaton 2021).

Higher education is essential as it outlines students' future professional careers (Eltayeb 2021). Statistical knowledge has been recognised as an important tool in academic education (Steinberger et al. 2021; Trassi et al. 2022). Today, academic training includes compulsory introductory statistics courses. Some students associate these with high anxiety levels (O'Bryant et al. 2021), termed statistics anxiety—a momentary negative emotional state when faced with statistical tasks (Onwuegbuzie et al. 1997). Research indicated that high levels of statistics anxiety impair proper academic performance among students (Trassi et al. 2022), resulting in lower performance rates, procrastination, course drop-out (Kaufmann et al. 2022), or academic dishonesty (Eshet et al. 2022).

Nevertheless, using mindfulness techniques, students might alleviate the negative effects of statistics anxiety. A precursory study demonstrated the usefulness of mindfulness in reducing anxiety in introductory statistics classes (Lesser 2017). Furthermore, mindfulness is also a predictor of individuals' (un)ethical decision-making (Götmann et al. 2021), risk behaviour (Y. Zhang et al. 2021a, b), and academic outcomes (Kuroda et al. 2022). Additionally, mindfulness is negatively associated with performance anxiety (Kuroda et al. 2022) and deviant behaviour (Müller 2021). However, statistics anxiety mediating factors remain underexposed (Trassi et al. 2022).

Despite the growing interest in mindfulness in higher education (Ergas & Hadar 2021), to the best of our knowledge, research literature that links risk behaviour, academic misconduct, statistics anxiety, and mindfulness is scarce. The present research shall fill this gap based on the prospect theory widely used concerning risk behaviour (Prietzel 2020) and academic misconduct (Salgado et al. 2022). This study assessed the mediating effect of mindfulness on the relationship between statistics anxiety and academic dishonesty moderated by risk aversion. Comprehending the relationship between all the aforementioned research variables among undergraduate students allows us to understand this relationship more deeply, personalise academic interventions, and, as a result, reduce academic dishonesty and statistics anxiety.

Theoretical background

Mindfulness

Mindfulness is a traditional Buddhist concept (Dawson 2021), defined as an intentional, nonjudgmental awareness of the present moment. It is a consciousness quality of awareness and a reflexive state of internal and external states or events (Brown and Ryan 2003a) with sustained attention to the current moment (Vaughn et al. 2013). Contemporary and Buddhist theory advocates that mindfulness embraces awareness of various objects (i.e., bodily sensations), mind (i.e., thoughts, emotions), and hedonic experiences

(i.e., pleasant or unpleasant experiences) (Hadash et al. 2023). Mindful awareness also involves the flexibility of attention and inhibits interpretation, elaboration, and analysis (Aksen et al. 2023). In other words, mindfulness is awareness of objects and temporal dynamics (Hadash et al. 2023).

The literature states that practising mindfulness helps improve reflection and understanding of emotions and mental events and leads to a higher capacity for objectivity regarding personal experiences (Eidman et al. 2022). Additionally, research suggests that meditation influences peoples' morality (Feruglio et al. 2022; Paruzel-Czachura & Kocur 2023), though with mixed results (Du et al. 2023; Reynolds et al. 2023).

Despite the extensive research on mindfulness, some important questions remain unanswered (Jankowski & Bąk, 2019; Karl & Fischer 2022). For example, how does mindfulness mediate the relationship between statistics anxiety and academic dishonesty? The present research elucidates this issue based on prospect theory (Kahneman & Tversky 1979, 2013; Salgado et al. 2022).

Prospect theory: risk aversion and risk seekers

The prospect theory implies that an individual's framing of a situation determines the risk-taking mindset (Kahneman & Tversky 1979). Risk-seeking (risk-taking or tolerant) behaviours, such as academic dishonesty, involve a potential chance for harm or danger (Lejuez et al. 2002), while risk-averse (or risk-avoidance) behaviours, such as academic integrity, involve avoiding harm or danger. The prospect theory describes the expected utility of a decision under risk (Levy 1992) by positing that if individuals evaluate the outcome as a higher utility than loss, they behave as risk-taking; however, if they consider it a loss, they behave as risk-averse (Liu 2022).

Consideration of risk presumes knowledge of probabilities of outcomes, whereas uncertainty does not. Decision-making often involves working under uncertainty (Vinod 2023). Thus, students' behavioural decisions, like academic dishonesty, imply risk and uncertainty. If students expect a positive outcome, they may behave with risk aversion, while students who expect negative outcomes may behave as risk seekers (Salgado et al. 2022). Thus, there is a need to study further students' appetites for risk and academic misconduct decision-making (Birks et al. 2020), and address how to support ethical decision-making in and beyond the classroom (Eaton 2023).

