Ugh … Statistics! College Students' Attitudes and Perceptions Toward Statistics

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UGH…STATISTICS!
COLLEGE STUDENTS' ATTITUDES AND PERCEPTIONS TOWARD STATISTICS

by

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ABSTRACT

Statistics is a course that is required for a majority of undergraduate college students in a wide variety of majors. It is not just required for Statistics or Mathematics majors, but also for those undergraduate college students majoring in Biology, Engineering, Sociology, and countless other majors. It can often be seen as a daunting course, especially for those who feel that mathematics is not their strongest subject. Students begin to dislike the course before even starting and this can carry on throughout the entirety of the course. This thesis will focus primarily on students' perceptions and attitudes toward their statistics courses rather than their performance. Many courses are taught a specific way that is conducive to all learning styles, which may lead to the students not enjoying or understanding their statistics course. The students' learning style may also be correlated to their attitude and perception of statistics. The goal of this thesis is to better understand the college students in order to adapt the current methods so that student can enjoy the course, appreciate the knowledge they learn and its impact on their future career paths.

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INTRODUCTION

Statistics is a course that is required for a majority of undergraduate college students in a wide variety of majors. It is not just required for Statistics or Mathematics majors, but also for those undergraduate college students majoring in Biology, Engineering, Sociology, and countless other majors. It can often be seen as a daunting course, especially for those who feel that mathematics is not their strongest subject. Students begin to dislike the course before even starting and this can carry on throughout the entirety of the course. This thesis will focus primarily on students' perceptions and attitudes toward their statistics courses rather than their performance. The goal of this thesis is to better understand the college students in order to adapt the current methods so that student can enjoy the course, appreciate the knowledge they learn and its impact on their future career paths.

LITERATURE REVIEW

Lester (2016) created a study to discover whether students' scores on a scale that measures statistics anxiety were associated with their performance in a psychology course with an emphasis on statistics. Students completed a basic algebra test, a scale to assess their anxiety and attitudes related to statistics. The study used correlation and linear regression to understand a possible relationship between the algebra test and the subscales of the Statistics Anxiety Rating Scale and the performance of undergraduate social science majors in a statistics course. The students' algebra knowledge was assessed by a 35-item basic algebra test administered by the college to dictate what algebra course the students should enroll in. The Statistics Anxiety Rating Scale, developed by Cruise and Wilkins (1980), assessed the students' attitudes toward statistics. The scale was divided into six subscales, worth of statistics, interpretation anxiety, test and class anxiety, computational self-concept, fear of asking for help, and fear of statistics teachers.

Each of the subscales was used individually in the correlation and regression analysis. The students' performance in the course was determined by the three examinations given during the semester and their other assignments were not used. The sample consisted of three sections, over three sequential semesters, of an introductory undergraduate statistic course taught one teacher. The class met twice a week with no online component. There were 93 participants, 18 males and 75 females, within the sample. A majority were psychology majors, but the students' major was not used as part of the analysis.

The study found that the students' sex and algebra test scores were significantly associated with how well the students performed in the statistics course. All six of the subscales

from the Statistics Anxiety Rating Scale were not correlation with students' performance. Study provides information regarding how the students' sex and algebra abilities affect their performance in their statistics course, but their anxiety towards statistics does not. The study did not specifically address possible differences between the different majors and only focused on an in-person statistics course, which leaves gaps in information that this thesis will attempt to fill.

Haughton and Kelly (2015) designed an analysis aimed to understand if students in a face-to-face statistics course or a flipped-hybrid statistics course performed better on the common final exam. The study also intended to find out if the final grades and student satisfaction were different between the two groups. Their study found that students in the hybrid courses semester grades, rating of the course, and newfound enthusiasm for statistics did not differ significantly from those of their peers in traditional classes. These results did not find a difference between face-to-face and hybrid statistics course, but it did not test for completely online statistics courses. This leaves room for the idea that online statistics course students may have a difference in rating of the course and interest for statistics. Questions regarding the method in which the course was conducted will be asked in this thesis.

Gonzalez, Rodriguez, Failde, and Carrea (2016) devised a study with three goals of analyzing a model of structural relations between intrinsic value, self-concept, anxiety in statistic class, self-regulatory and deep processing strategies, persistence, and performance; compare this model in two samples of undergraduates undertaking science–technology degrees and degrees in social studies; and to analyze possible effects between the variables. A questionnaire was distributed throughout the course. The undergraduate students completed the intrinsic value, self-concept, and anxiety in class scales in the fifth week. The intrinsic value of statistics was

measured through the use of a subscale of the Perceived Task Value Scale (Eccles & Wigfield, 1995). The Self Description Questionnaire was applied to mathematics to assess the statistics self-concept. A Class-Related Emotions Scale was taken from the Achievement Emotions Questionnaire (Perkun, Goetz, & Perry, 2005) to assess the anxiety in the statistics class. Academic engagement in statistics was ssessed using three Engagement Subscales from the Attitude toward Mathematics Survey (Miller, Greene, Montalvo, Ravindran, & Nochols. 1996). The students' academic performance in their statistics class was evaluated using their final grade in the course. Two samples of Spanish undergraduates, undertaking science–technology degrees (n = 479) or degrees in social studies (n = 468), participated in this study.

Undergraduates from the social sample experienced more anxiety in the statistics class, whereas science undergraduates obtained higher scores than their colleagues in the other remaining variables, and scored much higher in statistics self-concept and persistence in difficult tasks. This study provided information in regard to a difference between the two groups of majors. Those who were in the science majors had less anxiety and those with higher anxiety had lower academic engagement, learning, and performance. It would be important to discover what variables affect the students' anxiety, whether it is the class size, students' major, or mode of instruction.

Cherney and Cooney (2005) created and tested a scale to assess students' perceptions about mathematics and statistics. The Mathematics and Statistics Perception Scale (MSPS) was hypothesized to identify students who are at risk of poor performance due to statistical and mathematical apprehension and low self-efficacy. Also hypothesized that the MSPS would measure multiple attitudes in students taking a statistics course. The initial 65 item-scale

included statements assessing mathematics abilities and anxiety, computer competence, affect toward statistics, and the value of statistics in the real world. The second version of the MPSP consisted of 44 items and the third version included 35 items. The final version consists of 22 items. The 22-item scale was administered both at the beginning and at the end of the semester. Performance in the course was measured using final course grades for each participant. There was a total of 107 undergraduate students from two mid-sized universities participated in the initial scale. The scale was administered to three different undergraduate groups in a psychology course. 19 students participated in the second version of the scale, 61 in the third version of the scale, and 154 in the final version of the scale.

