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Surmounting Solo Status: Beliefs and Previous Experience Buffer Solo Women's Learning

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## Abstract

Solo status, defined as being the only member of one's social category in an otherwise homogenous group, has been shown to have detrimental effects on performance, independent of a stereotype being salient, and persists until the minority has breached the 33% mark. While previous research has fully explored performance and perception aspects of solo status, little research has examined its effect on learning or on potential moderating variables. The current study examined white female college students' ( $n=120$ ) ability to learn and perform when placed in a solo status group (i.e., three white males) or a control group (i.e., two white males and one white female). Participants completed two learning stages and a performance stage, throughout which participants were taught and tested on shorthand, an un-stereotyped, academic task. Participants also completed measures of previous experience with solo status and endorsement of traditional gender roles. Results revealed that the performance of participants in the solo condition during testing was better when they reported having frequently presented as a solo in social and academic settings compared to those with less solo experience. Further, results also revealed that when presenting as a solo, the learning and subsequent performance of material was better for participants who denied traditional gender roles compared to those who endorsed them, while participants in the control condition revealed the opposite effect, with learning and performance decreasing as rejection of traditional gender roles increased. Combined, these results suggest that previous solo status experience as well as a rejection of traditional gender roles may allow women to overcome the detrimental effects of presenting as a solo during learning and testing, possibly providing participants with an ability to cope when learning and performing as a solo member.

*Keywords:* solo status, gender role beliefs, gender stereotypes

**Surmounting Solo Status: Beliefs and Previous Experience Buffer Solo Women's Learning**

Despite growing diversification efforts, women continue to be under-represented in traditionally White, male-dominated fields of higher education, especially in the science, technology, engineering, and mathematics (STEM) disciplines (e.g., August & Waltman, 2004). In 2009, female undergraduates received only 39.9% of undergraduate degrees awarded in STEM fields (American Physical Society, 2001). This percentage decreases further at the doctoral level, with women earning only 29.5% of doctoral degrees awarded in the physical sciences (NSF, 2010), and only 22.3% of full professorships in STEM disciplines are held by female faculty at U.S. institutions (NSF, 2010). These discrepancies occur outside of the STEM disciplines as well, with only 33% of tenured faculty at doctorate level institutions being female (AAUP, 2006). Once hired, women who have managed to break the barrier continue to face challenges and disadvantages, including remaining in lower ranks and non-tenured positions (Kulis, Sicotte, & Collins, 2002; NSF, 2010) and working in more hostile and sexist departments (Settles, Cortine, Malley, & Stewart, 2006). Women are also under-represented outside of academia, serving as CEOs for only 2% of Fortune 500 companies (Catalyst, 2010), where an unexplained gender gap in compensation continues to disadvantage women (Muñoz-Bullón, 2010).

Many constructs contribute to these disadvantages, including the deep-rooted stereotype that males excel at STEM disciplines more than females. Although few people explicitly endorse these stereotypes, likely due to egalitarian social norms (Schmader, Johns, Barquissau, 2004), many still hold implicit gender biases (Rudman & Kilianski, 2000). Previous research has demonstrated that women who behave counter-normatively (i.e., persevering in STEM disciplines) risk social censure, making them reluctant to self-promote, fearing that they will be

perceived as unsuitable for many occupations (Janoff-Bulman & Wade, 1996; Deaux & Major, 1987). Thus, women are forced to choose between an image of professionalism or femininity, and the decision is often based on others' expectations, leading to stereotype perpetuation (Fiske & Stevens, 1993; Geis, 1993; Jussim, Eccles, & Madon, 1996). These findings suggest that gender stereotypes may keep women from pursuing STEM disciplines, influence hiring processes, and affect women throughout their careers.

Given that women are often underrepresented in certain situations such as STEM classrooms, solo status may play a role in hindering the advancement of women. Solo status is typically defined as being the only member of one's gender in an otherwise homogenous group (e.g., the only female in an otherwise all male classroom; Lord & Saenz, 1985; Salas, Cannon-Bowers, & Blickensderfer, 1997), although this definition has recently expanded to define an identity (e.g., female) that makes up less than 33% of a group (Dasgupta, 2011).