Likewise, mindfulness affects decision-making through decision-framing, according to the way choices are presented or perceived. In other words, mindfulness affects decision-making through decision-framing by inhibitory impulsivity and stress (Gonçalves et al. 2023), promoting awareness, reducing reactivity, and encouraging a focus on the present. Research suggests that mindfulness can potentially mitigate risk since the causal connections are mediated by the attention and present-focus components of mindfulness (Y. Zhang et al. 2021a, b).

The literature has found that mindfulness training reduces risk-taking behaviours (Baltruschat et al. 2021; Upton & Renshaw 2019) and reduces stress (Alem et al. 2021). Furthermore, risk-averse individuals were found to have higher levels of mindfulness than risk seekers (Aumeboonsuke & Caplanova 2021; Y. Zhang et al. 2021a, b). Based on the above, we posit the following:

H[1]: Risk-averse students will be more mindful than risk seekers.
Academic integrity—academic dishonesty

Education has been constantly subjected to academic integrity issues (Eshet & Margaliot 2022; Eshet et al. 2022; Steinberger et al. 2021). Academic integrity is essential for education (Ozoliņa & Bēriņa, 2021). It implies fair, responsible, and trustful behaviours (Sefcik et al. 2020). Academic integrity infringements—academic dishonesty—include misconducts like fraudulent behaviour, cheating, or plagiarising (Eshet et al. 2023; Pan et al. 2019). This unethical conduct harms the quality of higher education (Cuadrado et al. 2019; Lee et al. 2020). Furthermore, research points to the quotidian of academic dishonesty behaviour (Krou et al. 2021), and students report engaging in it when needed (Peled et al. 2019).

Engaging in misconduct is perceived as risky due to the uncertainty of negative consequences while receiving a low grade for inadequate work is seen as a more foreseeable outcome. Thus, based on prospect theory (Kahneman & Tversky 1979, 2013; Tversky & Kahneman 1992), the literature affirms that students' risk and uncertainty decision behaviour (whether academic integrity or academic dishonesty) is related to the expected outcome (Salgado et al. 2022). If students understand that the amount of learning activities required to succeed in a course is higher than the requested activities to pass a course or an exam, they are expected to risk avoidance and act honestly. Nevertheless, they would be more prone to risk-taking and academic dishonesty if expected to fail. Thus, we posit:

H[2]: Risk-averse students' academic dishonesty will be lower than risk seekers.

Statistics anxiety

Statistical knowledge facilitates the understanding, interpretation, and evaluation of information (e.g., weather probabilities, election results, and physical and mental health decisions) (Trassi et al. 2022). Consequently, in the last decade, statistical literacy has become a compulsory course in interdisciplinary academic education (J. W.Zhang et al. 2021a, b), as well as in humanities and social sciences (Trassi et al. 2022). Several students associate statistical courses with high anxiety levels (O'Bryant et al. 2021) and experience statistics anxiety.

Statistics anxiety indicates a negative emotional belief, attitude, or state incited by any contact with statistically linked content (O'Bryant et al. 2021). The widely acknowledged approach to statistics anxiety (Levpušček & Cukon 2020) is the multifaceted model as exemplified by the Statistics Anxiety Rating Scale (STARS) (Cruise et al. 1985). The STARS comprehends six components of anxious feelings and learners' attitudes towards statistics: (a) interpretation anxiety—the anxiety triggered by the need to interpret different statistical data; (b) test and class anxiety—the anxiety demonstrated while attending statistics courses and taking statistics tests; (c) fear of asking for help—the anxiety manifested when asking assistance to understand statistics; (d) computational self-concept—a student's perception of his mathematical abilities required for learning statistics; (e) worth of statistics—the significance and

relevance of learning statistics to daily or future practise or profession; and (f) fear of statistics teachers—students' perceptions of statisticians and statistics teachers.

Research has observed that statistics anxiety and academic performance are related (Siew et al. 2019; Steinberger et al. 2021) and that statistics anxiety impairs learning (Eshet et al. 2022). Furthermore, negative emotions, like anxiety, influence students' tendency to engage in unethical conduct (Tindall et al. 2021; Zhang et al. 2020). Despite the vast literature on statistics anxiety (Cui et al. 2019; Trassi et al. 2022; Zahan et al. 2020), to our knowledge, none has analysed it under the prospect theory lens. On the one hand, research (Luhmann et al. 2011) has shown that increased uncertainty results in riskier decision-making patterns among anxious individuals. Therefore, it is conceivable that anxious students might demonstrate a higher propensity for risk-taking when confronted with uncertainty about their grades in a statistics exam. On the other hand, other research suggests an association between anxiety and low risk/reward (Prietzel 2020). Individuals with high anxiety levels have overly anxious reactions to risk and exhibit risk-averse behaviour (Shou et al. 2022). Thus, given the diverse outcomes regarding the relationship between anxiety and risk aversion, we posit:

H_3: Risk-averse students will have higher levels of statistics anxiety than risk seekers.

Academic dishonesty and mindfulness

As previously stated, there is a myriad of literature on academic integrity and dishonesty (Eshet et al. 2023; Tatum 2022). Whereas academic integrity is the pillar of higher education principles of truth (Poitras Pratt & Gladue 2022), academic dishonesty often references various academic integrity violations like contract cheating, plagiarism, and cheating. (Hughes & Eaton 2022). Research has suggested a positive relationship between academic integrity and mindfulness (De Maio & Dixon 2022; Lau 2021). Furthermore, the literature argues that mindfulness restrains unethical behaviour (Y. Zhang et al. 2021a, b). Moreover, studies associating mindfulness with ethical decision-making suggest that individuals engaging in mindfulness practices typically cultivate an enhanced awareness of moral principles and cultural norms. This heightened awareness reduces their inclination to engage in actions that contravene these ethical standards (Orazi et al. 2021). This effect is likely attributable to the way mindfulness shapes ethical and moral choices by fostering self-awareness, emotional regulation, empathy, diminished reactivity, cognitive flexibility, and a sense of integrity. These factors collectively contribute to a more deliberate, compassionate, and morally informed decision-making process, shaping positive ethical decision-making (Culiberg & Mihelič, 2020). Thus, based on the literature, we posit:

H_4: Mindfulness will negatively impact academic dishonesty.

Mindfulness, academic dishonesty and statistics anxiety

As previously stated, mindfulness is characterized as a psychological trait, a practice (e.g., cultivating mindfulness through meditation), a state of awareness, or a psychological process. Mindfulness elements, such as awareness and nonjudgmental acceptance of one's moment-to-moment experience, are considered potential antidotes to

common psychological distress, such as anxiety (Keng et al. 2011). Mindfulness training is acknowledged as cognitive training, as it prompts individuals to comprehend the interplay between their thoughts, emotions, and anxiety-related behaviours (Reangsing et al. 2023). Through this practice, individuals gain heightened awareness and the ability to self-regulate their thoughts and emotions (Dark-Freudeman et al. 2022).

Higher education professionals and researchers have exponentially increased their interest in mindfulness (Ergas & Hadar 2021). Still, research linking academic misconduct, statistics anxiety, and mindfulness is scarce and addresses this issue separately. On the one hand, the research found a relationship between dishonest behaviour and statistics anxiety (Eshet et al. 2021, 2022; Steinberger et al. 2021). On the other hand, mindfulness is negatively related to academic dishonesty (Culiberg & Mihelič, 2020; De Maio & Dixon 2022; Lau 2021). Thus, based on the above, we posit:

> H_5: Mindfulness will mediate the relationship between statistics anxiety and academic dishonesty.

Risk aversion, mindfulness and statistics anxiety

Previous research showed that risk-averse persons report lower anxiety levels (McCleskey & Gruda 2021). Additionally, the literature indicates an association between low risk/reward and anxiety (Prietzel 2020). High-anxiety individuals are prone to risk-averse behaviour (Shou et al. 2022). Furthermore, studies suggested that mindfulness reduces risk-taking behaviours (Aumeboonsuke & Caplanova 2021; Baltruschat et al. 2021; Upton & Renshaw 2019), with anxiety being related to low-risk (Prietzel 2020) and risk-averse behaviour (Shou et al. 2022). Higher education students face several sources of stress (Amanvermez et al. 2022), like statistics anxiety. Thus, based on previous literature on the relationship between anxiety and risk aversion, anxiety and mindfulness and the above, we posit:

> H_6: Risk-aversion will moderate the relationship between statistics anxiety and mindfulness.

Research model

Based on the literature above, the hypothetical structural research model is presented in Fig. 1. The research model presents mindfulness as a mediator between statistics anxiety (measured by worth of statistics, interpretation anxiety, test and class anxiety,
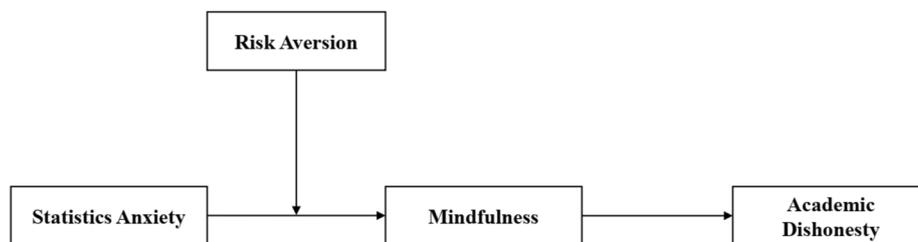
Fig. 1 Hypothetical structural model for determinants of academic dishonesty

computational self-concept, fear of asking for help, and fear of statistics teachers) and academic dishonesty, while the relationship between statistics anxiety and mindfulness is moderated by risk aversion.

