

Research Article

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Exploring Statistical Anxiety, Attitudes, and Self-Efficacy among Social Sciences Students: The Impact of Gender, Academic Progression, and Achievement

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Abstract

Background/purpose. Statistics courses represent a fundamental component in social sciences programs; however, many students encounter challenges in mastering statistical concepts due to anxiety, negative attitudes, and low self-efficacy. Understanding the prevalence of these factors is crucial for improving learning outcomes. This study aimed to examine the prevalence of statistical anxiety, attitudes toward statistics, and statistical self-efficacy among social sciences students. It further explored variations in these variables based on gender, academic year, and academic achievement.

Materials/methods. The study was conducted among 394 undergraduate students enrolled in statistics courses at United Arab Emirates University. Participants completed three validated instruments: the Statistics Anxiety Scale (SAS), the Attitudes Toward Statistics Scale (ATS), and the Current Statistics Self-Efficacy Scale (CSSE). Descriptive statistics, ANOVA, and post-hoc analyses were employed to analyze the data.

Results. Findings revealed that while overall statistical anxiety levels were below the theoretical average, approximately 25% of students experienced above-average anxiety. No significant gender differences were found. Anxiety levels varied significantly by academic year and achievement level, with third-year students and those with mid-range GPAs reporting higher anxiety. Attitudes toward statistics were generally neutral, with only 8% exhibiting highly positive attitudes. Self-efficacy was moderate overall but significantly higher among fourth-year students and those with high GPAs.

Conclusion. The study highlights the importance of early interventions targeting students at risk of high anxiety and low confidence. Educational strategies such as tutoring, skill-building workshops, and tailored instructional approaches are recommended to enhance students' attitudes, reduce anxiety, and strengthen self-efficacy in learning statistics.

1. Introduction

Statistics has become an essential component of academic training in social sciences, providing students with the tools to analyze data, evaluate research findings, and engage in evidence-based decision-making. Mastery of statistical concepts empowers students to contribute effectively to research activities and professional practices. A variety of instructional strategies have been reported to positively influence students' achievement and attitudes in science education. In this regard, Alsalhi (2020) found that applying the Know-Want-Learn (KWL) approach enhanced fourth-grade learners' performance and encouraged more favorable perceptions toward learning science. However, for many students, learning statistics is often accompanied by emotional and cognitive challenges that can hinder their academic performance. One of the most commonly observed obstacles is statistical anxiety. This form of anxiety refers to the feelings of tension, apprehension, and fear experienced when dealing with statistical tasks or courses. Students suffering from statistical anxiety may exhibit avoidance behaviors, diminished confidence, and lower academic achievement, which ultimately limit their research engagement and academic growth. Closely linked to statistical anxiety are students' attitudes toward statistics. Students who perceive statistics as difficult, irrelevant, or beyond their abilities often develop negative attitudes toward the subject. Such attitudes may discourage active participation in class, reduce motivation, and increase cognitive resistance to learning statistical concepts. Another crucial factor influencing students' experiences in statistics courses is statistical self-efficacy. Self-efficacy, in general, refers to individuals' beliefs in their ability to successfully perform specific tasks. In the context of statistics, students with higher self-efficacy are more likely to persist through challenges, utilize effective problem-solving strategies, and achieve better academic outcomes. In contrast, low self-efficacy is often associated with heightened anxiety, avoidance behaviors, and underperformance. Existing research has consistently demonstrated the interrelationship between statistical anxiety, attitudes, and self-efficacy, suggesting that these variables mutually influence one another. Factors such as gender, academic year, and academic achievement have also been found to contribute to variations in these psychological constructs, although the findings remain somewhat inconsistent across studies. Given the growing emphasis on data literacy and quantitative competence in higher education, it becomes imperative to explore the prevalence of these factors among social sciences students. This study seeks to assess levels of statistical anxiety, attitudes, and self-efficacy among students enrolled in statistics courses and to analyze how these variables differ based on gender, academic year, and academic performance in the UAE higher education institutions. The findings are expected to provide valuable insights that can guide educators and administrators in designing interventions aimed at improving student outcomes in statistics education.

1.1. Research Problem

Despite the growing emphasis on data literacy and statistical competence in social sciences education, many students continue to face considerable challenges in mastering statistical concepts. These difficulties often stem not solely from cognitive limitations, but also from affective factors such as anxiety, unfavorable attitudes, and diminished confidence in handling statistical tasks. For a significant portion of students, engaging with statistics triggers apprehension and avoidance behaviors that compromise their learning and academic success. Furthermore, while previous research has identified connections between statistical anxiety, attitudes, and self-efficacy, the extent to which these factors vary across demographic and academic variables such as gender, academic year, and academic achievement remains insufficiently explored and yields inconsistent findings across different educational contexts. Within this framework, there is a need for empirical investigation to better understand how these psychological dimensions interact and affect students' experiences in statistics courses, particularly among social sciences students in the UAE higher education context.