Women experiencing solo status are often at a disadvantage, in that they are stereotyped as less competent (Heilman, 2001), receive low responsibility positions (Lyness & Thompson, 2000), and are often considered as a representative for all women (Niemann & Dovidio, 1998). Kanter's (1977) theory of proportional representation argued that women may be evaluated more negatively due to the scarcity of women and because of their lower status, as increased visibility generates unfair performance pressure on women, requiring greater productivity to be evaluated positively in comparison to male coworkers (i.e., contrast). Multiple studies have confirmed Kanter's theory, including Heilman & Blader's (2001) research, which found that solos within a newly hired cohort were viewed as preferentially selected, less competent, and less likely to succeed. Being aware of these negative perceptions by others can have emotional effects such as feelings of isolation (Rosser, 2004; Kanter, 1977) as well as negative behavioral outcomes. For

example, when women were made aware that co-workers assumed they were preferentially selected, they acted more timidly and selected less complex tasks compared to women who assumed their selection was merit-based (Heilman & Alcott, 2001). Research has also suggested that as the ratio of women to men increases, assumptions of preferential assumptions disappear, women receive higher evaluations (Sackett et al, 1991), and increased compensation in pay (Shin, 2012).

These perceptual differences in gender are specific to women; that is, the findings reported above have not been replicated in research examining male solos (i.e., a traditionally high-status group) in a group of females. Male solos, unlike female solos, are more likely to be identified as group leaders (Crocker & McGraw, 1984), are viewed as contributing more to group discussions (Carli, 2001; Craig & Sherif, 1986), and are evaluated more positively independent of actual productivity (Heikes, 1991). These results suggest that the detrimental effects of solo status for women is not solely a matter of proportional representation but is more specifically related to gender stereotypes. While these differential perceptions can help explain why women may be less likely to pursue a specific field (i.e., STEM fields), laboratory research that controls for differential treatments continues to display decreased performance of low-status solos (e.g., Sekaquaptewa & Thompson, 2002, 2003; Keller & Sekaquaptewa, 2008), suggesting that differential treatment is not the sole perpetrator.

The disadvantages faced by female solos are not limited to how they are perceived, but also extend to their performance. Multiple studies have highlighted the compounding negative effects of solo status when performing a stereotyped task, including both written (Inzlicht & Ben-Zeev, 2001) and verbal math tests (Sekaquaptewa & Thompson, 2002), during which math stereotypes were activated and females performed as solos. These studies revealed that while

stereotype threat and solo status both negatively affect women's performance on math tasks, the combination of both is even more detrimental. Additionally, when female leaders were faced with both stereotype threat and solo status, they displayed lower self-efficacy, poorer leadership, and increased anxiety (Hoyt, Johnson, Murphy, & Skinnell, 2010).

In addition to affecting performance on gender-stereotyped tasks such as math and science, the detrimental effects of solo status on performance have been shown in a plethora of studies on tasks independent of salient stereotypes (e.g., performing poorly on a non-stereotyped task such as spatial ability measures; Sekaquaptewa & Thompson, 2002, 2003; Sekaquaptewa, Waldman, & Thompson, 2007). These effects on performance occur on publically performed tasks (i.e., verbally reporting answers in front of a group; Sekaquaptewa & Thompson, 2002) and anticipated public performances (i.e., solving a problem in private similar to one you will soon perform in front of a group; Keller & Sekaquaptewa, 2008), but do not occur during private performances (Inzlicht & Ben-Zeev, 2003). Further, these detrimental effects have been shown in groups as small as three people (i.e., one female and two males; Inzlicht & Ben-Zeev, 2003), and continue to persist until the solo identity has breached the 33% mark (i.e., more than a third of the group is female; Dasgupta, 2011; Biernat, Crandall, Young, Kobrynoqicz, & Halpin, 1998). Additionally, solos' performance is affected even when they have the same or higher levels of training and education than the non-solo majority (Sackett, DuBois, & Noe, 1991). Thus, it is clear that solo status arises from the context and should be understood as a situational condition, not a chronic stigma (Crocker, Major, & Steele, 1998).

More recent research on solo status has highlighted several partial mediators that have helped to further illuminate the mechanisms responsible for negative performance effects, including performance expectancies and cognitive appraisal. That is, participants' expectations to

perform well or perceiving the task as non-threatening reduced the detrimental effects of solo status (White, 2008; Sekaquaptewa & Thompson, 2003). Previous research has also demonstrated that performance apprehension (Sekaquaptewa & Thompson, 2002) is a partial mediator, suggesting that the public performance aspect of these tasks may be driving the detrimental effects. Additionally, individual tendencies have been identified as partial mediators (Keller & Sekaquaptewa, 2008). For example, after being introduced to a group via web-cams, participants completed a measure of spatial ability and were told they would later demonstrate their spatial ability skills with the group. After completing the practice task, participants completed a measure of self-construal, which revealed that individual tendencies (i.e. decreased interdependent levels of the self) were a partial mediator, such that separating one's self from the soloed group identity may mitigate the effects of solo status.

Due to similarities between solo status and stereotype threat, other work has applied prevalent stereotype threat theories (i.e., working memory and mere effort) to solo status, exploring the possibilities that solo status either decreases working memory or activates the prepotent response due to increased motivation to succeed. Initial research suggests that mere effort may mediate the detrimental effects of solo status on learning, but has not been conclusive (Chaney & Dickter, in prep). Thus, while it is clear that solo status negatively affects performance and perceptual evaluation, it remains unclear what exactly is causing these detriments.

Further, the vast majority of solo status research has focused on either the performance or perception of solos, leaving a key question unanswered: how does solo status during learning affect the encoding of new, novel information? Previously, only one study has attempted to examine this question (Sekaquaptewa & Thompson, 2002). Participants were seated in individual



rooms with a video-conferencing system that participants were led to believe would display a live feed, although all videos were of previously recorded confederates who were not present. After being introduced to three other students (making the participant either a gender solo or not) via the video-conference, each member of the group read a series of facts aloud, constituting the learning stage. Next, participants were introduced to a new group (again the participant was either a gender solo or not) and were verbally tested on the previously learned facts. Results revealed that solo status negatively affects learning, but to a lesser degree than solo testing. In this study, however, the material being taught was potentially stereotyped as it regarded biological information about monkeys, which may have activated stereotypes regarding STEM and natural science disciplines (Shapiro & Williams, 2012). Because of the science-related content, learning and performance may have been affected by stereotype threat for the female solo participants, which did not allow for the unique testing of learning effects based on solo status.

### **The Current Research**

The current study sought to examine whether solo status affects learning of non-stereotyped information among women. Further, this study aimed to examine this research question in an academic environment. Previous research by Lord and Saenz (1985) examined the recall of group members' opinions which had previously been discussed (e.g., "I would prefer to study abroad in England"), and found that solos recalled fewer opinions than non-solos, this information was not academic, but was a mere memory task. It is important that we determine the effects of being a solo while learning academic, non-stereotyped information, so that a more complete, realistic picture can be formed to understand the disadvantages of women in academia

where learning is not recalling facts or opinions, but reproducing and applying detailed, complex material.

Therefore, this study aimed to examine how solo status affects learning by examining women's ability to learn non-stereotyped academic material. Consistent with previous research showing that learning is negatively affected by solo status (Lord & Saenz, 1985; Sekaquaptewa & Thompson, 2002), we predicted that solo females would show less learning than non-solo females, even in a situation in which the content is non-stereotyped. Specifically, due to the visibility created by being a solo, we expect that female solos will experience increased motivation and anxiety, resulting in less focus on learning the new material. Overall, we predicted that women's learning would suffer as a function of being a solo and that performance would be further decreased as the number of solo stages increased.

In addition to providing a more solid understanding of how solo status may affect the learning of non-stereotyped material in an academic situation, this study examined several potential moderators that are expected to affect learning. First, because solo status is highly dependent on group status (i.e., low or high), gender role beliefs, which largely assert dominance or equality (i.e., low, high, or equal status; Ridgeway & Smith-Lovin, 1999), may affect solo status learning, anxiety, or expectations. The expectations state theory suggests that, when working in groups, people look for cues on how to behave, creating unconscious assumptions of self-performance expectations (e.g., my status requires I act in a way such that my performance matches my status; Ridgeway, 2001). These expectations have self-fulfilling effects on people's behavior (Miller & Turnbull, 1986; Shelton, 2003), and may create anxiety. Further, these expectations and anxiety may ultimately affect a solo at the learning stage, preventing proper encoding and processing. Therefore, we predicted that adhering to traditional gender roles would

highlight status differences (i.e., female as low-status), increasing the detrimental effects of solo status during learning, while rejection of traditional gender roles would minimize these detriments.

Second, we hypothesized that frequent previous solo status experiences would create an inoculation effect. Previous research has demonstrated that self-presenting as a solo is demanding, but, in agreement with the strength model of self-regulation (i.e., self-regulation is a renewable resource that builds like a muscle with experience; Baumeister, Vohs, Tice, 2007), Blacks who present as solos more frequently persist on tasks longer than Whites who rarely experience solo status (Vohs, Baumeister, & Ciarocco, 2005; Johnson & Richeson, 2009). Thus, we predicted that previous experience presenting as a gender solo would serve as a buffer, reducing the negative effect of solo status on learning. This is the first study to our knowledge testing the inoculation hypothesis with gender solo status.

In addition, previous work has suggested the potential for anxiety, motivation, and evaluation apprehension to affect solos' performance. For example, Cohen and Swim (1995) demonstrated that anxiety levels increased when presenting as a solo, which may be due to evaluation apprehension (McFall, Jamieson, & Harkins, 2009). Additionally, motivation was included in White's (2008) calculation of cognitive appraisal levels, suggesting motivation to perform well contributed to increased performance for solos. Thus, these variables were also included as potential moderators in the current study.

## **Method**

### **Participants**

A total of 120 White female ( $M_{age} = 19.31$  years,  $SD = 1.63$ ) undergraduate students at the College of William and Mary participated for partial class credit or monetary compensation.

All procedures were approved by the College's human subjects committee. All participants received either partial course credit or monetary compensation for their time.

### **Design**

The experiment was a 2 (Learning session one: solo or non-solo) X 2 (Learning session two: solo or non-solo) X 2 (Testing: solo or non-solo) between-subjects design, with participants randomly assigned to one of the eight conditions.

### **Materials and Procedure**

The hour-long experiment was completed in an individual room that contained a desktop computer as well as a laptop that was used for the video conferences. Participants were each greeted by a female experimenter and asked to carefully read a consent form (see Appendix A) that informed participants that they would be taking part in a series of two learning sessions followed by an individual evaluation and ultimately a group evaluation. To maintain the cover story that other participants were taking part in the study, while the participants were reading over the consent form, the experimenter opened and closed several near-by doors and spoke out loud, as if to greet and offer instructions to other participants. In order to examine the effects of solo status on learning, shorthand and Dutch were selected as gender-neutral, non-stereotyped materials to be used in two learning phases and the recall phase. Participants were told that the school was interested in shorthand due to the rise in technology in classrooms in order to increase note-taking brevity. Further, participants were informed that the Dutch material was to be regarded simply as obscure information that would test their ability to transfer knowledge across domains to new material, as would be required in a classroom. These instructions were meant to suggest that Dutch was not viewed as a language task that could potentially be viewed

as stereotypically favored towards women. After the consent form had been signed and all instructions were given, the video conference began.

Participants were told that video conferences would be used during each session to introduce them to other students with whom they would be working during the group evaluation as well as to create a classroom-like environment. The video conferences were not actually live, as the participants were led to believe, but in fact included previously recorded videos of confederates, including two white females and five white males who were upperclassmen at the College. All video conferences included three confederates, but the gender make-up of these groups varied based on the condition for the participant. All videos contained three confederates, with two males and one female in the non-solo videos and three males in the solo videos. During the video conferences, a video of each confederate was displayed one at a time during introductions, with text instructions appearing cuing each introduction (i.e., “Begin introductions participant 1”). All confederates and participants introduced themselves by stating their initials, home state, and a class they were taking. After the participant had viewed all introductions on the video conference and had introduced herself, the participant was instructed via a message on the video conference to follow instructions on the main computer that would guide her through the session. Following introductions, the video displayed all three confederates working through the session; the confederates made occasional glances at the camera to increase realism.

The learning sessions were counterbalanced between participants such that for each session, participants were randomly assigned to be either in the solo or non-solo condition, and each began with brief instructions. Each of the two learning sessions began with a presentation of seven facts regarding the history and usage of shorthand, including its invention, variations, and advantages (e.g., “shorthand was invented to record the speeches of Cicero”; see Appendix B).

This information was followed by the display of six shorthand symbols and their general translations as well as six Dutch words and their general English translation (see Appendix C). In order to mitigate complexity, the shorthand symbols were taken from the Gregg Shorthand style, but were simplified so that one symbol equaled one English word (Gregg, Leslie, Zoubek, 1995). Additionally, the Dutch words were taught ignoring person and tense so that one word was presented as encompassing all entities of the English translation. All facts, shorthand, and Dutch words were presented on the screen for 15 seconds or until the participant responded. Following this information, participants saw two example sentences containing the recently learned material, one in Dutch and the other in shorthand, followed by a summary screen presenting all Dutch and shorthand material for one minute. The information of the two sessions was crafted such that during session one, the participant was taught six Dutch words and six shorthand symbols. In the second session, the participant was taught the previously learned Dutch in shorthand, and the previously learned shorthand symbols in Dutch. Thus, the participant was actually taught 12 words in both Dutch and shorthand over the two learning sessions in addition to the 14 facts regarding shorthand.

Once all the information had been presented, participants were instructed to open the door and wait for the experimenter to return to begin their next session. In between sessions, the experimenter returned and informed the participant that once the other students had finished, she would return to set up the next conference. The experimenter then opened and closed doors in the hallway, again speaking out loud as if to other participants. After a minute or so the experimenter returned, set up the next video conference based on the participant's condition, and exited the room.

During the testing session, participants were instructed to record their shorthand answers on an answer sheet and were informed that all other answers should be entered directly into the computer. The testing session included 10 questions regarding the history of shorthand in both multiple choice and short answer format. Additionally, participants were asked to translate a total of 24 words (i.e., six words from English to shorthand, six from shorthand to English, six from Dutch to English, and six from English to Dutch). More complicated questions were also asked, requiring participants to translate five sentences from Dutch to shorthand and five sentences from shorthand to Dutch (see Appendix D). These sentence translations required knowledge from both learning sessions as well as the additional step of first translating to English before the desired language, while all other questions tested material from a single learning session.

Upon completion of the testing session, the program exited out and opened to a new screen which contained multiple self-report measures, including the Gender Role Beliefs Scale (GRB;  $\alpha = .807$ ; Kerr & Holden, 1996) that measured support of traditional gender roles (i.e., “Women with children should not work outside the home if they don’t have to financially”), with statements rated on a 7-point Likert scale from 1=strongly agree and 7= strongly disagree. The Evaluation Apprehension Scale (EAS;  $\alpha = .861$ ; Richmond, Wrench, & Gorham, 2001) was included to measure nervousness about testing (i.e., “I feel apprehensive while preparing for a test”), and statements were rated on a 5-point Likert scale from 1=strongly disagree and 5=strongly agree. Additionally, the State Trait Anxiety Scale (STAI;  $\alpha = .926$ ; Spielberger, Gorsuch, & Lueshene, 1964) was included to measure current overall anxiety (e.g., “I feel tense”) and was measured on a 4-point scale from 1=not at all and 4=very much. The Current Motivation Scale (CMS;  $\alpha = .732$ ; Freund, Kuhn, & Holling, 2011) was also included to measure how motivated participants were to succeed on the task (i.e., “I am eager to see how I will

perform on the task”) and was measured on a 7-point Likert scale from 1=strongly disagree to 7=strongly agree. Additional questions were asked regarding previous solo status experience in both academic and social situations (i.e., “I have frequently felt like the only person of my gender in academic situations”) and were rated on a 5-point scale from 1=never to 5=always (see Appendix E for all scales).

Upon completion, participants were probed for suspicion about both the true nature of the study and the video conferences. When suspicion was reported, follow-up questions inquired when and why they became suspicious, as well as how strongly they suspected the deception using a funnel debrief procedure. Additional questions were asked about the difficulty of the tasks and participants were encouraged to ask any questions they still had. Once participants were fully debriefed on the true nature of the study, they were thanked for their time and cooperation.

## **Results**

A total of 10 participants were removed from analyses due to previous experience with Dutch ( $n = 5$ ) or suspicion that the video conferences were fake ( $n = 5$ ), leaving 110 participants for data analysis. The five participants who reported suspicion personally knew one of the confederates in the video conferences, and became suspicious when they received no acknowledgement. A manipulation check revealed that 90.31% of participants correctly recalled the gender makeup of their groups at each session.

## **Performance**

Performance scores were calculated for the material from each learning session (i.e., one score for performance on the material taught in the first lesson, and a second for the material taught in the second lesson), with each correct answer yielding one point. Participants received a



score out of 27 for both learning sessions. Performance scores were also calculated for the transfer questions (i.e., translations from shorthand to Dutch and vice versa). For the sentence translations, participants were awarded one point for each word correctly translated, with a total possible score of 59 points. Participants also received a grand total score out of 113 possible points.

Total performance scores revealed that the task was relatively difficult, but scores varied greatly ( $M=53.86$ ,  $SD=22.61$ ). In order to examine whether total performance scores varied as a function of solo status during learning and testing, a 2 (Learning session 1: Solo, Non-Solo) X 2 (Learning session 2: Solo, