Math: An Equal Opportunity Subject?

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Abstract

The present study analyzes the possible effects of negative stereotypes/attitudes regarding females in mathematics and how they may affect performance. The study further evaluates possible intervention for the aforementioned effects in terms of the transmission of information regarding the malleability of intelligence and historical facts concerning female mathematical achievement. This study utilized 103 participants from Marywood University (66 Females, 27 Males). The current study was of a pre-test and post-test design. Participants were asked to complete the Third International Mathematics and Science Study (TIMSS) and Fennema-Sherman Mathematics Attitudes Scale (MAS) at each testing. Participants were randomly assigned to one of two experimental groups (Historical Female Achievement or Nature of Intelligence) or a control group. Participants underwent a two-week PowerPoint review of mathematics with the specific factors of their group embedded in the review. Some of the significant results that were found include the Male Domain Scale (MD), Anxiety Scale (A), and Confidence Scale (C) of the MAS. An unexpected result found involved the use of the Historical Female Achievement and Nature of Intelligence experimental conditions with males. Males benefitted from a large reduction in their stereotypical thoughts regarding females when in these group (Control M=37.250, Historical Female Achievement M= 50.334, Nature of Intelligence M=50.714). This study resulted in further support for the concept of a relationship between negative attitudes and mathematical performance, as well as emphasized possible expressions of stereotype threat in terms of the three aforementioned MAS scales.

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Introduction

Young Delilah slowly trudged up to her first grade teacher to talk about her latest math quiz score. When she reached the desk, Ms. Hunsberger asked Delilah why she was suddenly doing so poorly in regards to her math work. Math had always been Delilah's best subject. When questioned, Delilah looked toward Ms. Hunsberger and replied, "I can't do math…only boys can do math." It would seem that little Delilah had unfortunately fall victim to the hazard that all females may face in mathematics…stereotype threat.

While anecdotic in nature, there is some truth to the above story of Delilah. It has been documented in several studies that females perform worse on mathematical tasks when under stereotype threat conditions (Ben-Zeev et al., 2005; Good et al., 2003; Keller, 2007; Spencer et al., 1999). According to Steele, this phenomenon can be attributed to Stereotype Threat Theory (STT). According to STT, the gender differences in performance produced by negative stereotypes should be reduced as the negative stereotype is turned into an irrelevant one (Steele, 1997). Spencer and his colleagues point out that negative stereotype regarding groups of people are commonly known in the entire society, thus individuals who may embody these negative stereotypes gain an awareness of them. Consequently, these individuals face extra pressure that an action may be misconstrued as confirming the stereotype, and they will then always be judged through the lens of that stereotype (Spencer et al., 1999). Studies conducted by Eccles, Jacobs & Harold (1990), Fennema & Sherman (1977), and Jacobs & Eccles (1986), have all demonstrated that the idea of females being unable to perform mathematics well is a commonly and widely held stereotype.

In 1999, Spencer and his colleagues conducted a study to assess the relationship between gender differences in mathematical performance and stereotype threat conditions. It was found that when stereotype threat conditions were lowered, gender differences in performance were lowered to the point that they became negligible. The gender differences observed under stereotype threat conditions were considerable, and female performance paled in comparison to that of equally qualified males. These results were replicated in both highly selective and less selective populations. Another result of their study indicated that females perform worse on difficult math items as compared to easy items (Spencer et al., 1999). Hyde, Fennema, & Lamon (1990), Kimball (1989), and Steinkamp & Maehr (1983), similarly, found that females tended to perform worse on more advanced and difficult mathematical material. A study was completed that also found that females performed worse, under stereotype threat conditions, when completing threat-irrelevant tasks (Ben-Zeev et al., 2005). A caveat to these findings is that stereotype threat, and its effects, can occur even on tests with easy tasks. Spencer and his colleagues felt that their study, in combination with the most current research, have supplied “compelling evidence” to further the contention that a reduction in stereotype threat can result in an increase in female math performance (Spencer et al., 1999).

Several researchers have pointed out the importance of stereotype threat with academic achievement. In accordance with STT, Aronson (1999) and Leyens, Désert, Croizet, & Darcis (2000), have found that stereotype threat is more likely to affect those who highly identified themselves with the domain. Major, Spencer, Schmader, Wolfe, & Crocker (1998), as well as Steele (1997), have noted that stereotype threat leads to a great deal of pressure, and consequently, to female “disidentification” with mathematics. A study conducted by Kiefer and Shih indicated that when women suffered from stereotype threat and attributed poor performance to ability in mathematics, their desire to persist in mathematics was decreased (Kiefer & Shih, 2006). A consequence that naturally follows, in accordance with STT, is that female “disidentification” and lack of persistence with the domain of mathematics helps to continue the cycle of negative stereotypes regarding females in mathematics. It is then important to note that several studies have concluded that gender differences start to be seen when students are at the high school or college level and taking more difficult courses (Spencer et al., 1999). Now that one can understand the implications of stereotype threat and the period in which its effects may be seen, it is important to look to ways of nullifying the negative outcomes.

Keller has noted that few studies have been conducted in “real-life settings” to evaluate stereotype threat and ways to decrease it (Keller, 2007). Spencer and his colleagues demonstrated through their study that something as simple as describing a test to produce or not produce gender differences can be used as a way of decreasing or increasing performance, respectively (Spencer et al., 1999). While rooted in similar beliefs of STT, Good and her colleagues conducted a more extensive study to determine ways to nullify the negative effects of stereotype threat for females in mathematics. Good and her colleagues looked to pejorative thoughts and how they affected performance of females in mathematics (Good et al., 2003). Wilson and Linville have indicated that pejorative thoughts created an unending cycle which allows poor performance to continue (1985). According to Aronson et al., stereotype threat allows individuals to enter a temporary entity-theory mind-set (the belief that intelligence is static) which can only be overcome through an incremental-theory mind-set (the belief that intelligence is expandable) (2002). Many researchers, including Dweck & Sorich (1999), Jourden, Bandura, & Banfield (1991), as well as Martocchio (1994), have indicated that entity-theory places individuals at a higher risk of poor academic outcomes. As such, Good and her colleagues focused their research on methods to shift pejorative interpretations of failure to non-pejorative ones. For their study, they used an intervention that focused on the expandable nature of intelligence. When the participants began to make non-pejorative attributions and moved toward and incremental-theory mind-set the gender gap in performance between males and females greatly decreased. Females who underwent this intervention also performed significantly better on standardized math exams than compared with females in the control groups (Good et al., 2003).

While research has begun to be conducted in regards to the effects of negative stereotypes for females in mathematics, it is still a relatively new field of study. The research does demonstrate an awareness of the fact that negative effects may be a result of stereotypes, but researchers have yet to come to a conclusion as to what methods will best aid in the reduction of these negative effects on performance. With the aforementioned evidence in mind, the contention of this study will be to assess how negative attitudes and stereotypes regarding females in mathematics may affect performance and what interventions may aid in the reduction of any negative effects. The results of this initial study will provide invaluable data to further research into the connections between negative stereotypes/attitudes toward females in mathematics, academic performance, and appropriate interventions.

Hypothesis/ Research Questions

The hypothesis of this study is that negative attitudes and negative stereotypes regarding females in mathematics may affect performance; furthermore, intervention, may aid in the reduction of negative attitudes and negative stereotypes, thereby increasing performance. Additionally, this study questions the interaction of mathematical review, transmission of information regarding the malleability of intelligence and history of female achievements in mathematics with performance of those affected by negative attitudes and stereotype threat regarding females in mathematics.

Methods

Participants and Design

This study was conducted at Marywood University and participants were recruited from several mathematics courses. The selected courses represented a range of difficulty including lower level university core courses as well as upper level courses typically reserved for mathematics majors. A total of 103 students agreed to participate in this study. These students had a mean age of 20.1 years, completed 2 math courses on average, and had an average math GPA of 3.0. The most frequent level of education for both their mothers and fathers was the completion of high school. These students underwent an initial testing which consisted of a modified Third International Mathematics and Science Study (TIMSS) quiz and the Fennema-Sherman Mathematics Attitudes Scales (MAS). The students were randomly assigned one of three conditions of math review (historic female achievement in mathematics, nature of intelligence, or random fact control). Participants were asked to complete a two-week PowerPoint math review that was modified according to the condition they were assigned. At the end of the two weeks, participants were retested with a comparative modified TIMSS quiz and MAS. Only scores of students who participated at both testing times were included, of which there were 93 participants (66 females and 27 males).

Procedure

Prior to the start of this investigation, permission was obtained from Marywood University's Institutional Review Board, the mathematics department head, and three full time Marywood university mathematics professors, who taught the classes which the participants were recruited. Also prior to the start of this investigation, appropriate signatures were obtain from three full time professors of the mathematics department showing approval of a newly developed mathematics review PowerPoint. Once appropriate approval was gained, the researcher went into each of six courses to recruit participants. The research took place in the participants regularly schedule class in their typical meeting room, in an attempt to maintain the naturalistic setting of the study and recreation of a realistic testing situation. The professor was asked to leave the room prior to the start of any part of the investigation. The research questions and goals of the study were briefly explained as well as possible benefits and risks of participation to all students. If the student decided to participate, they were asked to read and sign a consent form. A demographics packet along with the modified TIMSS and MAS were then handed out. The participants were asked to complete the MAS prior to starting the TIMSS. The students were given approximately one hour to complete their materials, at which point, they were asked to return all materials in a sealed envelope to the researcher. As included in their demographics packets, the participants were notified by email within 24 hours which group they were assigned to and were sent the corresponding PowerPoint. Participants were given approximately two weeks to complete their PowerPoint review, at which point, the researcher returned to all classes and retested the participants under the aforementioned conditions. At the post-testing, participants received a comparable TIMSS in order to avoid student memorization of the previous material.