1.2. Importance of the Research

Theoretical and practical implications: the study has significant theoretical and practical importance. In theory, it adds to the current literature by examining the intricate, interrelated nature of statistical anxiety, attitudes towards statistics and self-efficacy amongst social sciences students – a group that has been under-researched in this regard, especially within the higher education setting in the UAE. It helps to fill in critical gaps in the literature on how gender, academic year and academic achievement correlate with these psychological factors among students, as well as to offer a more nuanced view of the students' experience with statistical education. From a practical perspective, there are implications for educators, academic advisors, and curricular leaders who may share a common goal of improving students' learning in statistics courses. The SBHS is able to throw light on critical time points for targeted intervention (early support programmes, anxiety reduction strategies, confidence building activities) by determining the prevalence and variation of anxiety, and attitudes and self-efficacy. These results may be used to help inform institutional policies and instructional practices designed to create more supportive learning environments that positively impact student's engagement, persistence, and statistically-related academic success in statistics a discipline of growing importance in the age of data-informed decision-making.

1.3. Research Objectives

The main purpose of this research is to examine the statistical anxiety, attitude towards statistics and statistical self-efficacy levels of undergraduate students in social science at university level. The specific aims of this study are:

- Find out the extent of the presence of statistical anxiety, statistics attitude and self-confidence in social sciences students.
- Examine whether gender affects these psychological correlates in students.
- Investigate the differences in the levels of statistical anxiety, attitude, and self-efficacy between different academic years.
- Assess the relationship between students' levels of academic achievement and their statistical anxiety, attitudes, and self-efficacy.
- Offer empirical evidence to help educators and educational institutions develop interventions that create a friendlier, more conducive learning environment in the realm of statistics education.

1.4. Research Questions and Hypotheses

The study aims to address the following questions:

RQ.1: What is the prevalence of statistical anxiety, attitudes toward statistics, and statistical self-efficacy among social sciences students?

RQ.2: How do statistical anxiety, attitudes toward statistics, and statistical self-efficacy vary by gender, academic year, and academic achievement?

2. Previous Studies

2.1. Statistical Anxiety in Social Sciences Students

Statistics anxiety has been extensively studied as one of the significant barriers to students' academic success in courses requiring quantitative skills. In the context of social sciences, many students enter university programs with limited exposure to mathematics or quantitative reasoning, making statistics courses particularly intimidating. Onwuegbuzie and Wilson (2003) emphasized that statistics anxiety is shaped by dispositional, situational, and environmental factors, each contributing

to the psychological burden that students experience when engaging with statistical material. These factors may include previous negative experiences with mathematics, fear of failure, and unfamiliarity with quantitative problem-solving. Benson and Bandalos (1989) characterized statistics anxiety as a multidimensional construct encompassing both cognitive and affective dimensions. Students with high statistics anxiety often demonstrate cognitive avoidance, mental blocks during problem-solving, and elevated uncertainty intolerance, as noted by Williams (2010). This leads to procrastination, lack of engagement, and overall poor academic performance. Moreover, Blalock (1987) pointed out that insufficient preparation in mathematical foundations often exacerbates anxiety, as students lack the prerequisite knowledge to approach statistical problems confidently. Some researchers have examined demographic influences on statistics anxiety. Edirisooriya and Lipscomb (2021) observed that older students may experience heightened anxiety due to increased personal responsibilities and prolonged absence from academic settings. Interestingly, they also reported that males often experience greater anxiety than females when seeking help for statistical difficulties, suggesting that help-seeking behaviors may be gender-dependent. Nevertheless, other studies, such as Baloglu (2003), found no significant gender differences in overall statistics anxiety when controlling for prior mathematical preparation, indicating that anxiety may be more strongly associated with academic readiness than demographic characteristics. Given the different socio-cultural characteristics of the UAE, this emphasizes the necessity of conducting this research.

2.2. Attitudes Toward Statistics

The diversity of higher education students' attitudes in the UAE and the uniqueness of their characteristics necessitate consideration of the potential impact on all research variables. Attitudes toward statistics are widely recognized as critical determinants of students' engagement, motivation, and academic success in statistics courses. Students who approach statistics with a positive attitude are more likely to persist, utilize problem-solving strategies, and achieve higher grades. Conversely, negative attitudes often lead to avoidance and reduced academic performance. Vanhoof et al. (2006) noted that many students in social sciences perceive statistics as complex and disconnected from their primary fields of study. This perception fosters resistance to learning and weakens students' commitment to mastering statistical skills. Similarly, Ramirez et al. (2012) applied expectancy-value theories to explain how students' perceived utility of statistics influences their attitudes and academic outcomes. When students fail to recognize the relevance of statistics to their future careers, they tend to develop negative perceptions, further compounding anxiety and disengagement. Carmona et al. (2005) emphasized that students' attitudes toward statistics are often rooted in their mathematical backgrounds. A weak foundation in mathematics contributes to negative self-concept and diminished confidence in handling statistical concepts. In contrast, students with solid mathematical preparation are more likely to develop favorable attitudes toward statistics. Several studies have investigated interventions aimed at improving attitudes toward statistics. D'Andrea and Waters (2002) proposed the use of storytelling and contextualized teaching strategies to make statistical concepts more relatable and reduce students' anxiety. Sesé Abad et al. (2015) further demonstrated that attitudes mediate the relationship between anxiety and academic performance, highlighting the interconnectedness of these constructs. When students adopt more positive attitudes, their anxiety levels tend to decrease, leading to improved learning outcomes.