Materials and methods

Sample and procedure

A sample size of 791, which was sufficient to detect a Large-sized (d = 0.25, α = 0.05, power = 0.80; G-Power Analysis). Data were collected from undergraduate students in six Israeli academic institutions studying for bachelor's degrees in social sciences. There were 791 participants, 14% of whom were male and 86% of whom were female students. The participants' average age was 25.32 years, ranging from 18 to 60 (SD = 7.32). The average time for filling out the questionnaires was 12 min. In this study, we used the convenience sampling method. About 12% of the participants were excluded from the analysis because their survey instruments were incomplete or carelessly completed (less than 80% in general).

Additional socio-demographic variables were examined: matriculation grade in mathematics (M = 86.44, SD = 11.17), grade point average (M = 86.80, SD = 8.90), Psychometric grade (M = 528.86, SD = 41.79).

Instruments

Risk aversion

Risk Aversion was measured according to the prospect theory framework by Kahneman and Tversky (1979, 2013). Prospect theory is one of the most influential frameworks in behavioural science, particularly in research on decision-making under risk (Ruggeri et al. 2020). The participants were asked to choose between two scenarios involving a 50% chance of gaining $450 and an equal chance of gaining nothing on a coin flip. The results were then scored with 0 for risk-seeking behaviour and 1 for risk aversion.

Mindfulness

The Mindful Attention Awareness Scale (Brown and Ryan 2003a, 2003b) is a validated (González-Blanch et al., 2022) and widely used self-report questionnaire that measures sustained attention capacity (Hadash et al. 2023; Isbel et al. 2020; Vaughn et al. 2013). It also measures the disposition to be attentive and aware of the experience of the present moment in daily life (Eidman et al. 2022). The questionnaire consists of 15 items on a 6-point Likert scale (with 1- "Almost never" and 6—"Almost Always"). The total scores were averaged, with a higher score indicating a higher level of mindfulness. The alpha Cronbach of the original questionnaire was 0.87 and 0.82 in the current study, with confidence intervals of 0.21—0.25.

Statistics anxiety

We used the Statistical Anxiety Rating Scale- Hebrew version (Steinberger 2020)—an abridged version of the STARS (Cruise et al. 1985)—internal consistency reliability (0.80–0.94). Previous research has established the confirmatory factor analysis (DeVaney 2016). Steinberger (2020) reported Internal consistency reliability coefficients and descriptive statistics of the Hebrew adaptation of the STARS (N = 163). The 35-item

STARS- Hebrew includes six subscales: (a) worth of statistics, (b) interpretation anxiety, (c) test and class anxiety, (d) computational self-concept, (e) fear of asking for help, and (f) fear of statistics teachers. We used a 5-point scale where 1 indicates no anxiety and 5 indicates great anxiety. The total scores were averaged, with a higher score indicating a higher level of statistic anxiety. Steinberger (2020) conducted an exploratory factor analysis to determine the factor structure of statistics anxiety. SA was conceived as multidimensional with six different dimensions. All the loading between the six dimensions was found to be high and significant, ranging from 0.41 to 0.93. The internal consistency reliability of the questionnaire in the current study ranged from 0.77 to 0.89, with confidence intervals ranging from 0.74—0.79 to 0.88 -0. 90. SA was conceived as multidimensional with six dimensions. All the loading between the six dimensions was found to be high and significant, ranging from 0.41 to 0.93.

Academic dishonesty

Academic dishonesty was measured directly using the Academic Misconduct Scale (Bolin 2004)—reliability of 0.91 Cronbach's alpha—and indirectly using the Academic Integrity Inventory (Kisamore et al. 2007)—reliability of 0.75 Cronbach's alpha. Questionnaires were adapted and validated to the Israeli context. Peled et al. (2019) conducted an exploratory factor analysis using the varimax rotation to determine the factor structure of academic dishonesty. Academic dishonesty was conceived as multidimensional, with the two different dimensions with sums of squared loadings ranging from 0.63 to 0.86. We used a 5-point scale where 1 corresponded to "Very unlikely" and 5 to "Very likely". The total scores were averaged, with a higher score indicating a higher level of academic dishonesty. The internal consistency reliability of the questionnaire in the current study was 0.94 for the Academic Misconduct Scale with a confidence interval of 0.93—0.94 and 0.68 for the Academic Integrity Inventory with a confidence interval of 0.64—0.77.