There was evidence that the 22-item Mathematics and Statistics Perception Scale (MSPS) is a reliable scale for measuring perceptions toward mathematics and statistics perceptions in undergraduate students. There was a trend toward an increase in positive perceptions about mathematics self-efficacy, while perceptions of statistics remained unchanged and the understanding that statistics can be useful to the students' career increased. Interestingly, the findings also showed that prior exposure to statistics did not change students' perceptions. This study provides useful information about using the MSPS as a reliable tool to measure students' perceptions to toward mathematics and statistics. Based on the results of the study by Cherney and Cooney (2005), the MSPS will be used in this thesis as a measure for students' perceptions toward statistics and mathematics.

Nolan, Beran, and Heck (2012) crafted a study with the purpose of identifying all peer-reviewed and non-peer-reviewed surveys developed to assess students' attitudes toward statistics, and to systematically review the evidence of the construct validity and internal

consistency of their scores. Evidence of content, substantive, structural, and external validity, and of internal consistency in the form of Cronbach's α was extracted from 35 peer-reviewed articles. If the construct validity evidence for scores from the Survey of Attitudes Toward Statistics SATS-28 can be applied to scores from the SATS-36, then interpretations of students' attitudes toward statistics based on SATS-36 scores appear to have the strongest evidence of construct validity and internal consistency. Provides a good idea of what type questions should be used to measure the students' attitudes towards their statistics classes based off of several previously established scales. Also, with the inclusion of these particular scales, one can decide to use the four or six dimensional model depending on the goal of the research.

Roberts and Reese (1987) The study compared two statistics attitude scales, the Statistics Attitude Survey (SAS) by Roberts and Bilderback (1980) and the Attitudes Toward Statistics (ATS) by Wise (1985). Wise had claimed that the SAS was partially invalid because many of the items appeared to be achievement oriented rather than attitudinal in nature. The SAS and ATS were combined in one scale and administer to 280 introductory statistics students at the beginning of the course. Course grades were obtained at the end of the course. Analyses showed high reliabilities for both SAS and ATS. The correlation between the scales was approximately .90. It was concluded that the ATS was essentially an alternative form of the SAS. Either scale could be used to assess the participants' attitudes toward statistics. Using this results and the ones found in Nolan, Beran, and Heck (2012), a more informed decision can be made when deciding which scale should be used to assess the college students' attitudes toward statistics.

Onwuegbuzie (1998) investigated the relationship

between learning style and statistics anxiety in a research methodology course, using a

multivariate analysis. Participants were 82 graduate students. The results of the study suggest that classroom design, structure of the course, authority-orientation, auditory-orientation, food intake preference, time of day preference, and mobility preference, are related in varying degrees to worth of statistics, interpretation anxiety, test and class anxiety, computation self-concept, fear of asking for help, and fear of statistics teachers. The participants of this study were specifically graduate college students, which cause one to wonder how these results may play out when applied explicitly to undergraduate college students. These types of questions will be included in this thesis in order to investigate if the results from Onwuegbuzie (1998) hold for undergraduate college students.

Hudak and Anderson (1990) were interested in examining the influence of learning styles that emphasize abstractness over concreteness. The ability to act consistently at the formal operations level and a preference for abstract learning were predicted to discriminate successful from unsuccessful students in both statistics and computer science classes. Learning style was evaluated using Kolb's (1971) Learning Style Inventory. 94 undergraduate students enrolled in an introductory statistics course in the psychology department or in an introductory computer science course. The data was collected for four consecutive semesters. They found that learning style contributes substantial independent variance to the discrimination between successful and unsuccessful students. The findings emphasize the need to examine students' learning style, which is often ignored when investigating college students' achievement in their courses.

Jespen, Varhegyi, and Teo (2015) designed a study to with the purpose to establish the relationship between students' learning styles with students' perceptions of teaching quality. The study used survey responses from 272 undergraduate students. All 80 items in the Honey and

Mumford's (1986) Learning Styles Questionnaire and all 46 teaching quality items (Thompson, 2002) were used to assess learning styles and perceptions of teaching quality, respectively. Structural equation modeling was used to investigate the relationships between learning styles and perception of teaching quality. Results indicate learners with dominant reflector or activist styles are influenced in their perceptions of teaching quality of their teacher or lecturer. No perceptions of teaching quality relationships were found for students with dominant theorist or pragmatist learning style. Students' perception of their teacher can affect their perception of the subject for the course. If the students' learning style did not match with how the teacher conducted the class then the students could perceive the course in a negative way. The students' learning style is something that is often over looked, thus this thesis will attempt to address possible correlations between learning style and other variables.

Neumann, Hood, and Neumann (2013) evaluated the use of real-life data during a first-year statistics course taught in a university psychology program. The research question addressed in this study was: what are students' perceptions on how the use of real-life data influences their experiences in learning statistics? The present investigation used a qualitative approach in which students were interviewed to elicit their reflections on how the use of real-life data was related to their engagement and learning. This indicated that the use of real-life data sets was associated with gaining meaning from statistics in a more applied or practical sense.

Half the sample gave comments that were coded as being related to learning and memory. These students generally believed that real-life data played a role in learning new concepts and techniques, as well as acting as a tool for remembering content. Almost one quarter of the sample reported that the use of real-life data was an important factor in understanding the

course material more easily and completely. In addition, the students reported that real-life data was associated with their interest, motivation, and engagement in learning about statistics. Can relate to students that did not enjoy their statistics course because they it did not use "real-world data." A question on the survey can address this to test if there is a difference between the students' attitudes when "real-world" data was used.

Based on the previously mentioned research studies, this thesis will address what variables affect both college students' perceptions and attitudes toward statistics. The previous research studies did not cover some possible significant variables or variables that could be investigated further. These variables included, but are not limited to, the students' college major, number of statistics courses taken, mode of delivery, etc. There are numerous studies that examine students' statistics anxiety and what variables affect it, but the same has not been inspected in regard to the students' attitudes and perceptions. A majority of the previous research studies solely focus on either attitudes or perceptions and lack an analysis of how the two may be correlated in the context of statistics courses.

From the previous research, it is shown that a students' learning style may affect how they perform in a statistics course. The students learning style will be investigated to see whether this plays a role in their perceptions or attitudes toward statistics. Many courses are taught a specific way that is conducive to all learning styles, which may lead to the students not enjoying or understanding their statistics course. The students' learning style may also be correlated to their attitude and perception of statistics. This thesis tested for possible correlations between these variables.

HYPOTHESES

Hypothesis 1: The college students' attitudes and perceptions toward statistics will be significantly correlated to the students' learning style.

Hypothesis 2: The college students' attitudes and perceptions toward statistics will be significantly different between class standings.

Hypothesis 3: The college students' attitudes and perceptions toward statistics will be significantly different between the modes of delivery.

Hypothesis 4: The college students' attitudes and perceptions toward statistics will be significantly different between college majors.