2.3. Statistical Self-Efficacy

Self-efficacy plays a crucial role in students' ability to succeed in statistics courses. Defined as an individual's belief in their capability to perform specific tasks, statistical self-efficacy influences both academic behavior and performance outcomes. Students with higher self-efficacy are more likely to engage in problem-solving, persist through challenges, and utilize effective study strategies (Bandura, 1997). Finney and Schraw (2003), who developed the Current Statistics Self-Efficacy (CSSE) scale,

demonstrated that students' confidence in their statistical abilities directly affects their performance. Perepiczka et al. (2011) confirmed this relationship, showing that self-efficacy not only predicts performance but also serves as a protective factor against anxiety. Hernández et al. (2023) expanded on these findings by showing that higher self-efficacy not only reduces anxiety but also improves students' attitudes toward statistics, creating a positive feedback loop that fosters academic success. Primi and Chiesi (2016) found that strong probabilistic reasoning skills contribute to greater self-efficacy, which in turn diminishes anxiety and enhances academic outcomes. Additionally, Mendes et al. (2024) emphasized the role of goal-driven persistence in promoting self-efficacy and reducing anxiety, while noting that individual differences such as threat sensitivity may elevate anxiety levels. These studies collectively demonstrate the complex interplay between self-efficacy, anxiety, and attitudes in shaping students' statistical learning experiences.

2.4. Gender Differences

There is no doubt that the issue of gender in the Middle East and Arab countries, especially the UAE, is directly reflected in the overall daily life in society in general and in higher education environments in particular. The relationship between gender and statistical anxiety, attitudes, and self-efficacy remains complex and somewhat inconsistent across studies. Ralston et al. (2016) reported that younger females often exhibit higher levels of statistics anxiety compared to younger males, whereas this pattern may reverse or equalize in older age groups. Edirisooriya and Lipscomb (2021) noted that males may experience greater discomfort in seeking assistance for statistical problems, reflecting different coping strategies across genders. However, other research such as Baloğlu (2003) and Schneider (2011) found no significant gender differences in overall anxiety or self-efficacy levels, suggesting that these constructs may be influenced more by academic experiences and instructional approaches than by gender itself. Mendes et al. (2024) observed lower self-efficacy levels among females, potentially linked to broader gender disparities in self-confidence related to quantitative fields. Chew et al. (2018) emphasized that reducing anxiety through effective interventions may help minimize gender disparities in self-efficacy, suggesting that educational strategies focusing on building confidence and reducing fear could benefit all students regardless of gender. Overall, gender appears to interact with multiple psychological and contextual factors, influencing students' experiences in statistics education in complex ways.

2.5. Academic Year Differences

Academic progression has been shown to influence students' anxiety, attitudes, and self-efficacy in statistics. Generally, first-year students exhibit higher anxiety and lower self-efficacy due to their limited exposure to statistical concepts. As students advance academically, their familiarity with statistical reasoning improves, often leading to more favorable attitudes and reduced anxiety. Hernández et al. (2023) and Ralston et al. (2016) found that early intervention is critical to prevent anxiety from escalating in first-year students. Shida et al. (2024) emphasized that students benefit from foundational training in statistics early in their academic journey to build confidence and competence. Vanhoof et al. (2016) observed that attitudes tend to improve over time as students recognize the practical relevance of statistics to their academic and professional fields. However, Ramirez et al. (2012) cautioned that negative attitudes formed early may persist throughout students' academic careers if not addressed promptly. Carmona et al. (2005) underscored the importance of addressing deficiencies in students' mathematical backgrounds to foster positive attitudes from the outset. Regarding self-efficacy, Schneider (2011) and Mendes et al. (2024) reported that senior students generally display higher levels of self-efficacy, reflecting their accumulated experience and skill development. Ogbogo and Amadi (2018) demonstrated that early support for self-efficacy can lead to long-term reductions in anxiety and improved academic performance.

2.6. Academic Achievement Differences

Students' academic achievement levels are also related to differences in statistics anxiety, attitudes, and self-efficacy. Abd Hamid and Sulaiman (2014) found that students with stronger mathematical preparation tend to perform better in statistics courses, although anxiety is not always directly related to performance. This is confirmed by Ali and Iqbal (2012) that comfort in mathematical operations reduces anxiety and improves achievement. This agrees with Ramirez et al. (2012) who confirmed the importance of enhancing positive attitudes to improve performance using the expectancy-value framework, and this also agrees with Sesé Abad et al. (2015) in that positive attitudes predict better academic outcomes and mediate the relationship between anxiety and performance. As a result, self-efficacy is considered a strong indicator of academic success (Perepiczka et al., 2011; Mendes et al., 2024), and this agrees with Hernández et al. (2023) in that improving self-efficacy can reduce anxiety and enhance performance. On the other hand, Vigil-Colet et al. (2008) identified test anxiety as a factor that negatively affects performance through its effect on cognitive performance. Thus, reducing anxiety is possible through the use of pedagogical strategies designed for that purpose, which in result lead to improvement in both attitudes and academic outcomes (D'Andrea and Waters, 2002). From the above, these combined results confirm the interconnected nature of anxiety, attitudes, self-efficacy, and academic achievement in shaping students' experiences and outcomes in learning statistics.

3. Methodology

3.1. Study Approach

This study employed a quantitative descriptive research design to investigate statistical anxiety, attitudes toward statistics, and statistical self-efficacy among social sciences students. The design allowed for both the assessment of the prevalence of these psychological variables and the analysis of differences across gender, academic year, and academic achievement levels.