Materials

Math Review.

As part of each experimental and control condition, the participants were given a PowerPoint review consisting of 41 slides of basic mathematical concepts. This math review went over several topics that are assumed to be part of the typical college student's mathematical repertoire. Topics included: how to solve word problems and linear equations, order of operations, fractions, ratios, exponents, and properties of the aforementioned items. Throughout each section, participants were offered the chance to review example problems, as well as solve problems through an interactive process. As per IRB policy, this math review was evaluated by three full time Marywood Mathematics professors and given approval as a tool for the review of basic mathematical concepts expected to be known when entering a university level class.

Conditions

Historic Female Achievement in Mathematics.

Of the participants included in the data analysis, 29 of them were subjected to the Historic Female Achievement in Mathematics condition. Slides were created, and embedded in the basic math review, with the hopes of garnering awareness in the participants to some of the beginning steps of female involvement in mathematics, as well as some of the most recent achievements. Brief histories of seven more famous female mathematicians were included. Mentioned mathematicians included Hertha Marks Ayrton, Sr. Mary Celine Fasenmyer, Charlotte Angas Scott, Ingrid Daubechies, Anna Johnson Pell Wheeler, Winifred Edgerton Merrill, and Florence Nightingale. Of these noteworthy women, special attention was paid to certain historic firsts in their mathematical careers. Scott was the first female to receive a doctorate in mathematics in England, as well as a “pioneer” for the advancement of women in the field. Similarly, Merrill was the first American female to earn a doctorate in mathematics. Pell Wheeler was the first woman to give the Colloquium Lectures at the American Mathematics Society in 1927, and held the distinction of being the only female to do so until 1980. Of the more recent female mathematical achievements, Daubechies not only became the first female full time professor at Princeton in 1993, but she also became the first female to win the National Academy of Science’s award in mathematics in 2000. All of these events were given special attention in an attempt to increase the likelihood of the reduction of stereotype that females are less capable than men in mathematics.

Nature of Intelligence.

Of the participants included in the data analysis, 34 of them were subjected to the Nature of Intelligence condition. Slides were created, and embedded in the basic math review, in hopes of instilling the idea of the expandable and malleable nature of intelligence. Included in these slides were descriptions of the abilities the brain, recent research into brain training and possible treatments to boost intelligence, as well as brain development. Also included were analogies meant to increases the participants sense of control over their own level of intelligence. Examples included comparing the brain to a muscle and the implication that it too can develop with practice as well as comparing intelligence to plants and the implication that they need to be nurtured in order to cultivate. All of the included facts were meant to attempt to increase the participant's view of intelligence as being expandable and malleable according to the level of effort the participant puts towards its development.

Random Fact Control.

Of the participants included in the data analysis, 30 of them were subjected to the Random Fact Control condition. Slides were created, and embedded in the basic math review, in order to be a comparative control group. The included slides merely contained random knowledge and were added to the math review in order to have an effective control group. The extra slides included were of the same number as included in the previous two experimental conditions. These slides expressly avoided any mention to female mathematicians, the brain, or intelligence.

Dependent Measures

TIMSS.

The Third International Mathematics and Science Study (TIMSS) is a research project completed by the International Association for the Evaluation of Educational Achievement (IEA). Over 40 countries and over half a million students worldwide participate in this evaluation. It has been hailed as the "largest and most ambitious study of comparative educational achievement" (Garden, 1996). Experts in mathematics across the global (Garden, 1996) and educational researchers from over 50 nations (Martin, 1996) aided in the development of the TIMSS, and distinguished scholars from 10 nations served upon a Subject Matter Advisory Committee to make certain that items on the TIMSS reflected the current priorities in mathematics. The TIMSS then underwent extensive piloting in 43 nations and received approval by the National Research Council in all participating countries (Garden, 1996).

The Modified TIMSS used in this study was constructed from formats of the test given internationally to students entering their 7th or 8th grade and their final year of secondary education. The test was shortened to fit into the allotted class time; thus, both the first and second quiz consisted of 13 questions. As part of the TIMSS analysis of results, each question has a corresponding international difficult index rating. In order to create comparable quizzes, the international difficulty index was used, and questions were selected so that both quizzes had approximately the same total international difficulty index. While most of the questions were of a multiple choice nature, some free response questions were added to the quizzes in an attempt to be as reflective of the TIMSS as possible. Where free response questions were used, guidelines that corresponded to each question was used to accurately grade the answer as the TIMSS would have. Scores were then converted to percentages and a direct comparison was allowable due to the comparable nature of the first and second quiz.

MAS.

The Mathematics Attitudes Scales (MAS) was developed by Fennema and Sherman in 1976 in order to evaluate a student's overall attitude towards mathematics. The MAS consists of nine scales. The scales include the Attitude toward success in Mathematics Scale (AS), Male Domain Scale (MD), Mother Scale (M), Father Scale (F), Teacher Scale (T), Confidence in Learning Mathematics Scale (C), Mathematics Anxiety Scale (A), Effectance Motivation Scale (E), and Mathematics Usefulness Scale (U). The Attitude toward success in Mathematics Scale is used to evaluate whether or not participants view the consequences of success in mathematics as positive or negative. The Male Domain Scale is intended to evaluate participant's views of mathematics as being a male, female, or neutral domain. This scale assess the aforementioned by looking at participant's views of the ability of each sex in mathematics, the masculinity or femininity of those successful in mathematics, and the degree of appropriateness for a particular sex to participate in mathematics. The Mother and Father Scales are each used to determine the participant's belief of parental interest, encouragement, and confidence in the participant's capabilities in mathematics. The Teacher Scale is intended to determine the participant's evaluation of how their teacher views them as a "learner" of mathematics. The Confidence in Learning Mathematics Scale is used to determine the level of confidence the participant has in his or her own mathematical abilities. The Mathematics Anxiety Scale determines the levels of anxiety, dread, and nervousness that are a result of mathematics. It is important to note that this is an entirely distinctive scale, and does not measure aspects contained within the Confidence in Learning Mathematics Scale. The Effectance Motivation Scale determines the level of involvement the participant has with mathematics. The Mathematics Usefulness Scale is intended to measure the extent to which the participant's feels mathematics is useful for present and future situations. Each of the previously mentioned scales contain 6 positively worded questions and 6 negatively worded questions that are scored on a 5 point Likert scale of agreement. A higher score on all scales reflect a more positive attitude toward mathematics. It is important to note that a higher score on the Male Domain Scale is indicative of a less stereotyped view of mathematics.

The MAS developed by Fennema and Sherman has stood the test of time due in part to the excellent construction of the scales. The MAS has been referred to as, "one of the most frequently used instruments for measuring attitudes in mathematics" (Meyer & Koehler, 1990). During the MAS' initial construction Fennema and Sherman paid particular attention to the validity of the scales. The items were initially written independently by the authors and separately judged to ensure they accurately represented the dimension described. This, in combination with the definition of each scale, led to good construct validity. Additionally, Fennema and Sherman found the split-half reliabilities that were calculated for each scale fell into a range of .86-.93. Inter-scale correlations were also computed and showed that, while the scales were related, they each measured a “somewhat different construct” (Fennema & Sherman, 1976). Additional research, in more recent years, has attested to the reliability and validity of the MAS. Broadbooks and colleagues indicate that the MAS has construct validity and that there is support for the theoretical structure of the MAS (Broadbooks et. al., 1981). A validity analysis conducted in schools in the Republic of Ireland revealed a cronbach alpha coefficient of .96 across the MAS subscales, similar to initial findings (Borg & Gall, 1996). All of the present research presented suggests that the MAS subscales are still a viable scale to use to determine mathematical attitudes of students. As such, all of the subscales were used in this particular study, and they were used in their original and entire version.

Results

Correlations

Several noteworthy and significant correlations appeared in regards to the MAS, TIMSS performance, and demographic information provided by the participants. The most interesting correlation found in this study was the correlation between MD1 (Male Domain Pre-test) and MD2 (Male Domain Post-test) ($r=.59$, $p<.05$) in comparison to the correlations of all other MAS scales at pre-testing and post-testing (See Table 1 Below for correlations and Appendix A-F for descriptive statistics). The major intention of this study was to observe the effects the treatment conditions had on stereotype threat and performance. One effective way to measure stereotype threat for females in mathematics is to look at participants’ scores under the MD scale. As such, it was a goal of this study to see a change in the pre-testing and post-testing score of the MD scale, while not necessarily targeting the other scales. The table below indicates that, while all of the other MAS scales' scores remained highly correlated, something lead to only a moderate correlation for the MD and AS scales in comparison over pre-testing and post-testing. While correlation is not causality, this does indicate that further analysis is necessary.

Table 1. Correlation Table of MAS Scales Pre-testing (1) versus Post-testing (2).

	Correlations Marked correlations are significant at p < .05000 N=93 (Casewise deletion of missing data)									
Variable	Quiz 2 Avg	C2	M2	F2	AS2	MD2	E2	T2	U2	A2
Quiz 1 Avg	0.64	0.47	0.27	0.07	-0.06	0.01	0.31	0.25	0.04	0.40
C1	0.57	0.91	0.68	0.47	0.06	-0.03	0.71	0.63	0.55	0.86
M1	0.47	0.70	0.82	0.61	0.14	-0.01	0.62	0.66	0.62	0.69
F1	0.31	0.47	0.62	0.81	0.05	0.05	0.44	0.54	0.48	0.43
AS1	0.10	0.24	0.23	0.14	0.63	0.15	0.16	0.27	0.24	0.16
MD1	0.22	0.10	0.07	0.13	0.17	0.59	0.13	0.17	0.11	0.02
E1	0.48	0.72	0.61	0.34	-0.03	-0.02	0.92	0.51	0.62	0.69
T1	0.49	0.69	0.69	0.61	0.10	0.08	0.62	0.88	0.55	0.66
U1	0.42	0.56	0.56	0.50	0.12	0.12	0.61	0.61	0.82	0.49
A1	0.55	0.85	0.64	0.41	0.00	-0.03	0.71	0.61	0.47	0.93

Other interesting correlations did result upon further analysis. In terms of the best predictive factor for mathematical performance on the TIMSS, for the pre-test, the initial score on the C scale was the best (r=.45, p<.05), and similarly, for the post-test, the post-treatment score on the C scale was the best (r=.57, p<.05). Other moderately good predictive factors for the pre-test TIMSS include the pre-treatment A scale (r=.40, p<.05). Other moderately good predictive factors for the post-test TIMSS include the post-treatment M and A scales (r=.48, p<.05; r=.47; p<.05). It is also important to note that the pre-treatment TIMSS score was moderately correlated with the post-treatment TIMSS score (r=.64, p<.05). While other statistically significant correlations exist between the mathematical performance pre-treatment and post-treatment, they were not as highly correlated as the previously mentioned scale (See Table 2 Below).

Table 2. Correlation Table of TIMSS Score with Pre-Treatment (1) and Post-Treatment (2) MAS Scales.

Variable	Correlations Marked correlations are significant at p < .05000 N=93 (Casewise deletion of missing data)									
	C1	M1	F1	AS1	MD1	E1	T1	U1	A1	Quiz 2 Avg
Quiz 1 Avg	0.45	0.23	0.17	0.03	0.12	0.31	0.26	0.20	0.40	0.64
C2	0.91	0.70	0.47	0.24	0.10	0.72	0.69	0.56	0.85	0.57
M2	0.68	0.82	0.62	0.23	0.07	0.61	0.69	0.56	0.64	0.48
F2	0.47	0.61	0.81	0.14	0.13	0.34	0.61	0.50	0.41	0.27
AS2	0.06	0.14	0.05	0.63	0.17	-0.03	0.10	0.12	0.00	0.00
MD2	-0.03	-0.01	0.05	0.15	0.59	-0.02	0.08	0.12	-0.03	0.11
E2	0.71	0.62	0.44	0.16	0.13	0.92	0.62	0.61	0.71	0.40
T2	0.63	0.66	0.54	0.27	0.17	0.51	0.88	0.61	0.61	0.42
U2	0.55	0.62	0.48	0.24	0.11	0.62	0.55	0.82	0.47	0.31
A2	0.86	0.69	0.43	0.16	0.02	0.69	0.66	0.49	0.93	0.47

In terms correlations between the demographic information given and initial MAS scores, there were noteworthy findings. The three strongest correlations found were between the mathematics GPA of the participant and their initial T score (r=.5, p<.05), their initial C score (r=.49, p<.05), and their initial A score (r=.42, p<.05). While other statistically significant correlations were found, none reached a moderate level of correlation (See Table 3 Below).

Table 3. Correlations Between Demographic Information and Pre-Treatment (1) MAS Scales.

Variable	C1	M1	F1	AS1	MD1	E1	T1	U1	A1
Correlations Marked correlations are significant at p < .05000 N=93 (Casewise deletion of missing data)									
gender	0.04	-0.01	-0.13	0.03	-0.32	-0.03	-0.05	-0.12	0.16
avg grade/gpa	0.49	0.31	0.25	0.06	0.19	0.33	0.50	0.30	0.42
courses	0.30	0.24	0.23	0.07	0.16	0.33	0.24	0.19	0.25
ed mother	0.03	0.05	-0.04	-0.07	-0.04	-0.07	-0.00	-0.04	0.07
ed father	0.04	0.07	0.19	-0.17	-0.08	0.02	0.04	-0.06	0.07

MAS

As part of initial analysis, the pre-treatment MAS scores were subjected to a t-test to determine the equality of the means between genders. The only significant finding involved the pre-treatment MD score (t=3.27580, df= 91, p=.00149). A comparison of the means revealed that prior to treatment, females held a less stereotypical view of females in mathematics (M=52.40909), whereas males held a view slightly more towards the neutral perspective on the MD scale (M=47.14815) (See Appendix I). These scores were observed on a 60 point scale with the higher score indicating a less stereotypical view. The other pre-treatment MAS scales held no significance.

As part of final analysis, MAS scores were subjected to a 2 (gender) x 3 (condition) analysis of variance (ANOVA). A significant main effect was discovered for gender (F (18, 70) =2.4340, p=.004280) and condition (F (36, 140) =1.8361, p=.006665). Planned comparisons revealed a significant differences between the C scale (t=2.120171, p=.036839), MD scale (t=3.35429, p=.001180), and A scale (t=2.048182, p=.043557) of the historical female achievement treatment group in comparison with the control group. Participants in the historical female achievement treatment group scored slightly lower on the A scale (M=32.62069) and C scale (M=35.31034) in comparison to the control group's A scale (M=38.4667) and C scale

(M=42.33333) (See Appendix L and H respectively); however, the participants in the historical achievement treatment group scored higher on the MD scale (M=51.82759) in comparison to the control group's MD scale (M=49.23333). It is important to note that, while still scoring lower than the control group, participants did see an increase in their A scale score compared to pre-treatment scores (M=30.82759). Planned comparison revealed significant differences between the F scale (t=2.162423, p=.03333) and MD scale (t=3.35089, p=.001193) of the nature of intelligence group in comparison with the control group. Participants in the nature of intelligence treatment group scored slightly lower on the F scale (M=39.41176) than the control group (M=42.88333) (See Appendix J), and slightly higher on the MD scale (M=51.14706) than the control group (M=49.23333) (See Appendix K). Planned comparison also revealed a significant difference between male and female scores on the MD scale after treatment (t=3.432421, p=.000918), with females scoring slightly higher (M=51.62121) than males (M=48.59259). While these planned comparisons revealed differences in the treatment conditions, a more in-depth look into the gender differences within treatments groups were far more revealing.

Planned comparisons looking into the differences in gender within treatment groups revealed several important findings. Marginally significant differences were revealed between females in the historical female treatment group in comparison to females in the control group on the C scale (t=1.77524, p=.079355) and A scale (t=1.76065, p=.081812). These females scored slightly lower (M=35.05000) on the C scale than the control group (M=41.61533). These females also scored slightly lower (M=31.20000) on the A scale than the control group (M=37.34615). It is important to note that while these females scored lower on the C and A scales than the control group, in terms of relative stability across treatment, the pre-treatment C scale score (M=35.7500) and pre-treatment A scale score (M=29.45000) are relatively similar to their post-treatment counterparts. No significant differences were revealed for the planned comparison of the nature of intelligence treatment group and the control group for females. In terms of males, planned comparison resulted in significant differences between the historical female treatment group and the control group on the M scale (t=2.02418, p=.046019), F scale (t=2.51199, p=.013851), and MD scale (t=3.375508, p=.001103). Males in this treatment group scored slightly lower (M=37.11111) on the M scale than the control group (M=46.50000), as well as on the F scale (M=35.44444) in comparison to the control group (M=48.25000). While statistically significant, in comparison to across treatment scores, the difference between the male scores for the M scale post-treatment and pre-treatment (M=38.88889) are relatively similar to their post-treatment counterparts. Males in this treatment group also scored significantly higher on the MD scale (M=50.33333) than the control group (M=37.25000). Finally, planned comparison revealed significant differences between the males of the nature of intelligence treatment group and those in the control group for the F scale (t=2.45792, p=.015958) and MD scale (t=3.681987, p=.000401). Males in this treatment group scored slightly lower (M= 36.42857) on the F scale than the control group (M=48.25000), and significantly higher (M=50.71429) on the MD scale than the control group (M=37.25). Again, while statistically significant for the F scale, differences across treatment scores are relatively small, with pre-treatment F scores of M= 38.57143, and may be considered negligible.

TIMSS

While the ANOVA yielded no statistically significant results. There were some slight differences between gender and groups in terms of pre-treatment and post-treatment scores. Pre-treatment, females on averaged scored lower (M=.551948) than their male counterparts (M=.595238) (See Appendix G). This trend continued in the post-treatment results with females scoring lower (M=.550189) than males (M=.600694). It is important to note that this male dominance of the TIMSS score maintained true throughout all treatment groups save the post-treatment Nature of Intelligence group where females scored slightly higher (M=.595313) than males (M=.573611). In the Nature of Intelligence group, females showed a small increase in their scores (M=.560714 to M=.595313); this was the only group to see an increase in female scores. In the historically female achievement group, males showed a slight increase in their scores (M=.619048 to M=.645833). While these results are not statistically significant, it has demonstrated that nominally, males have slightly outperformed females in this study.

Discussion

While it may be difficult to discern, part of this study's hypothesis and research goals were upheld. The treatment groups did not result in statistically significant effects for mathematical performance, but they did result in the statistically significant reduction of negative stereotypes regarding females in mathematics in terms of the MD scale. Furthermore, statistically significant correlations provided further support for the contention that mathematical attitudes, both positive and negative, can be related to mathematical performance. For this particular study, the correlations were moderate in terms of mathematical attitudes that can be affected by stereotypes (the C and A scales).

The statistically significant correlation between the C scale pre-treatment and post-treatment with performance on the TIMSS lends itself as support to recent research. A recent meta-analysis of the 2003 TIMSS conducted by Else-Quest, Hyde, and Linn has had similarly results in terms of correlations as the present study (Else-Quest et al., in press). Else-Quest and her colleagues found that, in terms of the TIMSS scales of self-confidence in mathematics and valuing mathematics, males consistently scored higher than females. In addition, they found that the self-confidence scale ($r=.54$, $p<.01$) and valuing mathematics scale ($r=.30$, $p<.05$) were moderately correlated with gender differences in mathematical performance on the TIMSS (Else-Quest et al., in press). These results are similar to those found in the present study. An equivalent self-confidence scale used presently is the MAS C scale, which was moderately correlated with TIMSS performance pre-treatment ($r=.45$, $p<.05$) and post-treatment ($r=.57$, $p<.05$). It is interesting to note that Else-Quest and her colleagues also found that males throughout their meta-analysis had higher levels of self-confidence and less anxiety than females in terms of mathematics (Else-Quest et al., in press). This is consistent with Steele's STT (1997) and may indicate that confidence and anxiety, MAS C and A scales respectively, can be an expression of stereotype threat in mathematics.

Other noteworthy results were in regards to the MAS and treatment groups. It appears that, in terms of statistically significant difference on the MD scale pre-treatment, female participants in this study held relatively positive views towards the female domain in mathematics ($M=52.40909$), whereas male participants held more neutral views ($M=47.14815$). Again, the aforementioned scores are observed on a 60 point scale with the higher score being reflective of a less stereotypical view. By definition, the MD scale is a direct expression of negative stereotypes in mathematics, and in conjunction with Steele's and Else-Quest's research, it may be prudent to also consider the major effects of stereotype threat as being expressed through confidence and anxiety. Thus the more positive female views on the MD scale may indicate a reduction of one of the major three aspect of stereotype threat. With the MD, C, and A scales now being viewed as possible expression of stereotype threat, it is now germane to more closely examine the effects of the treatment groups.

The only statistically significant improvement in terms of the possible expressions of stereotype threat involved the MD scale. As previously mentioned, the historical female achievement treatment group (M=51.82759) and the nature of intelligence treatment group (M=51.14706) were statistically different from the scores found for the MD scale in the control group (M=49.23333). Further analysis revealed this to be statistically significant for the males in the treatment groups only. For males in the historical female achievement group, they saw improvement from M=48.44444 to M=50.33333 on the MD scale. For the males in the nature of intelligence group, they saw improvement from M=47.85714 to M=50.71429. Females in treatment groups held a relatively stable MD score from pre-treatment (M=52.4090) to post-treatment (M=51.62121) and resulted in no statistically significant differences. The ability of the treatments to aid in a less stereotypical view of females in mathematics for the male group can be useful for the overall goal of reducing stereotype threat, and this can be seen after observing the TIMSS results.

While not statistically significant, males performed slightly better on the TIMSS both pre-treatment (M=.595238) and post-treatment (M=.600694) than their female counterparts (M=.551948, M=.550189). One might think it to be a curious result that the MD scale yielded a statistically significant difference for gender, yet no corresponding result was found in the mathematical performance results. Else-Quest and colleagues have noted similar results were observed where similarities in mathematical achievement were compounded with differences in attitudes between the genders; moreover, they suggest that analysis of recent research in 2005 and 2007 statewide mathematics testing indicates that gender differences have been eliminated at the grade school levels (Else-Quest et. al., in press). Since the present study was conducted at the college level, it is prudent to look at both the overall populous and more selective samples which are representative of college level groups.

A meta-analysis completed by Hyde, Fennema, and Lamon suggested that the overall effect size for mathematical performance was d= 0.15 (a slight male advantage) but for the general population was d= -0.05 (a slight female advantage). Hyde and her colleagues did give a caveat that the general statement may allow the reader to overlook the complex nature of the patterns garnered from the analysis; through regression analysis, it was revealed that age, selectivity, and cognitive level of the test were significant predictors (noted strongest to weakest, respectively) for mathematical performance. In terms of age, they discovered females had a negligible superiority during elementary and middle school years. Males gained superiority in the high school years (d= 0.29), and retained that throughout college (d= 0.4) and adulthood (d= 0.59). In terms of selectivity, males have a slight superiority (d= 0.15) overall; however, when looking at only the general population, females have a slight superiority (d= -0.05). This finding was partially represented in the cognitive level. It was noted that as a group becomes more selective, males performed significantly better than females. As a group traveled from “moderately selective” (d= 0.33) to “highly selective” (d= 0.54) to “exceptional mathematical precocity” (d= .41), males have the clear advantage (Hyde et al., 1990). The two presented meta-analyses present possible arguments for the lack of statistically significant results in terms of the TIMSS of the present study. As with all psychological studies, the purpose is to learn from the results and look for methods to help a target population.

The results of the current study have of several factors worthy of further investigation. Perhaps the most shocking revelation of the present study involved the statistically significant effect the treatment groups had on male MD scores, and yet no statistically significant results for females. While the intention of this study was to observe direct ways to reduce stereotype threat associated with female and mathematics, perhaps these results suggests that an indirect route could also be taken. It stands to reason that part of the cause of the continual perpetuation of the negative stereotypical views of females in mathematics may be due to internalized beliefs on the part of males that are more stereotypical. Because this seems like a logical association, it may be practical to observe how males with a less stereotypical view of females affect females who suffer from stereotype threat.

Regardless of the particulars of the research, there must be further investigation into the phenomena of stereotype threat and females in mathematics. If the negative stereotype still exists for females in mathematics, then it can still be a source of disruption for female education. Psychologists must look further into the data now becoming available through meta-analyses and new research in order to garner a better understanding of the reality of a lack of females in mathematical fields. The ultimate goal of all psychologists is to help others, so a call to arms must be issued in order to curb the negative effects that females may face as a result of a limited understanding of stereotype threat in mathematics.

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Descriptive Statistics of TIMSS and MAS Scales Pre-testing (scale1) and Post-testing (scale2).

group	gender	Quiz 1 Avg Mean	Quiz 1 Avg N	Quiz 1 Avg Min	Quiz 1 Avg Max	Quiz 1 Avg Std Dev	Quiz 1 Avg Q25	Quiz 1 Avg Median	Quiz 1 Avg Q75
N. I.	F	0.560714	20	0.357143	0.857143	0.135675	0.464286	0.571429	0.642857
H. F.	F	0.550000	20	0.285714	0.785714	0.176644	0.357143	0.535714	0.714286
H. F.	M	0.619048	9	0.428571	0.857143	0.138321	0.571429	0.571429	0.714286
C.	F	0.546703	26	0.214286	0.785714	0.156417	0.428571	0.500000	0.714286
N. I.	M	0.586735	14	0.428571	0.857143	0.146059	0.500000	0.535714	0.714286
C.	M	0.571429	4	0.357143	0.785714	0.174964	0.464286	0.571429	0.678571
all Grps		0.564516	93	0.214286	0.857143	0.151912	0.428571	0.571429	0.714286

group	gender	C1 Mean	C1 N	C1 Min	C1 Max	C1 Std. Dev.	C1 Q25	C1 Median	C1 Q75
N. I.	F	41.20000	20	16.00000	58.00000	12.05950	33.50000	40.50000	52.00000
H. F.	F	35.75000	20	14.00000	60.00000	11.78704	27.00000	33.00000	45.50000
H. F.	M	38.33333	9	17.00000	60.00000	15.66844	27.00000	40.00000	50.00000
C.	F	41.65385	26	16.00000	60.00000	13.05969	32.00000	46.00000	52.00000
N. I.	M	41.14286	14	19.00000	60.00000	13.18424	28.00000	45.50000	49.00000
C.	M	45.25000	4	31.00000	55.00000	11.44188	36.00000	47.50000	54.50000
All Grps		40.04301	93	14.00000	60.00000	12.72529	31.00000	41.00000	51.00000

group	gender	M1 Mean	M1 N	M1 Min	M1 Max	M1 Std. Dev.	M1 Q25	M1 Median	M1 Q75
N. I.	F	40.65000	20	30.00000	60.00000	7.198501	37.00000	40.00000	43.00000
H. F.	F	39.95000	20	27.00000	53.00000	8.049027	33.50000	40.50000	46.00000
H. F.	M	38.88889	9	22.00000	52.00000	9.033887	34.00000	41.00000	45.00000
C.	F	42.50000	26	27.00000	54.00000	7.905694	37.00000	44.00000	48.00000
N. I.	M	41.21429	14	27.00000	58.00000	7.202335	37.00000	41.50000	45.00000
C.	M	45.00000	4	41.00000	53.00000	5.477226	41.50000	43.00000	48.50000
All Grps		41.11828	93	22.00000	60.00000	7.648315	36.00000	42.00000	46.00000

*Note: H.F. (Historic Female Achievement), N. I. (Nature of Intelligence), C. (Control)

group	gender	F1 Mean	F1 N	F1 Min	F1 Max	F1 Std. Dev.	F1 Q25	F1 Median	F1 Q75
N. I.	F	40.90000	20	24.00000	60.00000	9.233235	36.00000	38.50000	46.00000
H. F.	F	43.95000	20	35.00000	59.00000	7.265455	38.00000	42.50000	47.50000
H. F.	M	38.66667	9	24.00000	48.00000	7.466592	36.00000	36.00000	44.00000
C.	F	40.76923	26	29.00000	58.00000	8.387170	34.00000	38.50000	49.00000
N. I.	M	38.57143	14	28.00000	59.00000	8.140254	36.00000	36.00000	37.00000
C.	M	44.50000	4	34.00000	55.00000	8.582929	39.00000	44.50000	50.00000
All Grps		41.10753	93	24.00000	60.00000	8.252091	36.00000	39.00000	47.00000

group	gender	AS1 Mean	AS1 N	AS1 Min	AS1 Max	AS1 Std. Dev.	AS1 Q25	AS1 Median	AS1 Q75
N. I.	F	49.50000	20	36.00000	60.00000	8.268520	43.50000	49.50000	57.00000
H. F.	F	47.85000	20	39.00000	55.00000	4.510514	45.00000	48.00000	51.50000
H. F.	M	48.22222	9	38.00000	58.00000	6.220486	45.00000	48.00000	52.00000
C.	F	48.19231	26	36.00000	58.00000	5.418629	44.00000	49.00000	51.00000
N. I.	M	49.42857	14	34.00000	59.00000	6.583362	46.00000	50.00000	54.00000
C.	M	48.25000	4	46.00000	52.00000	2.629956	46.50000	47.50000	50.00000
All Grps		48.59140	93	34.00000	60.00000	6.040149	44.00000	49.00000	53.00000

group	gender	MD1 Mean	MD1 N	MD1 Min	MD1 Max	MD1 Std. Dev.	MD1 Q25	MD1 Median	MD1 Q75
N. I.	F	52.45000	20	42.00000	60.00000	5.36534	48.00000	53.00000	56.50000
H. F.	F	53.85000	20	42.00000	60.00000	5.95841	51.50000	55.50000	59.50000
H. F.	M	48.44444	9	41.00000	60.00000	5.68135	46.00000	48.00000	51.00000
C.	F	51.26923	26	36.00000	60.00000	6.43464	47.00000	52.00000	55.00000
N. I.	M	47.85714	14	18.00000	60.00000	11.36700	46.00000	48.50000	56.00000
C.	M	41.75000	4	34.00000	46.00000	5.43906	38.00000	43.50000	45.50000
All Grps		50.88172	93	18.00000	60.00000	7.39249	46.00000	52.00000	56.00000

group	gender	E1 Mean	E1 N	E1 Min	E1 Max	E1 Std. Dev.	E1 Q25	E1 Median	E1 Q75
N. I.	F	39.20000	20	19.00000	59.00000	10.18048	36.00000	40.00000	44.50000
H. F.	F	34.10000	20	12.00000	60.00000	11.13506	29.00000	32.00000	40.50000
H. F.	M	33.55556	9	15.00000	46.00000	11.47945	26.00000	33.00000	45.00000
C.	F	35.80769	26	13.00000	53.00000	10.61327	29.00000	37.00000	45.00000
N. I.	M	37.50000	14	16.00000	51.00000	12.04319	28.00000	42.00000	47.00000
C.	M	33.50000	4	17.00000	52.00000	17.59735	18.50000	32.50000	48.50000
All Grps		36.10753	93	12.00000	60.00000	11.13012	29.00000	38.00000	45.00000

*Note: H.F. (Historic Female Achievement), N. I. (Nature of Intelligence), C. (Control)

group	gender	T1 Mean	T1 N	T1 Min	T1 Max	T1 Std. Dev.	T1 Q25	T1 Median	T1 Q75
N. I.	F	43.20000	20	30.00000	58.00000	7.68868	36.50000	44.00000	48.00000
H. F.	F	41.00000	20	30.00000	60.00000	7.53239	35.00000	41.00000	45.50000
H. F.	M	37.44444	9	15.00000	50.00000	12.64032	29.00000	42.00000	47.00000
C.	F	39.50000	26	20.00000	60.00000	9.71288	34.00000	41.00000	45.00000
N. I.	M	41.57143	14	20.00000	59.00000	9.79572	37.00000	42.50000	46.00000
C.	M	40.25000	4	29.00000	52.00000	9.39415	34.50000	40.00000	46.00000
All Grps		40.76344	93	15.00000	60.00000	9.10136	35.00000	42.00000	46.00000

group	gender	U1 Mean	U1 N	U1 Min	U1 Max	U1 Std. Dev.	U1 Q25	U1 Median	U1 Q75
N. I.	F	44.00000	20	23.00000	60.00000	11.08342	35.50000	46.00000	53.00000
H. F.	F	43.10000	20	20.00000	59.00000	9.66219	38.00000	43.00000	49.00000
H. F.	M	40.66667	9	16.00000	59.00000	15.58044	35.00000	41.00000	54.00000
C.	F	43.11538	26	20.00000	59.00000	10.87870	37.00000	43.50000	53.00000
N. I.	M	40.42857	14	16.00000	59.00000	13.44913	31.00000	42.50000	50.00000
C.	M	39.75000	4	22.00000	59.00000	16.17354	27.00000	39.00000	52.50000
All Grps		42.51613	93	16.00000	60.00000	11.57547	35.00000	43.00000	52.00000

group	gender	A1 Mean	A1 N	A1 Min	A1 Max	A1 Std. Dev.	A1 Q25	A1 Median	A1 Q75
N. I.	F	36.75000	20	18.00000	60.00000	10.95865	28.00000	38.00000	43.50000
H. F.	F	29.45000	20	12.00000	60.00000	12.44557	24.00000	27.50000	34.00000
H. F.	M	33.88889	9	14.00000	46.00000	12.57422	26.00000	37.00000	43.00000
C.	F	35.69231	26	13.00000	58.00000	13.33497	26.00000	37.50000	47.00000
N. I.	M	40.07143	14	12.00000	57.00000	15.05612	27.00000	46.00000	51.00000
C.	M	43.75000	4	34.00000	57.00000	10.78193	35.00000	42.00000	52.50000
All Grps		35.40860	93	12.00000	60.00000	13.01440	26.00000	36.00000	46.00000

group	gender	Quiz 2 Avg Mean	Quiz 2 Avg N	Quiz 2 Avg Min	Quiz 2 Avg Max	Quiz 2 Avg Std. Dev.	Quiz 2 Avg Q25	Quiz 2 Avg Median	Quiz 2 Avg Q75
N. I.	F	0.595313	20	0.250000	0.875000	0.167360	0.484375	0.609375	0.734375
H. F.	F	0.548438	20	0.125000	1.000000	0.218744	0.359375	0.562500	0.718750
H. F.	M	0.645833	9	0.187500	0.875000	0.228574	0.531250	0.718750	0.812500
C.	F	0.516827	26	0.156250	0.937500	0.220658	0.312500	0.531250	0.687500
N. I.	M	0.573661	14	0.062500	0.875000	0.248072	0.406250	0.531250	0.812500
C.	M	0.593750	4	0.312500	0.937500	0.262698	0.406250	0.562500	0.781250
All Grps		0.564852	93	0.062500	1.000000	0.214449	0.406250	0.562500	0.750000

*Note: H.F. (Historic Female Achievement), N. I. (Nature of Intelligence), C. (Control)

group	gender	C2 Mean	C2 N	C2 Min	C2 Max	C2 Std. Dev.	C2 Q25	C2 Median	C2 Q75
N. I.	F	44.15000	20	15.00000	60.00000	12.18401	36.00000	47.00000	53.50000
H. F.	F	35.05000	20	15.00000	60.00000	13.11277	23.50000	36.50000	46.50000
H. F.	M	35.88889	9	17.00000	52.00000	12.36370	25.00000	40.00000	46.00000
C.	F	41.61538	26	16.00000	60.00000	12.74701	32.00000	43.50000	51.00000
N. I.	M	43.07143	14	22.00000	60.00000	11.61871	34.00000	44.50000	53.00000
C.	M	47.00000	4	34.00000	58.00000	10.39230	39.00000	48.00000	55.00000
All Grps		40.64516	93	15.00000	60.00000	12.68142	32.00000	41.00000	51.00000

group	gender	M2 Mean	M2 N	M2 Min	M2 Max	M2 Std. Dev.	M2 Q25	M2 Median	M2 Q75
N. I.	F	41.10000	20	30.00000	60.00000	7.468530	36.00000	40.00000	41.50000
H. F.	F	40.10000	20	29.00000	56.00000	7.376349	34.00000	40.50000	45.00000
H. F.	M	37.11111	9	24.00000	53.00000	8.922506	33.00000	40.00000	41.00000
C.	F	39.96154	26	20.00000	54.00000	8.407048	33.00000	40.00000	47.00000
N. I.	M	42.71429	14	32.00000	58.00000	6.661353	39.00000	43.00000	45.00000
C.	M	46.50000	4	41.00000	55.00000	6.027714	42.50000	45.00000	50.50000
All Grps		40.65591	93	20.00000	60.00000	7.742450	36.00000	41.00000	45.00000

group	gender	F2 Mean	F2 N	F2 Min	F2 Max	F2 Std. Dev.	F2 Q25	F2 Median	F2 Q75
N. I.	F	41.50000	20	25.00000	60.00000	9.56144	36.00000	38.50000	47.00000
H. F.	F	43.20000	20	36.00000	57.00000	7.03824	37.50000	41.50000	47.50000
H. F.	M	35.44444	9	17.00000	47.00000	10.11325	34.00000	36.00000	43.00000
C.	F	41.42308	26	21.00000	58.00000	8.41510	36.00000	41.00000	46.00000
N. I.	M	36.42857	14	23.00000	59.00000	7.84184	34.00000	35.50000	37.00000
C.	M	48.25000	4	37.00000	55.00000	8.05709	42.50000	50.50000	54.00000
All Grps		40.78495	93	17.00000	60.00000	8.81186	36.00000	39.00000	46.00000

group	gender	AS2 Mean	AS2 N	AS2 Min	AS2 Max	AS2 Std. Dev.	AS2 Q25	AS2 Median	AS2 Q75
N. I.	F	48.50000	20	36.00000	60.00000	7.192833	42.50000	49.00000	54.50000
H. F.	F	46.00000	20	40.00000	58.00000	5.311358	42.00000	45.00000	48.00000
H. F.	M	47.33333	9	33.00000	56.00000	7.382412	44.00000	47.00000	52.00000
C.	F	47.69231	26	37.00000	58.00000	5.424162	45.00000	47.00000	52.00000
N. I.	M	48.42857	14	35.00000	59.00000	6.618323	44.00000	48.00000	54.00000
C.	M	48.00000	4	43.00000	52.00000	3.915780	45.00000	48.50000	51.00000
All Grps		47.59140	93	33.00000	60.00000	6.065291	43.00000	47.00000	52.00000

*Note: H.F. (Historic Female Achievement), N. I. (Nature of Intelligence), C. (Control)

group	gender	MD2 Mean	MD2 N	MD2 Min	MD2 Max	MD2 Std. Dev.	MD2 Q25	MD2 Median	MD2 Q75
N. I.	F	51.45000	20	38.00000	60.00000	5.995393	48.50000	51.50000	55.50000
H. F.	F	52.50000	20	44.00000	60.00000	6.435919	46.50000	50.00000	60.00000
H. F.	M	50.33333	9	40.00000	58.00000	6.745369	47.00000	54.00000	55.00000
C.	F	51.07692	26	36.00000	60.00000	5.864627	47.00000	52.00000	54.00000
N. I.	M	50.71429	14	33.00000	60.00000	7.456835	47.00000	48.50000	57.00000
C.	M	37.25000	4	28.00000	48.00000	8.220908	32.00000	36.50000	42.50000
All Grps		50.74194	93	28.00000	60.00000	6.934324	47.00000	51.00000	56.00000

group	gender	E2 Mean	E2 N	E2 Min	E2 Max	E2 Std. Dev.	E2 Q25	E2 Median	E2 Q75
N. I.	F	39.95000	20	14.00000	56.00000	9.84872	34.50000	41.00000	47.00000
H. F.	F	36.05000	20	12.00000	60.00000	10.45529	32.50000	35.00000	40.50000
H. F.	M	30.22222	9	15.00000	47.00000	12.55764	17.00000	30.00000	40.00000
C.	F	36.46154	26	14.00000	54.00000	11.24715	27.00000	39.50000	45.00000
N. I.	M	40.14286	14	21.00000	58.00000	10.85468	32.00000	42.00000	48.00000
C.	M	36.50000	4	24.00000	51.00000	12.66228	26.00000	35.50000	47.00000
All Grps		37.07527	93	12.00000	60.00000	10.98837	30.00000	39.00000	45.00000

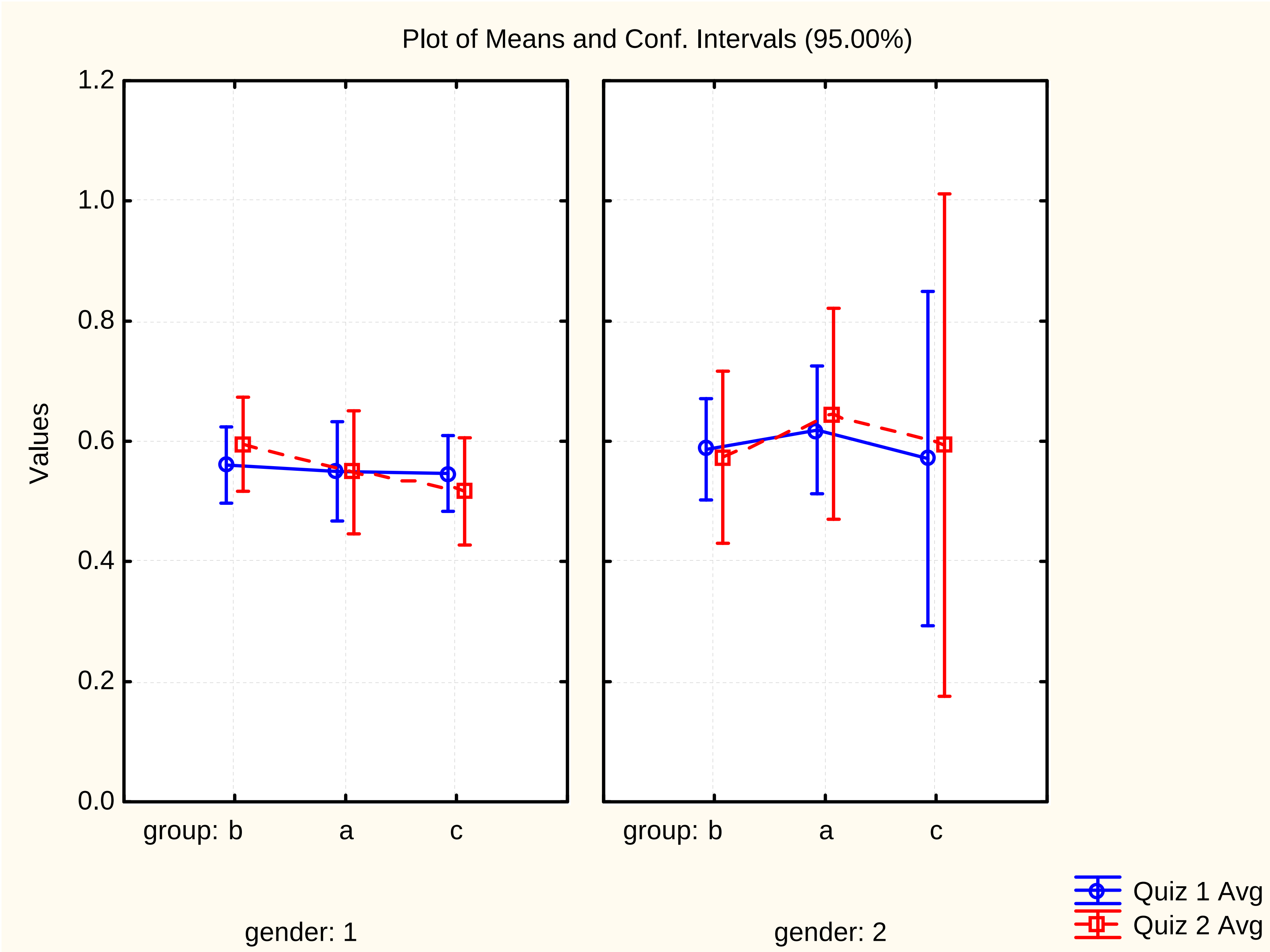
group	gender	T2 Mean	T2 N	T2 Min	T2 Max	T2 Std. Dev.	T2 Q25	T2 Median	T2 Q75
N. I.	F	43.55000	20	31.00000	60.00000	7.93045	37.50000	43.00000	50.00000
H. F.	F	41.85000	20	27.00000	59.00000	8.98112	34.00000	42.50000	47.50000
H. F.	M	37.11111	9	12.00000	48.00000	12.17009	28.00000	43.00000	45.00000
C.	F	40.03846	26	13.00000	60.00000	9.92968	35.00000	42.00000	46.00000
N. I.	M	43.14286	14	35.00000	60.00000	6.88205	37.00000	43.00000	47.00000
C.	M	45.00000	4	36.00000	59.00000	9.83192	39.00000	42.50000	51.00000
All Grps		41.58065	93	12.00000	60.00000	9.13941	36.00000	42.00000	47.00000

group	gender	U2 Mean	U2 N	U2 Min	U2 Max	U2 Std. Dev.	U2 Q25	U2 Median	U2 Q75
N. I.	F	44.60000	20	18.00000	60.00000	12.11089	38.50000	47.00000	53.00000
H. F.	F	43.15000	20	12.00000	60.00000	11.32429	40.50000	44.00000	49.00000
H. F.	M	41.33333	9	18.00000	60.00000	15.09139	29.00000	48.00000	50.00000
C.	F	44.57692	26	23.00000	60.00000	9.55478	37.00000	46.00000	51.00000
N. I.	M	45.28571	14	14.00000	60.00000	12.18718	39.00000	46.00000	54.00000
C.	M	43.00000	4	25.00000	60.00000	14.35270	33.50000	43.50000	52.50000
All Grps		44.00000	93	12.00000	60.00000	11.41985	39.00000	46.00000	51.00000