METHODS

Participants

The participants for this study were 133 college students. The study was restricted to only college students as this is the scope of the thesis. The participation in the study's survey was completely voluntary. The survey was open to any undergraduate college student regardless of their sex, ethnicity, age, college year or college major. The goal was to gather a sample that is truly representative of the population of undergraduate college students. A majority of the participants were currently a Junior (31.6%) or a Senior (31.6%), with the second highest year in college for participants were Freshmen (18%). Sophomore college student made up 15% of the sample and Graduate students were 3% of the sample. A very large majority of the undergraduate students in this study were a Psychology major (72.2%), with the second highest major being Heath Sciences (22.2%), next were Statistics (3.7%), Nursing (3.7%), Interdisciplinary Studies (3.7%), Biomedical Science (3.7%), and Other (3.7%). Elementary Education (1.5%), International Studies (1.5%), and Mathematics (1.5%) all had 2 participants in the study. Art History (0.8%), Athletic Training (0.8%), Biology (0.8%), Communications (0.8%), Economics (0.8%), English (0.8%), Forensic Sciences (0.8%), Industrial Engineering (0.8%), Journalism (0.8%), Management (0.8%), and Sociology (0.8%) all had 1 participant in the study. There were 78.2% of the participants that took their statistics courses in-person, 6.8% took their courses as a hybrid, and 14.3% took their courses online. There were also 94% of the participants claiming that the statistics course was required for their major. The remaining participants claimed that the statistics course was not required for their specific major.

Research Design

The participants in this study completed a 90 question online survey to assess their demographics, attitude toward statistics, perceptions of statistics, and their learning style. The survey was broken down into four blocks of questions. The first block of questions will ask about the participants' demographics. This will be done to give a better idea what type of student is completing the survey and how these factors could affect the other variables. The second block of question were addressing the students' attitude toward statistics. The third block of questions were assessing the students' perceptions towards statistics. The last block of questions were questions to uncover what the students' learning styles are. The survey was designed for participants to take a maximum of 10 to 15 minutes to complete the entire survey.

Materials

The questions on the survey will be pulled from several articles about attitudes and perceptions toward statistics and learning style types. The questions assessing the college students' statistics attitudes will be taken from Wise (1985) the Attitudes Toward Statistics (ATS). It is a 29-question scale that measures the students' attitudes toward statistics. Each one of the questions on this part of the survey is answered using a Likert scale, which contains five points that range from strongly agree to strongly disagree. The higher the total score, the more positive the attitude is toward statistics. There are two subscales within the ATS. One measures the participant's attitudes toward the field of statistics and the other measures the participant's attitudes toward the course.

The questions assessing the college students' statistics perceptions will be used from Cherney (2003) Mathematics and Statistics Perception Scale (MSPS). It is a 22-question scale

that measures the students' perceptions to statistics. Much like the ATS, each one of the questions on this part of the survey is answered using a Likert scale, which contains six points that range from strongly disagree to strongly agree. The questions were modified to focus more on statistics rather than mathematics as well. The modified scale contained 14 items. The higher the score, the more positive the perception toward statistics is.

The questions that will assess the college students' learning style will come from Barsch (1996) Learning Style Inventory. It is a 32-question scale that measures which of the four types of learning styles the student is most likely to possess. Like the ATS and MSPS, each one of the questions on this part of the survey is answered using a Likert scale. This inventory contains only three points that range from often to rarely. Each is assigned a point value; often is 5 points, sometimes is 3 points, and rarely is 1 point. Questions 2, 7, 10, 14, 16, 22, 26, and 32 are for visual. 1, 5, 8, 11, 18, 21, 24, and 28 are from auditory. Questions 4, 6, 12, 15, 20, 27, 30, and 31 are for tactile. Lastly, questions, 3, 9, 13, 17, 19, 23, 25, and 29 are for kinesthetic. The points for each style of learning are totaled and highest score determines the learning style of the individual. This will be used to test for a possible correlation between the learning style and the students' attitudes and perceptions toward statistics.

The first set of questions is about the students' demographics. These questions will pertain to the number of statistics classes the student has taken, the mode of delivery for the course, the students' major, whether the course was required, class standing, etc. These questions will provide the additional information that is not covered in the previous three scales. These questions will be used to assess a possible correlation between the students' statistics attitudes

and perceptions. No identifiable information was collected from the student, as the survey will remain anonymous.

Procedure

The students at the University of Central Florida were able to access a link to the study materials and survey in Qualtrics through the use of Webcourses and email distribution. Upon entering the survey, participants were asked read and accept the consent to start the survey. After entering the survey, participants were asked to complete a series of questions that addressed their previous experiences with statistics in college; the number of statistics course taken; the mode in which the statistics courses were completed; and the number of friends/followers they had collected across all social media platforms. They completed two open-ended questions asking them to insert a number corresponding to the amount asked in the question. The next 29 questions were a 5-point Likert scale format assessing the participants' attitudes toward statistics. For the next portion of the survey, participants completed a modified version of the 22-question Mathematics and Statistics Perception Scale. The final portion of the survey was the 32-question Learning Styles Inventory, which had answers choices of often, sometimes, and never. Upon submitting the survey, participants were thanked for their participation and the data from the survey was electronically collected. The survey had no time limit and participants could stop and resume the survey at any time. Also, participants were able to withdraw from the survey at any time.

Variables

As stated previously, due to the absence of manipulation of any variables by the researchers, no independent variables are present within this study. The dependent variables

being measured were college student's attitudes and perceptions toward statistics and their learning style. The college students' background with statistics was defined as the number of statistics course taken, the average number of students in their statistics course, their college major, the mode in which the courses were completed, and if the course was required. These questions provide data on the participants' previous/current experiences with statistics. The participants' attitudes toward statistics was determined by using the Attitudes Toward Statistics Scale (Wise, 1985). A high score represented an individual has a more positive attitude toward statistics. The participants' perception toward statistics is defined as their score on a mathematics and statistics perception questionnaire. To measure perception, the Mathematics and Statistics Perception Scale (2003) was used. A lower score on the scale will indicate a more negative perception toward statistics. Participants' learning style was measured using the Barsch Learning Style Inventory (1996). There are three subscales; visual, auditory, tactile, and kinesthetic.