3.2. Population and Sample

The population of the study consisted of undergraduate students enrolled in social sciences programs at United Arab Emirates University (UAEU). These students were required to complete one or more statistics courses as part of their academic curriculum. The sample was drawn from students registered in statistics courses offered by the College of Humanities and Social Sciences during the 2023/2024 academic year. Participation was voluntary, and students were invited to complete the study instruments during their regular class periods. A total of 394 students participated in the study after providing informed consent. Demographic information was collected from participants, including gender, academic year, and cumulative GPA. The final sample included students from different academic levels and achievement categories, providing a diverse representation of the student population. Most participants had completed only one semester of statistics, which is typical in the college of social sciences, where a single mandatory statistics course is common.

3.3. Research Instruments

To measure the primary variables of the study — statistical anxiety, attitudes toward statistics, and statistical self-efficacy — three standardized and validated instruments were administered. The research utilized three scales: The Statistics Anxiety Scale (SAS), the Attitudes Toward Statistics Scale (ATS), and the Current Statistics Self-Efficacy Scale (CSSE). These scales were employed in their original format and English language, as English is the medium of instruction at this university, and all students must meet minimum language requirements for admission.

a. Statistics Anxiety Scale (SAS)

The Statistics Anxiety Scale (SAS) developed by Vigil-Colet et al. (2008) was used to assess students' general anxiety related to statistics. This scale consists of 24 items rated on a five-point Likert scale ranging from 1 (no anxiety) to 5 (considerable anxiety). The total score is calculated by summing the item responses, with higher scores indicating greater anxiety. The scale includes three subdimensions: Examination Anxiety, Asking for Help Anxiety, and Interpretation Anxiety. The SAS has demonstrated strong internal consistency and reliability in previous research.

b. Attitudes Toward Statistics Scale (ATS)

Students' attitudes were measured using the Attitudes Toward Statistics Scale (ATS) developed by Wise (1985). The original ATS consists of two subscales; however, for the purpose of this study, only the nine-item subscale measuring attitudes toward the statistics course was utilized. Each item was rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Higher scores reflect more positive attitudes toward statistics courses.

c. Current Statistics Self-Efficacy Scale (CSSE)

The Current Statistics Self-Efficacy Scale (CSSE), developed by Finney and Schraw (2003), was used to assess students' confidence in performing statistical tasks. This scale includes 14 items rated on a six-point Likert scale ranging from 1 (no confidence at all) to 6 (complete confidence). The scale captures students' self-perceptions regarding their competence in various statistical skills and procedures. The Current Statistics Self-Efficacy Scale (CSSE) consists of 14 questions; each rated on a six-point Likert scale from 1 (no confidence at all) to 6 (complete confidence). Consequently, the scale's range is from 14 to 84, with a theoretical midpoint of 49.

3.4. Data Collection Procedure

Data collection was conducted after obtaining ethical approval from the appropriate university committee. Students were informed about the purpose of the study, assured of confidentiality, and given the right to withdraw at any point without penalty. The questionnaires were administered during scheduled class sessions under the supervision of the researchers. Participants first completed a brief demographic survey, followed by the three main instruments (SAS, ATS, and CSSE). The data were collected in paper-based format, reviewed for completeness, and coded for analysis.

3.5. Data Analysis

The collected data were entered into SPSS software for statistical analysis. Descriptive statistics, including means, standard deviations, and percentiles, were calculated to assess the prevalence of statistical anxiety, attitudes, and self-efficacy. To examine differences across gender, academic year, and academic achievement, one-way analysis of variance (ANOVA) was conducted for each dependent variable. Where significant differences were found, post-hoc comparisons using the Bonferroni test were performed to identify specific group differences. Internal consistency reliability for each scale was evaluated using Cronbach's alpha.

Academic achievement was categorized into three levels based on students' cumulative GPA: Level C: GPA $\leq$ 2.69, Level B: GPA between 2.70 and 3.69, Level A: GPA between 3.70 and 4.00. This Academic achievement was divided into three categories based on students' cumulative GPA which is used in the university: Level C for GPA $\leq$ 2.69, Level B for GPA between 2.70 and 3.69, and Level A for GPA between 3.70 and 4.00. This classification aligns with the concept of categorizing students into high, medium, and low achievement levels. . All statistical tests were performed at a significance level of 0.05.

4. Results and Discussion

4.1. Descriptive Statistics of the Sample

The final sample consisted of 394 undergraduate students enrolled in various social sciences statistics courses at United Arab Emirates University. Table 1 presents the demographic distribution of the participants.

Table 1. Demographic Characteristics of the Participants.

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	80	20.3
	Female	308	78.2
Academic Year	First Year	88	22.3
	Second Year	111	28.2
	Third Year	120	30.5
	Fourth Year	57	14.5
GPA Level	Level C (≤ 2.69)	74	18.8
	Level B (2.70–3.69)	157	39.8
	Level A (3.70–4.00)	64	16.2

The mean age of the participants was 20.17 years ($SD = 2.04$). The sample included significantly more female students than male students, which reflects the actual gender distribution at the University. The internal consistency reliability of the scales used was evaluated using Cronbach's alpha, yielding values of 0.93 for the SAS, 0.80 for the ATS, and 0.95 for the CSSE, indicating excellent internal consistency across all instruments.