Socio-demographic variables

The questionnaire contained items related to participants' sociodemographic contexts: age, gender, grade point average, matriculation grade in mathematics, and Psychometric grade.

Plan of analysis

We analysed the data using Structural Equation Modelling (SEM), and full information maximum likelihood estimates were computed using the Analysis of Moment Structures (AMOS) program. The model was examined for the goodness of fit using χ^2, comparative fit index (CFI) and root mean square error of approximation (RMSEA) fit indices. CFI values above 0.90 and 0.95 indicate adequate and good model fit, respectively, and RMSEA values below 0.08 and 0.05 indicate adequate and good model fit, respectively (Hu and t., & Bentler, P. M. , 1999; Kline 2023). Standardised indirect effects were computed for each of the 5,000 bootstrapped samples, and the 95% confidence interval was computed by determining the indirect effects at the 2.5th and 97.5th percentiles.

Additional statistical analyses were used in this research: descriptive measures (M; SD), Pearson correlational analysis, t-tests, and Cronbach's alpha internal reliability analysis. All the hypotheses were tested at the $p < 0.05$ level of confidence.

Ethical considerations of the study

The ethics committee approved the study (Reference number 2021/20, approval date: 02/04/2021). Informed consent was collected before enrolment.

Results

This research involved 791 participants, with 12% indicating high levels of statistics anxiety (scoring above 4 on a scale ranging from 1 to 5). Additionally, 65% of respondents acknowledged breaching academic integrity at least once.

Table 1 presents descriptive statistics on academic misconduct. Most of the respondents (55%) admitted to copying sentences without giving credit to the author. Some respondents (39%) acknowledged copying material from fellow students and submitting it as their own. Some respondents reported that they helped someone else cheat on a test (41%).

Table 2 presents descriptive statistics on academic integrity. Most of the respondents (74%) agreed that faculty is very much concerned about academic integrity. Additionally, most students (70%) understand academic integrity requirements.

Table 3 presents Pearson correlations between mindfulness, statistics anxiety, and the dependent variables of academic integrity and misconduct.

The results show significant negative correlations between mindfulness and all the six components of statistics anxiety and between mindfulness and the dependent variables of academic dishonesty: Academic misconduct and academic integrity. The higher the level of a student's mindfulness, the less they will experience statistics anxiety and the less they will engage in acts of academic dishonesty. In addition, there are significant positive correlations between the components of statistics anxiety and

Table 1 Descriptive statistics of academic misconduct scale

Scale Items	Never	Once	A few times	Several times	Many times
Copied a few sentences from a published or internet source and not given credit to the author	45%	26%	22%	5%	2%
Copied material from another student and turned it in as your own work	61%	18%	15%	4%	2%
Helped someone else cheat on a test	59%	18%	17%	4%	2%
Worked with others on an assignment when the instructor asked for individual work	64%	15%	14%	5%	2%
Turned in work done by someone else	71%	13%	9%	6%	1%
Copied from another student on a test	71%	11%	11%	5%	2%
Used a text or notes on a test without the instructor's permission	69%	11%	12%	5%	3%
Received substantial help on an assignment without the instructor's permission	60%	20%	14%	5%	1%
Cheated on a test in any way	63%	16%	14%	5%	2%
Used unfair methods to learn about a test before taking it	68%	11%	14%	5%	2%

Table 2 Descriptive statistics of academic integrity inventory

Which of the below behaviors you might consider to be dishonest?	Strongly Disagree	Disagree	Nor agree, nor disagree	Agree	Strongly agree
Plagiarism	36%	26%	28%	7%	3%
Copying from someone else during a test	44%	24%	20%	8%	4%
My best friend would disapprove if they would know that I engaged in academic misconduct (cheated on an assignment or a test)	19%	16%	27%	18%	20%
An average student in my academic institution would disapprove if they would know that I engaged in academic misconduct	16%	19%	32%	19%	14%
An average student in my academic institution would report an incidence of cheating on a test	17%	24%	40%	12%	7%
The severity of penalties for cheating at your school is high	10%	14%	42%	20%	14%
Students at my faculty understand the requirements of academic integrity	5%	6%	19%	32%	38%
Faculty is very much concerned about academic integrity	4%	5%	17%	30%	44%