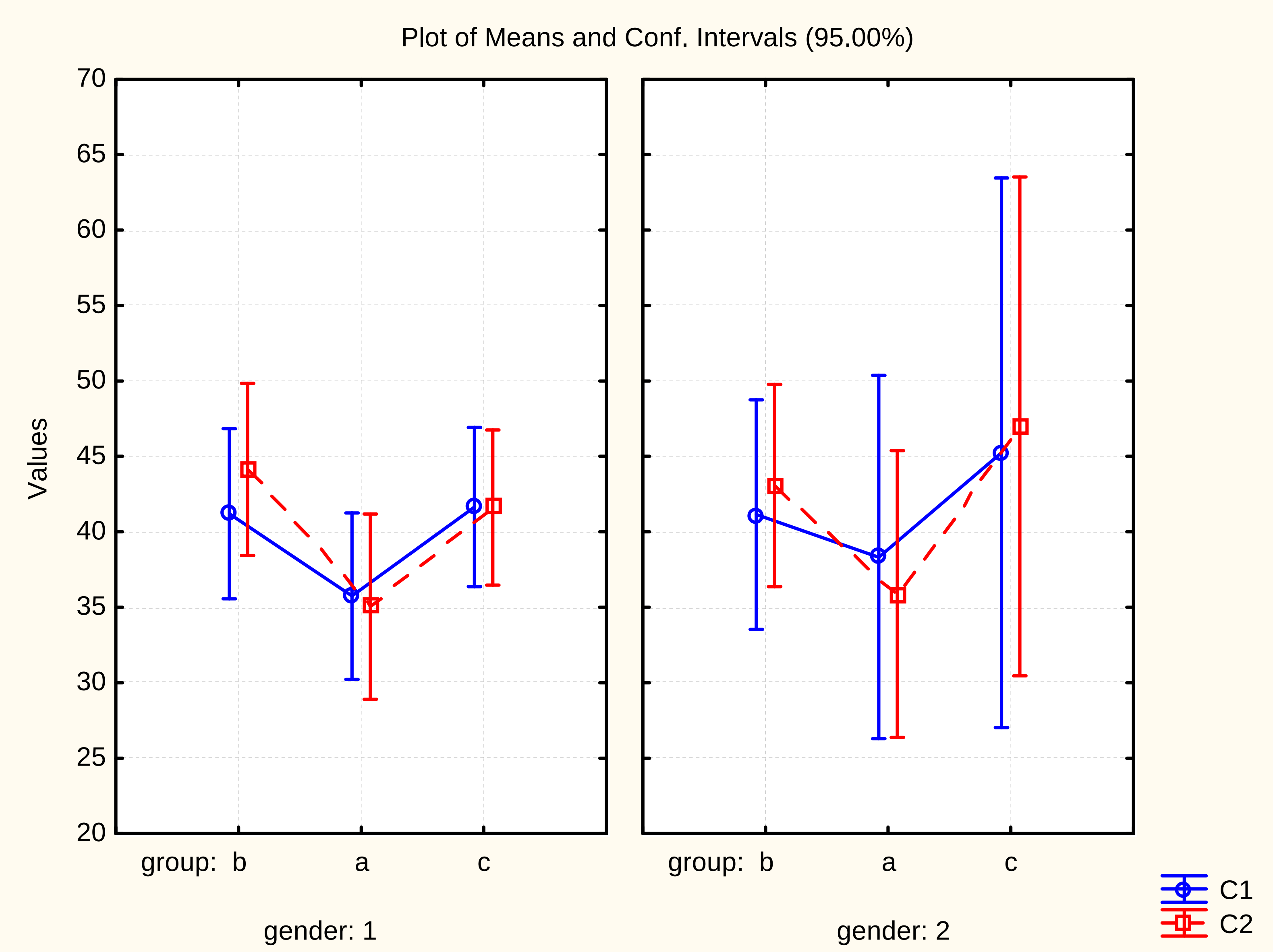
*Note: H.F. (Historic Female Achievement), N. I. (Nature of Intelligence), C. (Control)

group	gender	A2 Mean	A2 N	A2 Min	A2 Max	A2 Std. Dev.	A2 Q25	A2 Median	A2 Q75
N. I.	F	39.25000	20	23.00000	60.00000	9.85086	32.00000	40.50000	45.50000
H. F.	F	31.20000	20	13.00000	60.00000	12.58905	24.00000	26.50000	38.50000
H. F.	M	35.77778	9	12.00000	48.00000	12.65679	29.00000	41.00000	45.00000
C.	F	37.34615	26	12.00000	60.00000	13.03209	24.00000	38.50000	48.00000
N. I.	M	42.50000	14	22.00000	60.00000	10.98776	37.00000	46.00000	48.00000
C.	M	45.75000	4	42.00000	50.00000	3.30404	43.50000	45.50000	48.00000
All Grps		37.41935	93	12.00000	60.00000	12.10850	26.00000	39.00000	47.00000

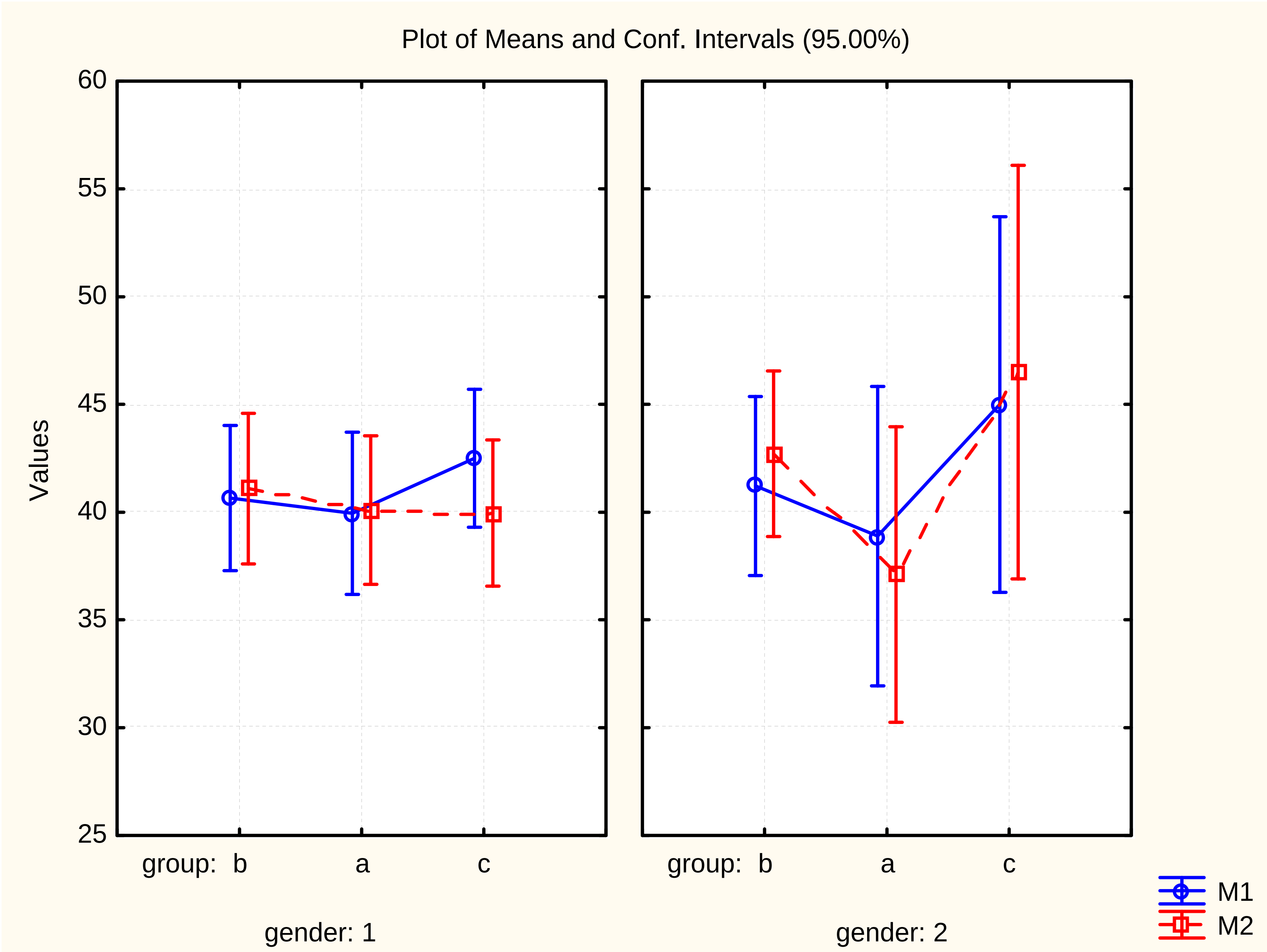
*Note: H.F. (Historic Female Achievement), N. I. (Nature of Intelligence), C. (Control)



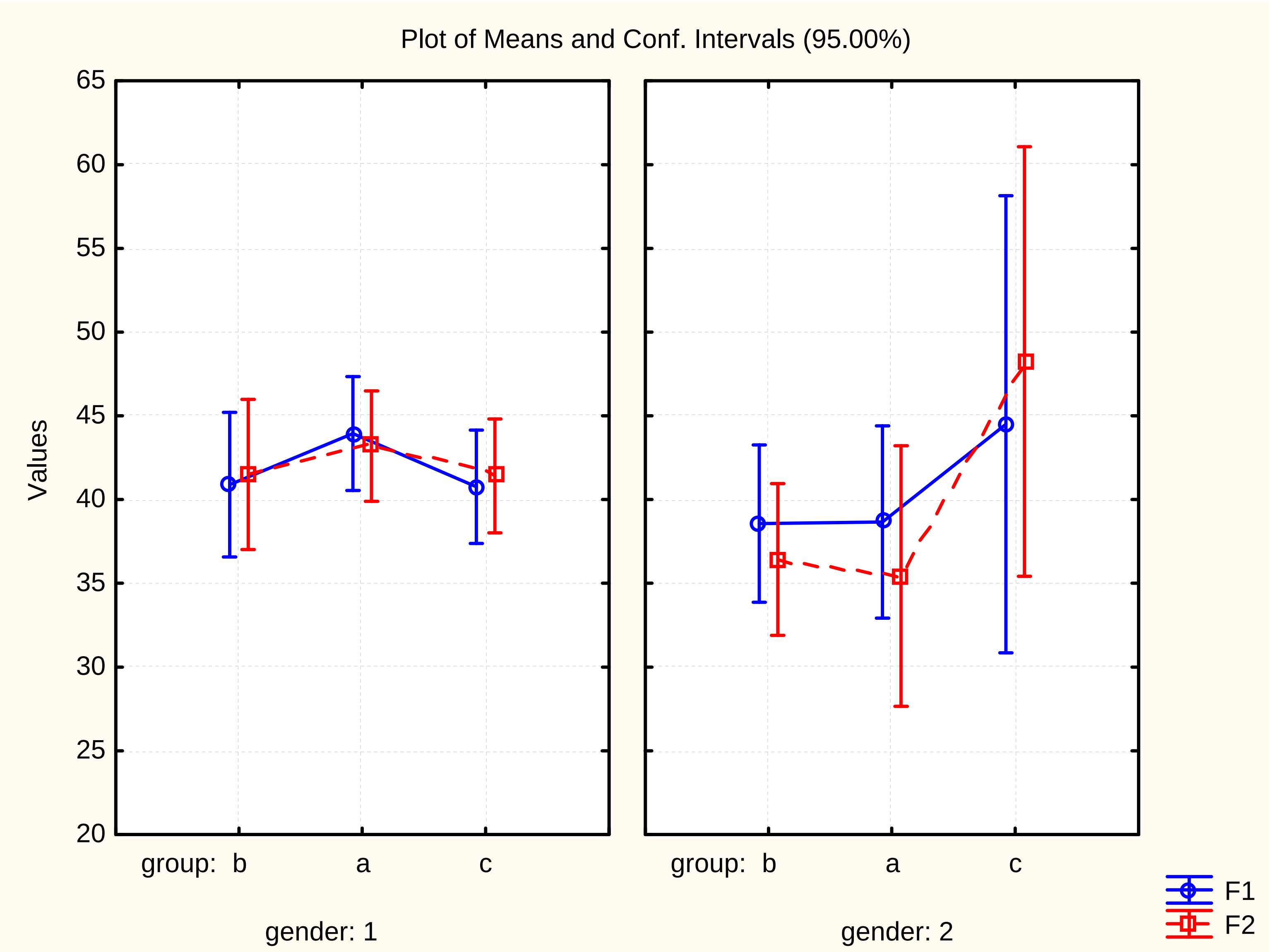
* Note: Gender 1 (Female), 2 (Male); Group A (Historic Female Achievement), B (Nature of Intelligence), C (Control).



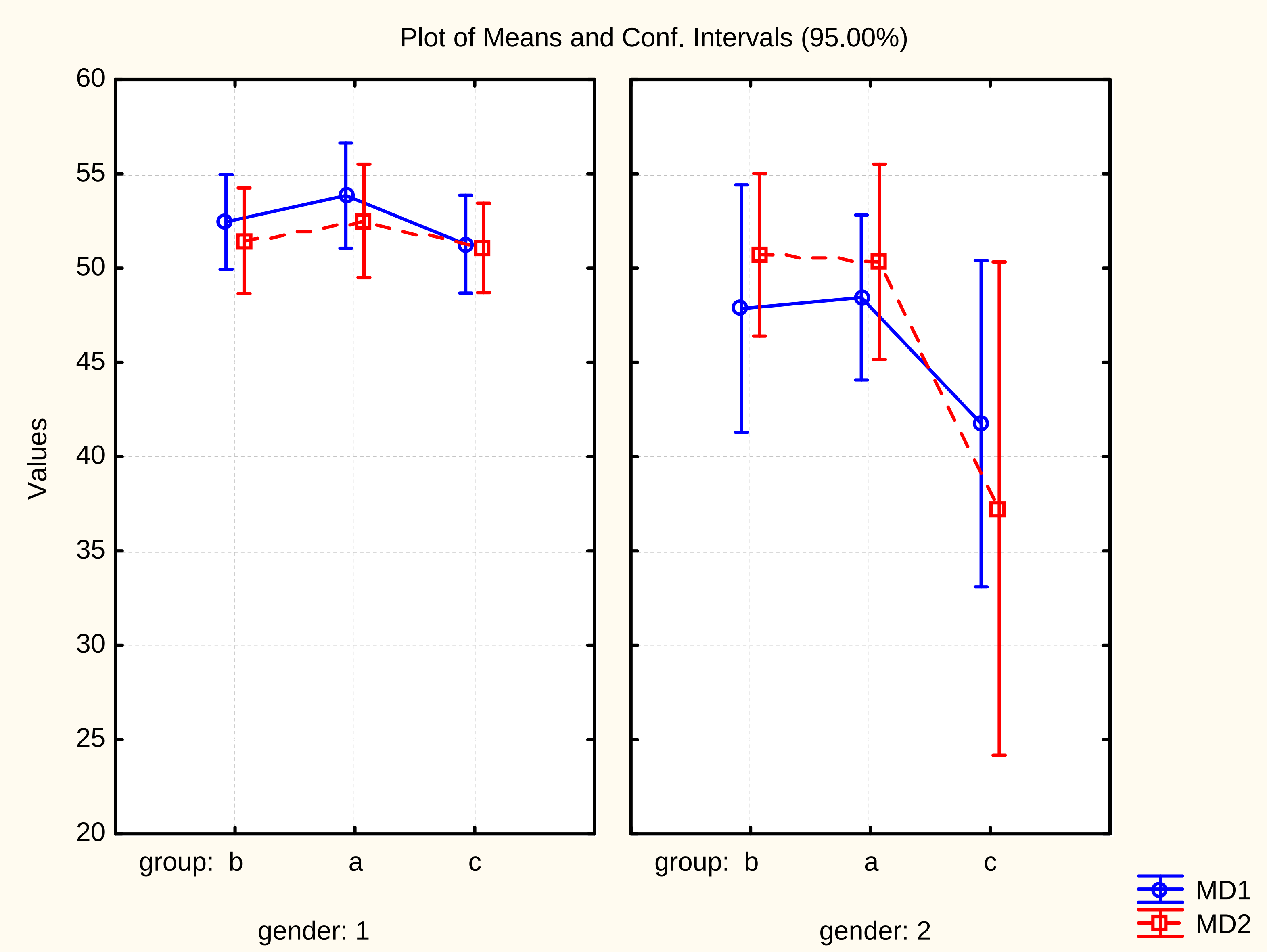
* Note: Gender 1 (Female), 2 (Male); Group A (Historic Female Achievement), B (Nature of Intelligence), C (Control).



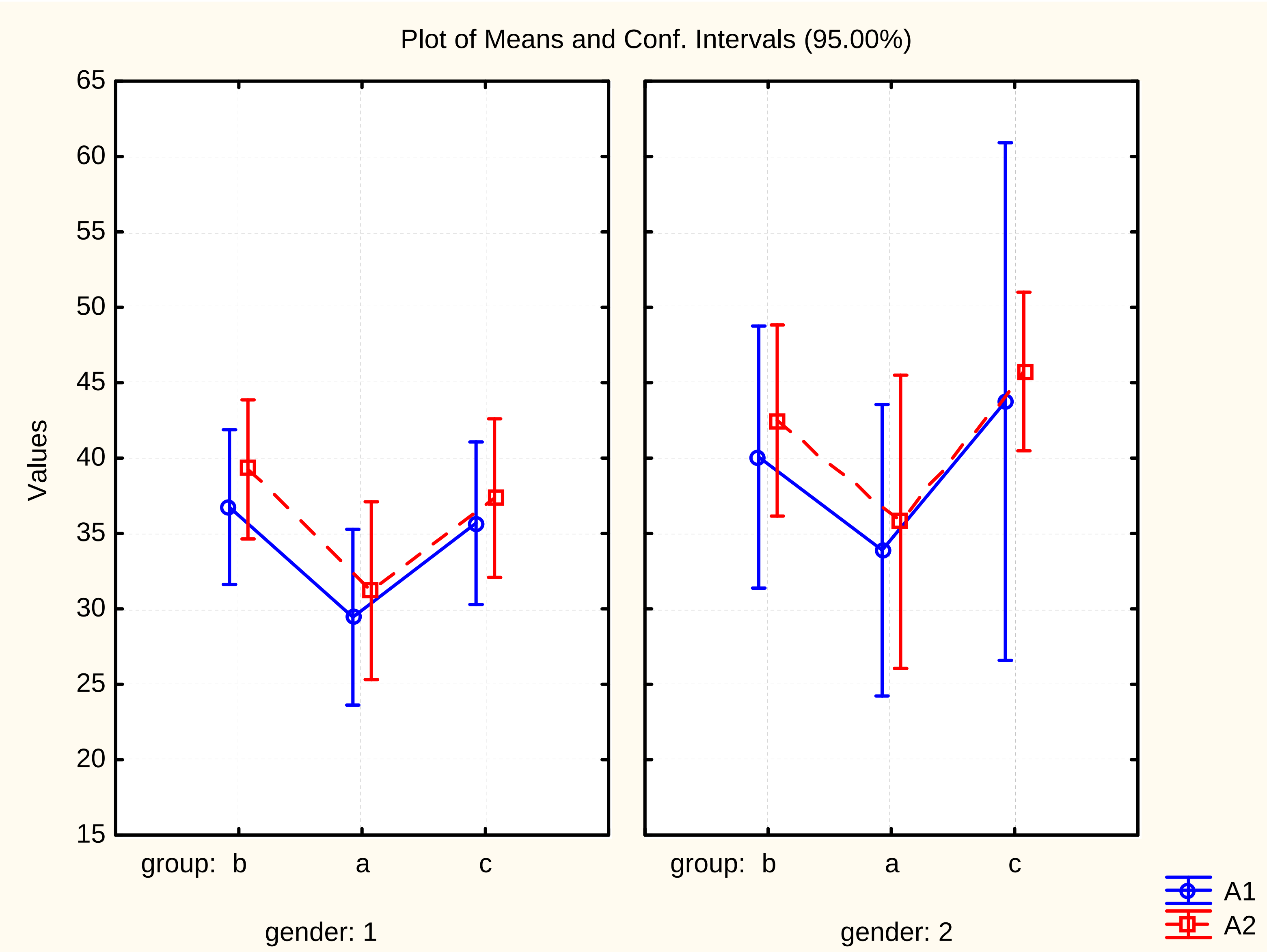
* Note: Gender 1 (Female), 2 (Male); Group A (Historic Female Achievement), B (Nature of Intelligence), C (Control).



* Note: Gender 1 (Female), 2 (Male); Group A (Historic Female Achievement), B (Nature of Intelligence), C (Control).



* Note: Gender 1 (Female), 2 (Male); Group A (Historic Female Achievement), B (Nature of Intelligence), C (Control).



* Note: Gender 1 (Female), 2 (Male); Group A (Historic Female Achievement), B (Nature of Intelligence), C (Control).