4.2. Prevalence of Statistical Anxiety

The mean total score for the Statistics Anxiety Scale (SAS) was 62.11 ($SD = 19.72$), which is below the theoretical average score of 72. However, percentile analysis indicated that approximately 25% of students scored above this average threshold, suggesting that a significant minority experience elevated anxiety levels.

Table 2. Percentiles for SAS Scores Above the Theoretical Average (72).

Percentile	Score	Percentile	Score
74	73.08	87	85.54
75	74.50	88	86.00
76	75.00	89	86.00
77	76.00	90	87.00
78	77.00	91	87.22
79	78.18	92	89.64

Percentile	Score	Percentile	Score
80	79.00	93	91.00
81	79.00	94	92.00
82	81.00	95	94.00
83	82.00	96	95.32
84	83.00	97	97.00
85	83.00	98	101.32
86	85.00	99	108.74

4.3. Group Differences in Statistical Anxiety

a. Gender Differences

Mean anxiety scores were slightly higher for males ($M = 63.24$, $SD = 14.85$) compared to females ($M = 61.64$, $SD = 20.74$). However, this difference was not statistically significant ($F(1, 386) = 0.366$, $p = 0.545$).

b. Academic Year Differences

Significant differences in anxiety levels were observed across academic years ($F(3, 386) = 7.204$, $p < 0.001$), $\eta^2 = .06$.

- First-year students reported the lowest anxiety ($M = 54.75$, $SD = 16.52$),
- while third-year students exhibited the highest anxiety levels ($M = 67.75$, $SD = 18.90$).
- Post-hoc Bonferroni tests revealed significant differences between first-year and third-year students, and between second-year and third-year students.

c. Academic Achievement Differences

Students' anxiety levels varied significantly by GPA levels ($F(2, 386) = 4.001$, $p = 0.019$), $\eta^2 = .03$.

- Students in Level B (GPA 2.70–3.69) reported higher anxiety ($M = 65.05$, $SD = 19.39$) compared to Level A (GPA 3.70–4.00) ($M = 56.85$, $SD = 20.19$).
- Bonferroni tests confirmed a significant difference between these two groups.

Table 3. ANOVA Summary for Statistical Anxiety.

Variable	Group	Mean	SD	F	p	η^2
Gender	Male	63.24	14.85	0.366	0.545	.01
	Female	61.64	20.74			
Academic Year	First Year	54.75	16.52	7.204	< 0.001	.06
	Second Year	59.86	21.64			
	Third Year	67.75	18.90			
	Fourth Year	63.69	17.40			

Variable	Group	Mean	SD	F	p	η^2
GPA	Level C	61.06	17.43	4.001	0.019	.06
	Level B	65.05	19.39			
	Level A	56.85	20.19			

Regarding assumptions, ANOVA is generally robust against normality violations, especially with large sample sizes, which is the case in this study. Thus, the normality assumption is satisfied. For homogeneity of variance, a common guideline is that the ratio of the largest to the smallest sample variance should not exceed 3:1. Variances across ANOVA groups and the three dependent variables—statistics anxiety, attitudes toward statistics, and statistics self-efficacy—were compared. For instance, the variances for the Statistical Anxiety variable across First Year, Second Year, Third Year, and Fourth Year were 272.91, 468.29, 357.21, and 302.76, respectively, with the largest-to-smallest variance ratio being less than 3:1. Therefore, the homogeneity of variance assumption is also met. Similar outcomes were observed for all other ANOVA tests.

Post-hoc Bonferroni tests revealed significant differences in self-efficacy between first- and fourth-year students, as well as between Level C and Level B GPA groups as table 4.

Table 4. A Post Hoc Analysis for Statistics Anxiety over Academic Levels

(I) Year	(J) Year	Mean Difference (I-J)	Std. Error	Sig.
First Year	Second Year	-5.10225	2.94944	.508
	Third Year	-12.99415*	2.91232	<.001
	Fourth Year	-8.93748	3.39880	.054
Second Year	First Year	5.10225	2.94944	.508
	Third Year	-7.89190*	2.69323	.022
	Fourth Year	-3.83524	3.21305	1.000
Third Year	First Year	12.99415*	2.91232	<.001
	Second Year	7.89190*	2.69323	.022
	Fourth Year	4.05666	3.17901	1.000
Fourth Year	First Year	8.93748	3.39880	.054
	Second Year	3.83524	3.21305	1.000
	Third Year	-4.05666	3.17901	1.000

From Table 4, we note the presence of statistically significant differences between the first and third years in favor of the third year. There are also differences between the second and third years in favor of the third year.

4.4. Attitudes Toward Statistics

The mean score for attitudes toward statistics was 28.86 (SD = 5.17), which is slightly above the neutral midpoint of 27 on the scale (range: 9–45). Percentile analysis showed that only 8% of students scored 36 or above, indicating highly positive attitudes, while the majority demonstrated neutral to moderately positive attitudes.

Table 5. ANOVA Summary for Attitudes Toward Statistics.

Variable	Group	Mean	SD	F	p	η^2
Gender	Male	29.04	4.93	0.069	0.793	.00
	Female	28.87	5.23			
Academic Year	First Year	29.94	3.84	2.003	0.113	.02
	Second Year	29.16	5.61			
	Third Year	28.36	5.42			
	Fourth Year	28.19	4.96			
GPA	Level C	28.09	5.73	2.674	0.071	.02
	Level B	28.84	5.06			
	Level A	30.18	4.78			

No significant differences were observed across gender, academic year, or academic achievement for students' attitudes toward statistics.

4.5. Statistical Self-Efficacy

The mean score for self-efficacy was 44.37 (SD = 16.72) on a scale with a theoretical average of 49. Only 22% of students scored 56 or higher, indicating sufficient confidence in their statistical abilities, while the majority demonstrated moderate or low levels of self-efficacy.

Table 6. ANOVA Summary for Statistical Self-Efficacy.

Variable	Group	Mean	SD	F	p	η^2
Gender	Male	44.89	14.71	0.078	0.780	.00
	Female	44.28	17.20			
Academic Year	First Year	40.63	15.80	2.879	0.036	.06
	Second Year	44.91	18.90			
	Third Year	44.86	15.16			
	Fourth Year	49.19	15.75			
GPA	Level C	40.97	13.54	8.488	< 0.001	.03
	Level B	49.60	14.88			
	Level A	42.51	20.07			

Post-hoc Bonferroni tests revealed significant differences in self-efficacy between first- and fourth-year students, as well as between Level C and Level B GPA groups, as shown in Table 7.

Table 7. A Post Hoc Analysis for Statistics Self-Efficacy over Academic Levels

(I) Year	(J) Year	Mean Difference (I-J)	Std. Error	Sig.
First Year	Second Year	-4.28676	2.47748	.507
	Third Year	-4.23611	2.44705	.506
	Fourth Year	-8.56731*	2.95502	.024
Second Year	First Year	4.28676	2.47748	.507
	Third Year	.05065	2.29044	1.000
	Fourth Year	-4.28054	2.82670	.785
Third Year	First Year	4.23611	2.44705	.506
	Second Year	-.05065	2.29044	1.000
	Fourth Year	-4.33120	2.80006	.737
Fourth Year	First Year	8.56731*	2.95502	.024
	Second Year	4.28054	2.82670	.785
	Third Year	4.33120	2.80006	.737

From Table 7, we note the presence of statistically significant differences between the first and fourth years in favor of the fourth year.

5. Discussion

The present study investigated the prevalence of statistical anxiety, attitudes toward statistics, and statistical self-efficacy among social sciences students. It also examined how these factors varied by gender, academic year, and academic achievement. The findings offer several important insights, many of which are consistent with prior literature, while others provide new perspectives within the specific context of students in the United Arab Emirates.

5.1. Prevalence of Statistical Anxiety

The results revealed that the overall level of statistical anxiety among the students was below the theoretical average. Nevertheless, approximately one-fourth of the students reported experiencing above-average anxiety levels. This indicates that although a majority of students demonstrate moderate levels of anxiety, a significant proportion experience substantial anxiety that may negatively affect their learning. These findings align with those of Onwuegbuzie and Wilson (2003), who described statistical anxiety as a multidimensional construct that persists even among students who generally perform adequately. Similarly, Ramirez et al. (2012) emphasized that individual differences contribute to the variability in students' experiences of statistical anxiety, suggesting that anxiety is not uniformly distributed across student populations. Comparable patterns have also been documented by Ralston et al. (2016), who argued that targeted interventions may be necessary to assist students who experience heightened anxiety, even in generally low-anxiety populations. Conversely, some studies have reported higher prevalence rates of statistics anxiety in other populations. For example, Edirisooriya and Lipscomb (2021) found elevated anxiety among

older graduate students, which they attributed to academic gaps and additional life responsibilities. Furthermore, Baloğlu (2003) emphasized the role of prior mathematical preparation as a mitigating factor for statistics anxiety. The current study supports the broader view that while statistics anxiety is not universally high, it remains a substantial obstacle for a subset of students, warranting ongoing attention from educators and support services.

5.2. Prevalence of Attitudes Toward Statistics

In terms of attitudes, the majority of students demonstrated neutral to moderately positive attitudes toward statistics, with only a small fraction (8%) reporting highly positive attitudes. This suggests that while students may not strongly dislike statistics, they are also not fully engaged or enthusiastic about the subject. These results are consistent with the findings of Vanhoof et al. (2006), who reported that undergraduate students often perceive statistics as somewhat disconnected from their field of study but may still maintain moderately favorable attitudes toward specific statistics courses. Likewise, D'Andrea and Waters (2002) found that attitudes toward statistics often improve as students progress through a course, particularly when anxiety decreases over time. Carmona et al. (2005) further explained that students' mathematical background strongly influences their attitudes toward statistics. Students with weaker math foundations may lack confidence and hold more negative views, while those with stronger preparation approach statistics more positively. Sesé Abad et al. (2015) demonstrated that students' attitudes toward statistics play a mediating role between anxiety and academic achievement, with more favorable attitudes contributing to better outcomes. These consistent findings suggest that students' attitudes toward statistics are moderately positive but may benefit from instructional interventions designed to improve relevance, engagement, and perceived usefulness of statistical concepts.