Table 3 Descriptive statistics and pearson correlations among research variables

Variables	M	SD	1	2	3	4	5	6	7	8
1. Mindfulness	4.22	0.82	==							
2. Worth of Statistics	3.49	1.04	-.065~	==						
3. Interpretation anxiety	3.16	0.98	-.246***	.487***	==					
4. Test & class anxiety	3.28	0.99	-.234***	.508***	.805***	==				
5. Computational self-concept	2.85	0.96	-.200***	.624***	.523***	.595***	==			
6. Fear of asking for help	2.64	1.01	-.326***	.339***	.682***	.631***	.468***	==		
7. Fear of statistics teachers	2.68	0.83	-.255***	533***	.448***	487***	.691***	.499***	==	
8. Academic Misconduct	1.47	0.70	-.345***	-.001	.104**	.106**	.140***	.251***	.186***	==
9. Academic Integrity	2.63	0.63	-.114**	.112**	.118**	.108**	-.006	.028	.065	.206***

~$p < 0.06$; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$; $n = 791$

Table 4 Differences between risk seekers and risk averse in research variables

Variable	Risk Aversion	N	Mean	SD	T-test	Cohen's D	CI
Statistics Anxiety	Risk Seekers	193	2.92	.67	2.186*	.77	-.329, -.004
	Risk Averse	598	3.05	.80			
Mindfulness	Risk Seekers	193	4.10	.84	2.232*	.82	-.347, -.022
	Risk Averse	598	4.25	.82			
Academic Dishonesty	Risk Seekers	193	2.18	.52	3.948***	.51	.164, .490
	Risk Averse	598	2.01	.51			

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$

the dependent variables of academic dishonesty. The higher the level of a student's level of statistics anxiety, the higher the tendency they will have to behave unethically in academic settings.

Table 4 presents the differences between risk seekers and risk-averse students in statistics anxiety, mindfulness, and academic dishonesty.

As shown in Table 4, there are significant differences in all three research variables, thus confirming H_1, H_2, and H_3. Risk aversion is significantly higher than risk seekers in statistics anxiety and mindfulness but significantly lower in academic dishonesty.

The academic dishonesty variable was modelled by the variables of academic misconduct and academic integrity and by the latent variable of statistics anxiety (measured worth of statistics, interpretation anxiety, test and class anxiety, computational self-concept, fear of asking for help, fear of statistics teachers) with a mediation of mindfulness moderated by risk aversion. The data fit the academic dishonesty model well ($\chi^2 = 228.392$, N = 791, df = 27, p < 0.001, CFI = 0.964, RMSEA = 0.097).

Academic misconduct analysis

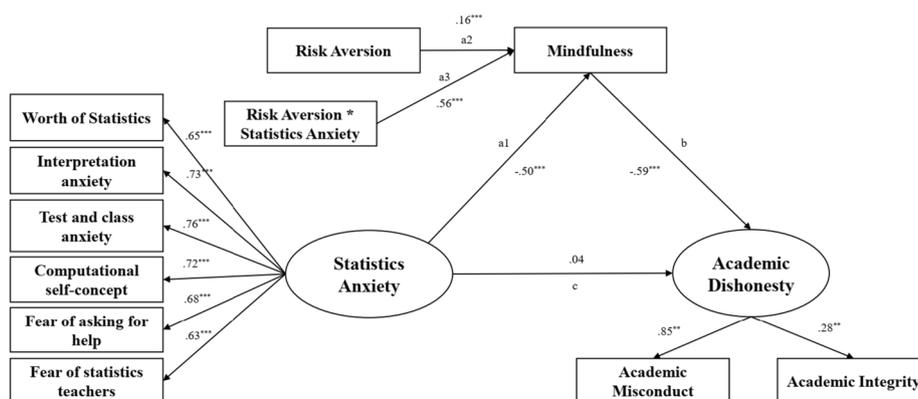The structural model of academic misconduct is illustrated in Fig. 2.

The results of the analysis indicate that the variance in academic dishonesty is explained by students' statistics anxiety with a mediation of mindfulness moderated by risk aversion.

As shown in Fig. 2, mindfulness significantly negatively affects academic dishonesty ($b = -0.59$, $p < 0.001$). The more mindful the individual is, the less likely they are to engage in unethical behaviours in academic settings. The results provide support for the proposed H_4.
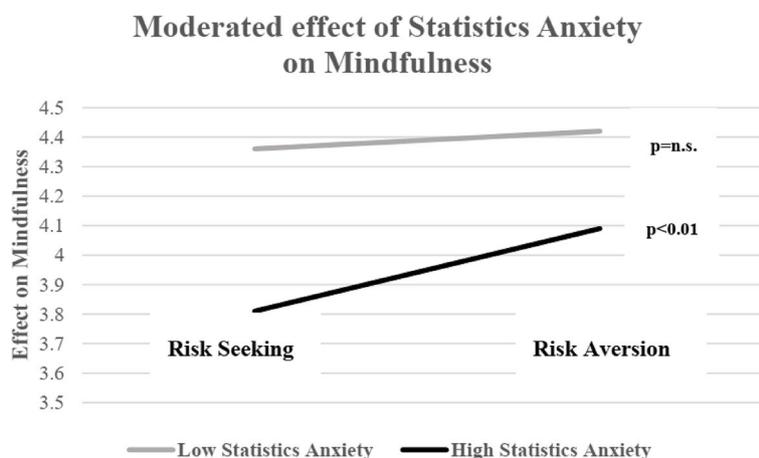
Statistic anxiety has no significant direct effect on academic dishonesty ($b = 0.04$, $p = 0.328$). However, a significant indirect effect was found between statistic anxiety on academic dishonesty, indicating that mindfulness mediates the relationship. The bootstrapped standardised, indirect effect of mindfulness as a mediator between students' statistic anxiety and academic dishonesty was -0.454 ($p < 0.05$), and the 95% confidence interval ranged from -1.726 to -0.166. Thus, this indirect effect was statistically significant and support for H_5 was obtained.

In addition, risk aversion has a significant direct effect on mindfulness ($b = 0.16$, $p < 0.001$), which means that risk-averse individuals tend to have higher levels of mindfulness than risk seekers. Moreover, risk aversion significantly moderates the relationship between statistics anxiety and mindfulness ($b = 0.56$, $p < 0.001$), confirming H_6.

Figure 3 presents the relationship between statistics anxiety and mindfulness moderated by risk aversion.

Fig. 2 Structural model for determinants of academic misconduct

Fig. 3 Effect of statistics anxiety on mindfulness moderated by risk aversion

As shown in Fig. 3, within individuals with low statistics anxiety, there is no significant difference in the level of mindfulness between risk averse and risk seekers at the specified $p < 0.05$ level, $t_{(393)} = 0.741$, $p = 0.459$, $d = 0.79$, 95% CI [-0.31, 0.14]. However, among individuals with high statistics anxiety, there is a significant difference in the level of mindfulness between risk averse and risk seekers at the specified $p < 0.05$ level, $t_{(394)} = 2.910$, $p < 0.01$, $d = 0.80$, 95% CI [-0.58, -0.11], with higher mindfulness among risk averse individuals ($M = 4.09$, $SD = 0.82$) than among risk seekers ($M = 3.81$, $SD = 0.74$).

Discussion

The present research aim is to answer the following question: How does mindfulness mediate the relationship between statistics anxiety and academic dishonesty, moderated by risk aversion? First, we analysed the differences between risk-seeking and risk-averse students in (a) mindfulness (H_1), (b) academic ethical behaviour (H_2), and (c) statistics anxiety (H_3). Our results show that risk-averse students have higher levels of mindfulness and lower levels of academic dishonesty than risk-seeker students, thus confirming H_1 and H_2. These results may be due to the positive influence of mindfulness on academic performance (Verhaeghen 2023), utilitarian moral judgment (Paruzel-Czachura & Kocur 2023), risk perception reasoning style (Siegrist & Árvai 2020), and negative effects suppressor (Aksen et al. 2023). At the same time, anxiety influences decision-making by regulating risk behaviour (Y. Zhang et al. 2021a, b). Previous research points out that mindfulness reduces rumination, worry, and fear of future scenarios (Galles et al. 2019).

Second, we examined the relationship between mindfulness and academic dishonesty (H_4). The results, in line with previous literature (De Maio & Dixon 2022; Lau 2021), confirm that mindfulness negatively correlates to academic dishonesty. This result may be due to mindfulness' implicit characteristics as a (un)ethical behaviour regulator (Paruzel-Czachura & Kocur 2023; Y. Zhang et al. 2021a, b).

Third, we analysed how mindfulness mediates the relationship between statistics anxiety and academic dishonesty (H_5). The findings indicate a significant indirect effect between statistic anxiety and academic dishonesty, indicating that mindfulness mediates the relationship. The higher the level of a student's statistics anxiety,

the lower the mindfulness and, as a result, the higher the tendency to commit academic dishonesty. One possible explanation for how mindfulness might mediate the relationship between statistics anxiety and academic dishonesty is that students high in mindfulness have better emotion regulation skills, such as the ability to recognise and reduce the distraction caused by attending to afflictions (Smith et al. 2023), thus counteracting anxiety and reducing the likelihood of engaging in risky, unethical behaviour, like academic dishonesty. On the contrary, the influx of anxiety feelings obstructs mindfulness capability. The entire mind is distracted by restlessness, worries, and fears, increasing the inability to concentrate and the cheating tendency.