RESULTS

Several statistical analyses were run to determine the descriptive statistics, including the Mean, Standard Deviation, and the Range, for each of the following scales: Attitudes Toward Statistics, Mathematics and Statistics Perception Scale, and the Learning Style Inventory. For the Attitudes Toward Statistics Field subscale, the range was 39.00, *(M = 64.18, SD = 6.758).* For the Attitudes Toward Statistics Course subscale, the range was 31.00, *(M = 24.30, SD = 7.096).* For the adjusted Mathematics and Statistics Perception Scale, the range was 28.00, *(M = 42.43, SD = 5.752).* For the Learning Style Inventory Visual subscale, the range was 10.00, *(M = 12.35, SD = 2.130).* For the Learning Style Inventory Auditory subscale, the range was 11.00, *(M = 15.32, SD = 2.584).* For the Learning Style Inventory Tactile subscale, the range was 12.00, *(M = 14.65, SD = 2.388).* For the Learning Style Inventory Kinesthetic subscale, the range was 16.00, *(M = 14.983, SD = 4.096).*

Table 1: Descriptive Statistics of Scales

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
MSPS	123	28.00	30.00	58.00	42.4309	5.75181	33.083
ATS - Field	128	39.00	40.00	79.00	64.1797	6.75841	45.676
ATS - Course	128	31.00	10.00	41.00	24.3047	7.09614	50.355
LSI Visual	119	10.00	8.00	18.00	12.3529	2.12965	4.535
LSI Auditory	119	11.00	11.00	22.00	15.3193	2.58396	6.677
LSI Tactile	119	12.00	8.00	20.00	14.6471	2.38849	5.705
LSI Kinesthetic	119	16.00	8.00	24.00	14.9832	4.09626	16.779

Descriptive statistics were also completed on how many statistics course taken and the average number of students in the statistics courses. For the number of statistics courses taken,

the range was 21.00, *(M = 1.92, SD = 2.021).* For the average number of students in the statistics course, the range was 395.00 *(M = 128.64, SD = 109.303).*

Table 2: Descriptive Statistics of Number of Courses and Students

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
Number of statistics course taken	132	21.00	.00	21.00	1.9242	2.02134	4.086
Number of students in courses	132	395.00	5.00	400.00	128.6439	109.30280	11947.101

Bivariate Pearson Correlation analyses were computed to analyze whether or not there is a relationship between specific variables. It was determined that there is a positive correlation that is not statistically significant at the 0.10 level between the number of statistics courses taken and the Mathematics and Statistics Perception Scale total *(r = .126, p = .166, ns).* There is a positive correlation that is statistically significant at the 0.01 level between the number of statistics courses taken and Attitudes Toward Statistics Field subscale total *(r = .274, p = .002).* There is a negative correlation that is not statistically significant at the 0.10 level between the number of statistics courses taken and Attitudes Toward Statistics Course subscale total *(r = -.056, p = .534, ns).* There is a negative correlation that is not statistically significant at the 0.10 level between the average number of students in the statistics courses and the Mathematics and Statistics Perception Scale total *(r = -.022, p = .806, ns).* There is a positive correlation that is not statistically significant at the 0.10 level between the average number of students in the statistics courses and the Attitudes Toward Statistics Course subscale *(r = .004, p = .961, ns).* There is a negative correlation that is statistically significant at the 0.01 level between the

average number of students in the statistics courses and the Attitudes Toward Statistics Field subscale *(r = -.229, p = .009).*

There is also a negative correlation that is statistically significant at the 0.05 level between Mathematics and Statistics Perception scale total and the Learning Style Inventory Visual subscale *(r = -.226, p = .014).* There is a positive correlation that is not statistically significant at the 0.10 level between Mathematics and Statistics Perception scale total and the Learning Style Inventory Auditory subscale *(r = .131, p = .157, ns).* There is a positive correlation that is not statistically significant at the 0.10 level between Mathematics and Statistics Perception scale total and the Learning Style Inventory Tactile subscale *(r = .013, p = .891, ns).* There is a negative correlation that is statistically significant at the 0.01 level between Mathematics and Statistics Perception scale total and the Learning Style Inventory Kinesthetic subscale *(r = -.302, p = .001).*

There is a negative correlation that is not statistically significant at the 0.10 level between Attitudes Toward Statistics Field subscale total and the Learning Style Inventory Visual subscale *(r = -.084, p = .365, ns).* There is a positive correlation that is not statistically significant at the 0.10 level between Attitudes Toward Statistics Field subscale total and the Learning Style Inventory Auditory subscale *(r = .003, p = .973, ns).* There is a negative correlation that is not statistically significant at the 0.10 level between Attitudes Toward Statistics Field subscale total and the Learning Style Inventory Tactile subscale *(r = -.098, p = .289, ns).* There is a positive correlation that is not statistically significant at the 0.10 level between Attitudes Toward Statistics Field subscale total and the Learning Style Inventory Kinesthetic subscale *(r = .067, p = .467, ns).*

There is a positive correlation that is statistically significant at the 0.01 level between Attitudes Toward Statistics Course subscale total and the Learning Style Inventory Visual subscale *(r = .275, p = .003).* There is a negative correlation that is not statistically significant at the 0.10 level between Attitudes Toward Statistics Course subscale total and the Learning Style Inventory Auditory subscale *(r = -.102, p = .268, ns).* There is a positive correlation that is not statistically significant at the 0.10 level between Attitudes Toward Statistics Course subscale total and the Learning Style Inventory Tactile subscale *(r = -.044, p = .635, ns).* There is a positive correlation that is not statistically significant at the 0.10 level between Attitudes Toward Statistics Course subscale total and the Learning Style Inventory Kinesthetic subscale *(r = .147, p = .110, ns).*

Table 3: Correlation Matrix

		Number of Classes Taken	Number of Students	MSPS	ATS Field	ATS Course	LSI Visual	LSI Auditory	LSI Tactile	LSI Kinesthetic
Number of Classes Taken	Pearson Correlation	1	-.063	.126	.274**	-.056	-.051	-.015	-.100	-.043
	Sig. (2-tailed)		.475	.166	.002	.534	.579	.876	.278	.642
Number of Students	Pearson Correlation	-.063	1	-.022	.004	-.229**	.020	-.035	-.036	-.020
	Sig. (2-tailed)	.475		.806	.961	.009	.828	.707		.827
MSPS	Pearson Correlation	.126	-.022	1	-.129	-.318**	-.226*	.131	.013	-.302**
	Sig. (2-tailed)	.166	.806		.154	.000	.014	.157	.891	.001
ATSField	Pearson Correlation	.274**	.004	-.129	1	-.286**	-.084	.003	-.098	.067
	Sig. (2-tailed)	.002	.961	.154		.001	.365	.973	.289	.467
ATSCourse	Pearson Correlation	-.056	-.229**	-.318**	-.286**	1	.275**	-.102	.044	.147
	Sig. (2-tailed)	.534	.009	.000	.001		.003	.268	.635	.110
LSIVisual	Pearson Correlation	-.051	.020	-.226*	-.084	.275**	1	-.326**	.211*	.253**
	Sig. (2-	.579	.828	.014	.365	.003		.000	.021	.005

	tailed)									
LSIAuditory	Pearson Correlation	-.015	-.035	.131	.003	-.102	-.326**	1	.190*	.108
	Sig. (2-tailed)	.876	.707	.157	.973	.268	.000		.038	.243
LSITactile	Pearson Correlation	-.100	-.036	.013	-.098	.044	.211*	.190*	1	.271**
	Sig. (2-tailed)	.278	.698	.891	.289	.635	.021	.038		.003
LSIKinesthetic	Pearson Correlation	-.043	-.020	-.302**	.067	.147	.253**	.108	.271**	1
	Sig. (2-tailed)	.642	.827	.001	.467	.110	.005	.243	.003	

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Independent samples t-tests were conducted on the data to compare those who were required to take the statistics courses and those who were not and their attitudes and perceptions toward statistics. When analyzing if the course was required and the Mathematics and Statistics Perception scale, there was not a statistically significant difference at the .100 level between those required to take the courses *(M = 42.61, SD = 5.725)* and those who were not required *(M = 39.43, SD = 5.769); t(121) = 1.428, p = .156, ns.* These results indicate that there is not a difference in perceptions toward statistics for those who were required to take the course and those who were not. When analyzing if the course was required and the Attitudes Towards Statistics Field subscale, there was no statistically significant difference between those required to take statistics *(M = 64.38, SD = 6.334)* and those who were not required *(M =60.71, SD = 12.223); t(6.188) = .787, p = .460, ns*. When analyzing if the course was required and the Attitudes Towards Statistics Course subscale, there was no statistically significant difference between those required to take statistics *(M = 24.31, SD = 7.001)* and those who were not required *(M =24.29, SD = 9.250); t(126) = .006, p = .994, ns.*

ANOVA tests were conducted on the data to compare those in the different class standings, different majors, and mode the course was delivered and their attitudes and perceptions toward statistics. When analyzing class standing and statistics perception, there was not a statistically significant difference at the 0.10 level between groups as determined by one-way ANOVA *(F(4,118) = 1.252, p = .293, ns)*. When analyzing class standing and attitudes toward the statistics field, there was not a statistically significant difference at the 0.10 level between groups as determined by one-way ANOVA *(F(4,123) = 1.689, p = .157, ns)*. When analyzing class standing and attitudes toward the statistics course, there was a statistically significant difference at the 0.10 level between groups as determined by one-way ANOVA *(F(4,123) = 2.050, p = .091)*. Post hoc tests were not performed with class standing since none of the groups showed any differences.

Table 4: Class Standing ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Mathematics and Statistics Perception Scale	Between Groups	164.289	4	41.072	1.252	.293
	Within Groups	3871.873	118	32.812		
	Total	4036.163	122			
Attitudes Toward Statistics - Field	Between Groups	302.064	4	75.516	1.689	.157
	Within Groups	5498.803	123	44.706		
	Total	5800.867	127			
Attitudes Toward Statistics - Course	Between Groups	399.743	4	99.936	2.050	.091
	Within Groups	5995.374	123	48.743		
	Total	6395.117	127			

When analyzing college major and perceptions toward statistics, there was not a statistically significant difference at the 0.10 level between groups as determined by one-way ANOVA *(F(19,103) = .979, p = .491, ns)*. When analyzing college major and attitudes toward the statistics field, there was a statistically significant difference at the 0.01 level between groups as determined by one-way ANOVA *(F(20,107) = 2.114, p = .008)*. When analyzing college major and attitudes toward the statistics course, there was a statistically significant difference at the 0.05 level between groups as determined by one-way ANOVA *(F(20,107) = 1.966, p = .015)*. Post hoc tests were not performed with college major since at least one major had less than two participants.

Table 5: College Major ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Mathematics and Statistics Perception Scale	Between Groups	617.340	19	32.492	.979	.491
	Within Groups	3418.822	103	33.192		
	Total	4036.163	122			
Attitudes Toward Statistics - Field	Between Groups	1643.120	20	82.156	2.114	.008
	Within Groups	4157.747	107	38.857		
	Total	5800.867	127			
Attitudes Toward Statistics - Course	Between Groups	1718.601	20	85.930	1.966	.015
	Within Groups	4676.516	107	43.706		
	Total	6395.117	127			

When analyzing mode of delivery and statistics perception, there was not a statistically significant difference at the 0.10 level between groups as determined by one-way ANOVA *(F(2,120) = 1.119, p = .330, ns).* When analyzing mode of delivery and attitudes toward the statistics field, there was a statistically significant difference at the 0.05 level between groups as determined by one-way ANOVA *(F(2,125) = 3.537, p = .032).* When analyzing mode of delivery and attitudes toward the statistics course, there was a statistically significant difference at the 0.05 level between groups as determined by one-way ANOVA *(F(2,125) = 3.634, p = .029).* Post hoc tests were performed on mode of delivery and attitudes toward the statistics course. Post hoc comparisons for attitudes toward the statistics course using the Tukey HSD test indicated that the mean score for in-person courses *(M = 23.52, SD = 6.933)* was significantly different than the online courses *(M = 28.28, SD = 7.607).* However, the hybrid courses *(M = 25.11, SD = 5.622)* did not significantly differ from the in-person and online courses.

Table 6: Mode of Delivery ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Mathematics and Statistics Perception Scale	Between Groups	73.885	2	36.942	1.119	.330
	Within Groups	3962.278	120	33.019		
	Total	4036.163	122			
Attitudes Toward Statistics - Field	Between Groups	309.890	2	154.945	3.527	.032
	Within Groups	5490.977	125	43.928		
	Total	5800.867	127			
Attitudes Toward Statistics - Course	Between Groups	351.429	2	175.715	3.634	.029
	Within Groups	6043.688	125	48.350		
	Total	6395.117	127			

Multiple Comparisons

Dependent Variable				Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Attitudes Toward Statistics - Field	Tukey HSD	In-person	Hybrid	5.16282	2.30560	.069	-.3060	10.6316
			Online	2.82948	1.69569	.221	-1.1926	6.8516
		Hybrid	In-person	-5.16282	2.30560	.069	-10.6316	.3060
			Online	-2.33333	2.70579	.665	-8.7514	4.0847
		Online	In-person	-2.82948	1.69569	.221	-6.8516	1.1926
			Hybrid	2.33333	2.70579	.665	-4.0847	8.7514
Attitudes Toward Statistics - Course	Tukey HSD	In-person	Hybrid	-1.58636	2.41886	.789	-7.3238	4.1511
			Online	-4.75303*	1.77899	.023	-8.9727	-.5333
		Hybrid	In-person	1.58636	2.41886	.789	-4.1511	7.3238
			Online	-3.16667	2.83871	.506	-9.9000	3.5666
		Online	In-person	4.75303*	1.77899	.023	.5333	8.9727
			Hybrid	3.16667	2.83871	.506	-3.5666	9.9000

*. The mean difference is significant at the 0.05 level.

Table 7: Mode of Delivery Tukey HSD

DISCUSSION

The current study was designed to examine how a college student's attitude and perception toward statistics was related to their learning style. The first hypothesis of this study was that college students' attitudes and perceptions toward statistics would be significantly correlated to the students' learning style. The results of the current study indicated that a college student's attitudes and perceptions were not significantly related to their learning style. There was a positive relationship between a college student's statistics perception and the visual learning style. There was a positive relationship between a college student's attitudes towards the statistics course and the visual learning style. There was a negative relationship between a college student's statistics perception and the kinesthetic learning style.