5.3. Prevalence of Statistical Self-Efficacy

The findings related to self-efficacy indicated that most students reported moderate confidence in their ability to complete statistical tasks, with only 22% demonstrating high self-efficacy. This reflects the general uncertainty many social sciences students feel when faced with quantitative work, particularly when they lack extensive prior experience with statistics. Similar trends have been documented in prior studies. Perepiczka et al. (2011) emphasized the strong inverse relationship between statistics anxiety and self-efficacy, showing that students with lower anxiety generally exhibit greater self-confidence. Hernández et al. (2023) also demonstrated that improvements in self-efficacy contribute to both lower anxiety and more positive attitudes, ultimately leading to better academic performance. Schneider (2011) observed that self-efficacy tends to fluctuate based on students' exposure to statistical concepts, with greater experience and practice helping to build confidence over time. Chiesi et al. (2011) further supported this conclusion, noting that improved probabilistic reasoning skills are closely tied to enhanced self-efficacy. Overall, the findings highlight the central role of self-efficacy in students' academic experiences with statistics, reinforcing the need for instructional strategies that promote confidence-building from the outset of students' academic journeys.

5.4. Differences by Gender

This study found no statistically significant differences in statistical anxiety, attitudes, or self-efficacy between male and female students. While males reported slightly higher anxiety and self-efficacy scores, these differences were not significant. These results are consistent with those of Baloğlu (2003) and Schneider (2011), who found that gender alone is not a reliable predictor of statistics anxiety or self-efficacy once academic preparation and instructional context are taken into account. However, these findings contrast with studies such as Ralston et al. (2016) and Mendes et al. (2024), which reported higher anxiety and lower self-efficacy among female students in certain samples. Chew et al. (2018) suggested that gender differences may be moderated by anxiety-

reduction interventions, implying that instructional methods can play a crucial role in minimizing gender gaps. The absence of significant gender differences in the present study may reflect specific cultural, instructional, or institutional factors within the UAE context, where teaching approaches may promote more equitable experiences for male and female students in statistics courses.

5.5. Differences by Academic Year

Significant variations were observed across academic years for both statistical anxiety and self-efficacy, though not for attitudes. Third-year students demonstrated the highest anxiety levels, while first-year students reported the lowest. Fourth-year students exhibited the highest levels of self-efficacy. These findings are partially aligned with those of Mendes et al. (2024), who noted that anxiety often peaks at intermediate stages when course content becomes more complex, and that self-efficacy increases as students gain more experience. Similarly, Hernández et al. (2023) emphasized the importance of early intervention to prevent the persistence of high anxiety levels as students advance academically. Ramirez et al. (2012) also emphasized that students' attitudes and perceptions often stabilize over time, with initial attitudes potentially influencing long-term engagement. Carmona et al. (2005) highlighted that early preparation in mathematical concepts can mitigate later anxiety and promote confidence.

Collectively, these findings suggest that students may benefit from targeted support during the transition from introductory to advanced statistics courses, particularly around the third year, when anxiety appears to spike.

5.6. Differences by Academic Achievement

Statistically significant differences in both anxiety and self-efficacy were observed based on students' GPA levels. Students with higher GPAs demonstrated lower anxiety and higher self-efficacy, while those with lower GPAs exhibited elevated anxiety and reduced confidence. These patterns are consistent with those documented by Abd Hamid and Sulaiman (2014), who found that stronger mathematical backgrounds are associated with better performance in statistics courses. Perepiczka et al. (2011) and Hernández et al. (2023) similarly emphasized that self-efficacy is a strong predictor of academic success, while anxiety tends to interfere with achievement. Furthermore, Sesé Abad et al. (2015) demonstrated that positive attitudes mediate the negative impact of anxiety on performance, suggesting that comprehensive interventions addressing both cognitive and affective factors may enhance students' academic outcomes. These results support the argument that academic achievement is intricately linked to both psychological and cognitive readiness for statistics coursework, underscoring the importance of early preparation and confidence-building interventions.

6. Limitations of the Study

Although this study offers significant information about the associations between statistical anxiety, attitudes towards statistics, and self-efficacy in the current participants belonging to social sciences, there are some limitations that need to be considered. The first limitation of our study is that it was conducted in one setting and thus may not be representative of other universities or another educational framework (e.g., in terms of curricular organization, teaching format, student characteristics). Second, the characteristic of self-reported data might lead to response bias, because the participants might over-report or under-report their anxiety levels, attitudes, and self-efficacy. This is a limitation because the cross-sectional nature of the study's design precludes drawing causative conclusions and following these students across the years of their academic tenure. Furthermore, the study did not control for possible extraneous variables (e.g., previous training in mathematics, the influence of the instructor or support mechanisms) which may have influenced the psychological response of the students to statistics teaching. The development of longitudinal

research that includes multi-institutional samples as well as additional contextual variables would contribute to a fuller understanding of the dynamics that affect students' statistics learning experiences.

7. Implications of the Study

The findings of this study offer several important implications for educators, curriculum developers, academic advisors, and policymakers in higher education. Given the complex interplay between statistical anxiety, attitudes toward statistics, self-efficacy, and academic performance, targeted interventions are needed to enhance students' experiences and success in statistics courses.

1. Early Identification of High-Risk Students

The study revealed that approximately one-fourth of students experience above-average levels of statistical anxiety, while many others exhibit moderate or low self-efficacy. Early screening for students who demonstrate heightened anxiety or low confidence at the beginning of statistics courses can allow instructors and academic advisors to provide timely support. Diagnostic assessments, self-report questionnaires, or brief interviews may help identify students who are most vulnerable to anxiety-related learning challenges. By intervening early, educators can prevent the escalation of anxiety and create more supportive learning environments, ultimately improving students' engagement and performance.

2. Development of Supportive Instructional Strategies

The findings emphasize the need for instructional methods that actively address both cognitive and affective components of learning statistics. Instructors should incorporate active learning approaches, problem-based learning, and real-world applications that demonstrate the relevance of statistical concepts to students' fields of study. Storytelling, collaborative projects, and contextualized examples, as suggested by D'Andrea and Waters (2002), may help students perceive statistics as approachable and meaningful rather than abstract and intimidating. Moreover, providing continuous feedback, low-stakes assessments, and opportunities for peer support can help students build confidence incrementally as they master statistical content.

3. Integration of Anxiety-Reduction Interventions

Recognizing the strong inverse association between statistical anxiety and self-efficacy, it is essential to incorporate anxiety-reduction interventions alongside academic instruction to foster more supportive and effective learning environments. These interventions may encompass a variety of strategies, including relaxation training and mindfulness exercises aimed at managing stress levels, as well as workshops that focus on enhancing time management skills and effective test preparation techniques. Cognitive-behavioral approaches may also be employed to help students identify and restructure negative thought patterns that contribute to their anxiety. Furthermore, instructors can adopt immediacy behaviors that encourage open communication and create a non-intimidating classroom atmosphere. By simultaneously addressing both the emotional and cognitive aspects of learning, these interventions can equip students with greater resilience and confidence when navigating the challenges of statistics education.

4. Strengthening Foundational Mathematical Skills

As several prior studies have indicated, weak mathematical preparation contributes significantly to students' negative attitudes, anxiety, and low self-efficacy in statistics. Therefore, it is recommended that institutions incorporate preparatory or remedial courses focusing on essential quantitative skills before students enroll in advanced statistics courses. Providing refresher workshops in basic mathematics, algebra, and probability may help students enter statistics courses with greater confidence, thus reducing anxiety and promoting stronger academic outcomes.

5. Continuous Monitoring of Academic Progress

The study demonstrated that students in the middle academic years and those with lower academic achievement are particularly vulnerable to heightened anxiety and reduced self-efficacy. Academic advising systems should closely monitor students' progress throughout their programs to detect patterns of academic struggle. Personalized mentoring, academic coaching, and structured study groups may offer additional layers of support, particularly during transitions from introductory to advanced statistics courses, where anxiety often intensifies.

6. Faculty Development and Training

Instructors of statistics courses hold a central role in influencing students' learning experiences and outcomes. Therefore, faculty development initiatives should equip instructors with the necessary skills to effectively address both the cognitive and emotional needs of their students. This includes developing the ability to identify and respond appropriately to early signs of statistical anxiety, fostering inclusive and supportive classroom environments that encourage student engagement, and implementing instructional strategies that simultaneously build students' content mastery and confidence. Furthermore, instructors should be trained to apply formative assessment techniques that provide timely and constructive feedback, allowing students to monitor their progress and address difficulties promptly. Through such comprehensive training, educators will be better prepared to create classroom environments that not only advance students' statistical competencies but also promote their emotional well-being, motivation, and long-term academic persistence.

7. Institutional Policy and Curriculum Design

At the institutional level, curriculum development committees play a crucial role in enhancing students' learning experiences in statistics. It is essential that policies and curricula incorporate components specifically designed to alleviate statistical anxiety and foster students' confidence. Such curricular enhancements may involve the integration of embedded skill-building modules that systematically strengthen students' quantitative competencies, as well as flexible pacing options that accommodate the diverse learning needs and paces of individual students. Additionally, providing opportunities for students to engage in applied statistical practice across various disciplines can reinforce the practical relevance of statistical concepts, thereby increasing motivation and engagement. By adopting this comprehensive and student-centered approach to curriculum design, institutions can more effectively prepare students to meet the growing demands of research, data analysis, and evidence-based decision-making within their academic and professional fields.

8. Recommendations for Future Research

Although the present study offers important insights into the dynamics of statistical anxiety, attitudes, and self-efficacy among social sciences students, several avenues remain open for future investigation. Longitudinal studies are needed to track how students' experiences with statistical anxiety, attitudes, and self-efficacy evolve throughout their academic journeys. Additionally, future research should evaluate the effectiveness of targeted interventions specifically designed to support students who are at heightened risk of experiencing significant anxiety or low self-efficacy. Further exploration of cultural and institutional influences may also provide a deeper understanding of how these variables interact within diverse educational settings. Expanding research to include students from various academic disciplines beyond the social sciences could help determine whether the observed patterns are generalizable across different fields of study. Collectively, such investigations would contribute to a more holistic understanding of the psychological, pedagogical, and contextual factors shaping students' engagement and success in statistics education.

Declarations

Author Contributions. Hamzeh D: original manuscript preparation, and writing manuscript, A. Alqawasmi: Literature review, conceptualization. N. Alsalhi: methodology, data analysis, review-editing, and writing

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