Another explanation may be that, on the one hand, students interpret risk behaviour differently (Irwin et al. 2020). On the other hand, decision-making is linked to awareness situations (Avcu Meriç & Sönmez 2022). Consequently, a student's mindfulness may help reduce the profit weight in their decision-making (Du et al. 2023) and decrease the reward-seeking behaviour (Reynolds et al. 2023). In other words, a student may be aware of they anxiety levels and react to it, or not, and interact with (un)ethical risky decision-making at the cost of profit or losing it (passing the exam vs. being caught). Paradoxically, a student may behave unethically and neutralize this negative feeling with mindfulness by not judging the unwanted behaviour.

Finally, results confirmed the moderating effect of risk aversion on the relationship between statistics anxiety and mindfulness (H_6). The findings showed that among students suffering from high statistics anxiety, there is a significant difference in the level of mindfulness between risk-averse and risk-seekers. No such difference was found among students with low statistics anxiety. This finding confirms that risk aversion moderates the effect of statistics anxiety on mindfulness. Students with high statistics anxiety levels are prone to risk-seeking behaviours, experience lower mindfulness, and are inclined to commit academic dishonesty. This outcome can be explained by the assumption that these risk-taker students are motivated by the potential rewards and make controverted decisions without fully considering the consequences of their actions (Kurdoglu et al. 2023). In other words, risk is a forward-looking idea that captures the eventuality of an occurrence (Vinod 2023). The risk-taker consciousness centres on the distant future, its outcomes, and possible profits and benefits—contrasting mindfulness, whose focus seeks to be here and now, accepting the circumstances of the moment. In addition, statistics anxiety can increase stress levels, impair cognitive functioning and decision-making abilities (Browning et al. 2015; Hartley & Phelps 2012), and decrease mindfulness, thus influencing the likelihood of engaging in academic dishonesty.

In contrast, anxious, risk-averse counterparts tend to be more mindful of their situation and behaviour and less frequently engage in academic misconduct. Risk aversion is avoiding risks that may lead to negative consequences (Hartley & Phelps 2012). Risk-averse students are more cautious and may approach a challenging situation with greater awareness and a greater sense of control, which reduces the likelihood of engaging in academically unethical behaviours. These results align with previous studies examining the relationship between mindfulness and risk aversion (Baltruschat et al. 2021).

Conclusion and practical implications

In line with the literature, students' academic misconduct decision-making may be changed (Draper et al. 2021). Thus, we suggest that mindfulness-based interventions might be a constructive tool to reduce risk-taking and promote ethical decision-making among individuals who experience high levels of statistics anxiety. Furthermore, developing these skills may succour individuals with higher anxiety levels, guide them on managing it, and help them avoid engaging in academically unethical behaviours.

Mindfulness is a universal acquirable skill available to everyone (Morgan & Katz 2021). Therefore, based on the current research results, we recommend implementing mindfulness training in academic institutions to reduce students' anxieties (David et al. 2022), specifically in compulsory statistics courses. Through consistent and continuous practice, the students will acquire tools to deal with their anxieties and positively affect avoidance and unethical behaviour. Thus, when the level of anxiety about statistics rises (toward the date of an exam or a deadline for a difficult assignment), students will have the skill to express anxiety without dramatizing it.

Moreover, these proactive interventions enhance academic integrity behaviour. By being nonjudgmental and fully present in the moment, individuals can contemplate their thoughts and emotions without becoming overwhelmed, thereby allowing them to respond ethically. For example, if a student is experiencing statistics anxiety and is tempted to cheat on a test, mindfulness might help them recognize the temptation as a passing thought rather than acting on it. By being fully present and nonjudgmental, students can take a deep breath, refocus their attention, and tackle the task with a clear mind and ethical intention.

Limitations and future research

This research also has limitations. First, due to the gap in the literature on the relationship between the research variables, this is exploratory research. Furthermore, data was collected using a subjective self-report questionnaire. Future research may benefit from dyadic data, like self-report and objective data, with plagiarism detection software. Furthermore, exploring the impact of experimental mindfulness interventions on academic dishonesty and statistics anxiety could be a promising avenue for future research. Additionally, future research may compare and measure risk preferences according to the multidimensional DOSPERT (Blais & Weber 2006), a psychometrically valid measure.

Additionally, our samples were not gender balanced. Thus, we recommend conducting future studies on gender comparisons. Finally, our research was conducted in only one culturally diverse Westernised country, so future studies should include samples from other countries with different backgrounds.

Abbreviations

SEM	Structural Equation Modelling
STARS	Statistics Anxiety Rating Scale
MAAS	Mindful Attention Awareness Scale
AMOS	Analysis of Moment Structures
CFI	Comparative Fit Index
RMSEA	Root Mean Square Error Of Approximation

Declarations

Ethics approval and consent to participate
The study was approved by the Ethics Committee of the. The consent Zefat Academic College was given in written form (number of decision: RDR 15051).

Competing interests
The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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