The second hypothesis of this study was that the college students' attitudes and perceptions toward statistics will be significantly different between class standings. The results of the current study indicated that there is no difference between a freshman, sophomore, junior, senior, or graduate college students and their perceptions toward statistics. There was an uneven representation of each of the class standings, which could have possibly lead to having a specific group of students being underrepresented.

The third hypothesis was that college students' attitudes and perceptions toward statistics will be significantly different between the modes of course delivery. The results of the current study indicated that there is a not significant difference between college students' perception toward statistics between the three course modes of delivery. The results of the current study also indicated that there is a significant difference between college students'

attitudes toward the statistics field and course between the three course modes of delivery. The results indicated that the attitudes toward the statistics course for in-person courses was lower than those who took the online courses. However, the hybrid courses attitudes toward the course were not different from the in-person or the online courses.

The fourth hypothesis was that college students' attitudes and perceptions toward statistics will be significantly different between college majors. The results of the current study indicated that there is a difference between attitudes towards the statistics field for the different college majors. The results of the current study also indicated that there is a difference between attitudes towards the statistics course for the different college majors. The results of the current study indicated that there is not a difference between perceptions toward statistics for the different college majors. The study consisted of about 74% psychology majors and may majors in the sample only had one participants, which may have led to some of the difference between the different majors. It was not possible to get a full representation of every major, especially when there is only one participant of a particular major.

Future studies should continue to explore the relationship between college students' attitudes and perceptions toward statistics and their learning styles. There was a question in the survey pertaining to whether the statistics course was required, but a large majority of students indicated that the course was required. This study was limited in the fact that the sample was biased. There were only 133 total subjects and these subjects were only those students willing to participate in the study. These students could have not answered the questions honestly due to possessing knowledge of the research process or only completing the survey to gain credit. Those only completing the survey to gain credit in the course may not have answered accurately

due to their disinterest in participating. There were also several participants who did not complete the entre survey, which left incomplete responses to the different scales. These specific results may not have occurred if there was a different, more varied sample of undergraduate college students. Future research should aim gain a more diverse sample of college majors. Those students in a major that rely heavily on statistics could skew the results. There was a sizable percentage of college students that completed their statistics course in-person and a very small number who took a hybrid course. Future research should attempt to get a more even distribution between the modes of delivery for the statistics courses.

In a general view of this study, the rejection of some of the projected hypothesis and being unable to reject other warrants further examination of this topic, particularly concerning previous literature analyzing learning styles and statistics. These topics have not been thoroughly researched and this thesis only provides a brief insight to the relationship between these two aspects. Hopefully college educators of statistics are able to use this knowledge to better understand their student. This could lead students to leave their statistics course feeling more positively about statistics as a whole.

APPENDIX A: CONSENT

You are invited to participate in a web-based online survey about college students' attitudes and perceptions toward statistics. The purpose of this study is to better understand how college students' demographics affect their attitudes and perceptions toward statistics. You were selected as a possible participant in this study because you are a college student who has completed one or more statistics course that can provide this study with valuable data. If you decide to participate, please complete the following survey. Your completion of this survey indicates your consent to participate in this research study. The survey is designed to explore your college background and your attitudes and perceptions toward statistics. The survey consists of 85 short and simple questions. It will take about 10 to 15 minutes. Questions will be included to verify you are completing the survey to the best of your knowledge. You will be asked to answer questions about your demographics, such as age and sex, your major, learning style, and questions to gauge your overall attitude and perception toward statistics. No information will be collected about your overall performance in your classes. Your responses will be used to help uncover a possible correlation between college students' attitudes and perceptions toward statistics and their learning style. Any discomfort or inconvenience to you is minimal, but it is not expected to be any greater than anything you encounter in your daily life. Again, if you decide to participate, you are free to stop at any time and you may choose not to complete the survey. Your participation in the study is voluntary and you have the right to withdraw at any time should you object to the nature of the research. Do not skip any questions and give your best answer if you are unsure of your response. All of your responses will be kept completely confidential. No identifiable information will be collected from you, i.e. name, address, etc. Please feel free to address any questions or concerns you may have regarding this study to Drew Doyle at drewdoyle@knights.ucf.edu. Thank you for your time and interest in our study.

Respectfully,

Drew Doyle

By selecting "I agree", I consent to having read this form and have decided that I will participate in the project described above. Its general purposes, the particulars of involvement, and possible risks and inconveniences have been explained to my satisfaction. I understand that I can discontinue participation at any time. Please select an option to proceed.

- ❍ I agree
- ❍ I disagree

Condition: I disagree Is Selected. Skip To: End of Survey.

APPENDIX B: SURVEY

This set of questions is designed to get a better idea of your previous experiences with statistics and your demographic background.

Have you previously enrolled in/completed a statistics course or are currently enrolled in one?
- ❍ Yes
- ❍ No

Condition: No Is Selected. Skip To: End of Survey.

How many statistics course have you taken? Please use numbers only.

_____

Was the statistics course(s) required for your degree?
- ❍ Yes
- ❍ No

What was the main mode of delivery for your statistics courses?
- ❍ In-person
- ❍ Hybrid
- ❍ Online

What was the average number of students in your statistics course(s)? Please use numbers only.

_____

What is your college major? (If more than one, select your primary major)

- ❍ Accounting
- ❍ Advertising - Public Relations
- ❍ Aerospace Engineering
- ❍ Anthropology
- ❍ Architecture
- ❍ Art - Emerging Media Track
- ❍ Art - History Track
- ❍ Art - Studio Art Track
- ❍ Art - Studio Track
- ❍ Art - Visual Arts and Emerging Media Management Track
- ❍ Art Education
- ❍ Athletic Training
- ❍ Biology
- ❍ Biomedical Sciences
- ❍ Biomedical Sciences - Preprofessional Concentration
- ❍ Biotechnology
- ❍ Chemistry
- ❍ Chemistry - Biochemistry Track
- ❍ Civil Engineering
- ❍ Communication & Conflict
- ❍ Communication Sciences and Disorders
- ❍ Computer Engineering
- ❍ Computer Science
- ❍ Construction Engineering
- ❍ Criminal Justice
- ❍ Criminal Justice - Scholar's Track
- ❍ Digital Media
- ❍ Early Childhood Development and Education Track 1: Education: Pre-Kindergarten - Primary (PK-3)
- ❍ Early Childhood Development and Education Track 2: Early Childhood Development
- ❍ Early Childhood Development and Education Track 3: Early Childhood Careers
- ❍ Economics
- ❍ Economics, Business
- ❍ Electrical Engineering
- ❍ Elementary Education
- ❍ English - Creative Writing
- ❍ English - Literature

- English - Technical Communication
- English Language Arts Education
- Entertainment Management
- Environmental Engineering
- Event Management
- Film
- Film - Cinema Studies Track
- Finance
- Forensic Science - Analysis Track
- Forensic Science - Biochemistry Track
- French
- Health Informatics and Information Management
- Health Sciences - Pre-Clinical Track
- Health Services Administration
- History
- Hospitality Management
- Human Communication
- Humanities and Cultural Studies
- Industrial Engineering
- Information Technology
- Integrated Business
- Interdisciplinary Studies
- Interdisciplinary Studies - Environmental Studies Track
- International and Global Studies
- Journalism
- Latin American Studies
- Legal Studies
- Management
- Marketing
- Mathematics
- Mathematics Education
- Mechanical Engineering
- Medical Laboratory Sciences
- Music
- Music - Jazz Studies Track
- Music - Music Composition Track
- Music - Music Performance Track
- Music Education

- Nursing
- Nursing - Concurrent A.S.N. to B.S.N. Enrollment Option
- Nursing - R.N. to B.S.N. Program
- Philosophy
- Photography
- Photonic Science and Engineering
- Physics
- Physics
- Political Science
- Political Science - Prelaw Track
- Psychology
- Public Administration
- Radio - Television
- Real Estate
- Religion and Cultural Studies
- Restaurant and Foodservice Management
- Science Education - Biology
- Science Education - Chemistry
- Science Education - Physics
- Social Science Education
- Social Sciences
- Social Work
- Sociology
- Spanish
- Sport and Exercise Science
- Statistics
- Technical Education and Industry Training
- Theatre - Acting Track
- Theatre - Design and Technology Track
- Theatre - Musical Theatre Track
- Theatre - Stage Management Track
- Theatre Studies
- World Languages Education - Spanish
- Writing and Rhetoric
- Other not listed

What is your current class standing?

- ❍ Freshman
- ❍ Sophomore
- ❍ Junior
- ❍ Senior
- ❍ Graduate Student

For each of the following statements, mark the rating category that most indicates how you currently feel about the statement. Please respond to all of the items to the best of your knowledge. Indicate using one of the following for each statement: Strongly Disagree, Disagree, Neutral, Agree, or Strongly Agree

I feel that statistics will be useful to me in my profession.

- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neutral
- ❍ Agree
- ❍ Strongly Agree

The thought of being enrolled in a statistics course makes me nervous.

- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neutral
- ❍ Agree
- ❍ Strongly Agree

A good researcher must have training in statistics.

- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neutral
- ❍ Agree
- ❍ Strongly Agree

Statistics seems very mysterious to me.

- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neutral
- ❍ Agree
- ❍ Strongly Agree

Most people would benefit from taking a statistics course.

- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neutral
- ❍ Agree
- ❍ Strongly Agree

I have difficulty seeing how statistics relates to my field of study.

- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neutral
- ❍ Agree
- ❍ Strongly Agree

I see being enrolled in a statistics course as a very unpleasant experience.

- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neutral
- ❍ Agree
- ❍ Strongly Agree

I would like to continue my statistical training in an advanced course.

- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neutral
- ❍ Agree
- ❍ Strongly Agree

Statistics will be useful to me in comparing the relative merits of different objects, methods, programs, etc.

- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neutral
- ❍ Agree
- ❍ Strongly Agree

Statistics is not really very useful because it tells us what we already know anyway.

- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neutral
- ❍ Agree
- ❍ Strongly Agree

Statistical training is relevant to my performance in my field of study.

- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neutral
- ❍ Agree
- ❍ Strongly Agree

I wish that I could have avoided taking my statistics course.

- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neutral
- ❍ Agree
- ❍ Strongly Agree

Statistics is a worthwhile part of my professional training.

- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neutral
- ❍ Agree
- ❍ Strongly Agree

Statistics is too math oriented to be of much use to me in the future.

- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neutral
- ❍ Agree
- ❍ Strongly Agree

I get upset at the thought of enrolling in another statistics course.
- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neutral
- ❍ Agree
- ❍ Strongly Agree

Statistical analysis is best left to the "experts" and should not be part of a lay professional's job.
- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neutral
- ❍ Agree
- ❍ Strongly Agree

Please select "Disagree" as your response.
- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neutral
- ❍ Agree
- ❍ Strongly Agree

Statistics is an inseparable aspect of scientific research.
- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neutral
- ❍ Agree
- ❍ Strongly Agree

I feel intimidated when I have to deal with mathematical formulas.
- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neutral
- ❍ Agree
- ❍ Strongly Agree

I am excited at the prospect of actually using statistics in my job.

- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neutral
- ❍ Agree
- ❍ Strongly Agree

Studying statistics is a waste of time.

- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neutral
- ❍ Agree
- ❍ Strongly Agree

My statistical training will help me better understand the research being done in my field of study.

- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neutral
- ❍ Agree
- ❍ Strongly Agree

One becomes a more effective "consumer" of research findings if one has some training in statistics.

- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neutral
- ❍ Agree
- ❍ Strongly Agree

Training in statistics makes for a more well-rounded professional experience.

- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neutral
- ❍ Agree
- ❍ Strongly Agree

Statistical thinking can play a useful role in everyday life.
- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neutral
- ❍ Agree
- ❍ Strongly Agree

Dealing with numbers makes me uneasy.
- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neutral
- ❍ Agree
- ❍ Strongly Agree

I feel that statistics should be required early in one's professional training.
- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neutral
- ❍ Agree
- ❍ Strongly Agree

Statistics is too complicated for me to use effectively.
- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neutral
- ❍ Agree
- ❍ Strongly Agree

Statistical training is not really useful for most professionals.
- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neutral
- ❍ Agree
- ❍ Strongly Agree

Statistical thinking will one day be as necessary for efficient citizenship as the ability to read and write.

- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neutral
- ❍ Agree
- ❍ Strongly Agree

For each of the following statements please indicate your agreement or disagreement. Please indicate using one of the following for each statement: Strongly Disagree, Disagree, Neither Agree nor Disagree, Agree, or Strongly Agree.

I am confident in my mathematics skills.

- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neither Agree nor Disagree
- ❍ Agree
- ❍ Strongly Agree

I enjoy doing hand calculations.

- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neither Agree nor Disagree
- ❍ Agree
- ❍ Strongly Agree

I like using mathematical formulas.

- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neither Agree nor Disagree
- ❍ Agree
- ❍ Strongly Agree

I understand why we need mathematics in everyday life.

- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neither Agree nor Disagree
- ❍ Agree
- ❍ Strongly Agree

Statistics make me nervous.
- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neither Agree nor Disagree
- ❍ Agree
- ❍ Strongly Agree

I enjoy working with numbers.
- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neither Agree nor Disagree
- ❍ Agree
- ❍ Strongly Agree

It is unlikely that I will use statistics in my future job.
- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neither Agree nor Disagree
- ❍ Agree
- ❍ Strongly Agree

Statistics is my least favorite subject.
- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neither Agree nor Disagree
- ❍ Agree
- ❍ Strongly Agree

Statistics are unimportant for my career.
- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neither Agree nor Disagree
- ❍ Agree
- ❍ Strongly Agree

Mathematics comes easy to me.
- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neither Agree nor Disagree
- ❍ Agree
- ❍ Strongly Agree

I am scared of statistics.
- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neither Agree nor Disagree
- ❍ Agree
- ❍ Strongly Agree

I expect to do well in a statistics course.
- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neither Agree nor Disagree
- ❍ Agree
- ❍ Strongly Agree

Statistics is a useful skill in everyday life
- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neither Agree nor Disagree
- ❍ Agree
- ❍ Strongly Agree

Please select "Agree" as your response.
- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neither Agree nor Disagree
- ❍ Agree
- ❍ Strongly Agree

I expect statistics to be relatively easy.

- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Neither Agree nor Disagree
- ❍ Agree
- ❍ Strongly Agree

For each of the following statements please indicate the frequency in which you perform the action. Please indicate using one of the following for each statement: Often, sometimes, or never.

I remember more about a subject by listening than reading.

- ❍ Often
- ❍ Sometimes
- ❍ Never

I find it easier to follow directions when written vs. given orally.

- ❍ Often
- ❍ Sometimes
- ❍ Never

I perform new physical skills or movements quickly and with few errors.

- ❍ Often
- ❍ Sometimes
- ❍ Never

I bear down extremely hard on a pen/pencil when writing

- ❍ Often
- ❍ Sometimes
- ❍ Never

I require explanations of diagrams, graphics, charts, or visual directions.

- ❍ Often
- ❍ Sometimes
- ❍ Never

I enjoy working with tools.

- ❍ Often
- ❍ Sometimes
- ❍ Never

Please select "Never" as your response.
- ❍ Often
- ❍ Sometimes
- ❍ Never

I am skillful with and enjoy making graphs, charts, and diagrams.
- ❍ Often
- ❍ Sometimes
- ❍ Never

I can tell if sounds match when presented with a pair of them.
- ❍ Often
- ❍ Sometimes
- ❍ Never

I can watch someone do a dance step and copy it easily.
- ❍ Often
- ❍ Sometimes
- ❍ Never

I can understand directions on maps and follow them easily.
- ❍ Often
- ❍ Sometimes
- ❍ Never

I do better in academic subjects that rely mainly on listening to lectures and tapes.
- ❍ Often
- ❍ Sometimes
- ❍ Never

I commonly play with keys, change, or other objects in my pocket.
- ❍ Often
- ❍ Sometimes
- ❍ Never

I enjoy perfecting a movement in a sport or in dancing.
- ❍ Often
- ❍ Sometimes
- ❍ Never

I can better understand by reading about news in the paper rather than listening to it on the radio.
- ❍ Often
- ❍ Sometimes
- ❍ Never

I chew gum, smoke, or snack while studying
- ❍ Often
- ❍ Sometimes
- ❍ Never

The best way for me to remember something is to picture it in my head.
- ❍ Often
- ❍ Sometimes
- ❍ Never

I enjoy activities where I am aware of my body's movement.
- ❍ Often
- ❍ Sometimes
- ❍ Never

I would rather listen to a lecture or speech than read the same material in a textbook.
- ❍ Often
- ❍ Sometimes
- ❍ Never

I consider myself athletic.
- ❍ Often
- ❍ Sometimes
- ❍ Never

I am likely to have something in my hands when studying.
- ❍ Often
- ❍ Sometimes
- ❍ Never

I prefer listening to the news on radio rather than reading about it.
- ❍ Often
- ❍ Sometimes
- ❍ Never

I like to get information on interesting subjects by reading.

- ❍ Often
- ❍ Sometimes
- ❍ Never

I am highly aware of sensations and feelings in my hips and shoulders after learning new skills or movements.

- ❍ Often
- ❍ Sometimes
- ❍ Never

I follow oral directions better than written ones.

- ❍ Often
- ❍ Sometimes
- ❍ Never

It is easy for me to memorize something when I can use my body in some way.

- ❍ Often
- ❍ Sometimes
- ❍ Never

I prefer to write down things I have to remember.

- ❍ Often
- ❍ Sometimes
- ❍ Never

I remember better when writing things down over and over.

- ❍ Often
- ❍ Sometimes
- ❍ Never

I learn to spell better by repeating letters aloud than by writing the words.

- ❍ Often
- ❍ Sometimes
- ❍ Never

I can frequently visualize body movements to perform tasks such as swinging a golf club or dancing.

- ❍ Often
- ❍ Sometimes
- ❍ Never

I learn spelling best by tracing over letters.

- ❍ Often
- ❍ Sometimes
- ❍ Never

I feel comfortable touching, hugging, shaking hands, etc.

- ❍ Often
- ❍ Sometimes
- ❍ Never

I am good at working out and solving jigsaw puzzles.

- ❍ Often
- ❍ Sometimes
- ❍ Never

REFERENCES

Cherney, I. D., & Cooney, R. R. (2005). Predicting student performance in a statistics course using the mathematics and statistics perception scale. *Transactions of the Nebraska Academy of Sciences and Affiliated Societies*. Paper 41.

González, A., Rodríguez, Y., Faílde, J. M., & Carrera, M. V. (2016). Anxiety in the statistics class: Structural relations with self-concept, intrinsic value, and engagement in two samples of undergraduates. *Learning And Individual Differences*, *45*214-221. doi:10.1016/j.lindif.2015.12.019

Haughton, J., & Kelly, A. (2015). Student performance in an introductory business statistics course: Does delivery mode matter?. *Journal Of Education For Business*, *90*(1), 31-43. doi:10.1080/08832323.2014.968518

Hudak, M. A., & Anderson, D. E. (1990). Formal operations and learning style predict success in statistics and computer science courses. *Teaching Of Psychology*, *17*(4), 231-234. doi:10.1207/s15328023top1704_4

Jepsen, D. M., Varhegyi, M. M., & Teo, S. T. (2015). The association between learning styles and perception of teaching quality. *Education & Training*, *57*(5), 575-587. doi:10.1108/ET-02-2014-0005

Lester, D. (2016). Predicting success in psychological statistics courses. *Psychological Reports*, *118*(3), 772-777. doi:10.1177/0033294116647687

Neumann, D., Hood, M., & Neumann, M. M. (2013). Using real-life data when teaching statistics: Student perceptions of this strategy in an introductory statistics course. *Statistics Education Research Journal*, *12*(2), 59-70.

Nolan, M. M., Beran, T., & Hecker, K. G. (2012). Surveys assessing students' attitudes toward statistics: A systematic review of validity and reliability. *Statistics Education Research Journal*, *11*(2), 103-123.

Onwuegbuzie, A. J. (1998). Statistics anxiety: A function of learning style?. *Research In The Schools*, *5*(1), 43-52.

Roberts, D. 1., & Reese, C. M. (1987). A comparison of two scales measuring attitudes towards statistics. *Educational & Psychological Measurement*, *47*759-764. doi:10.1177/001316448704700329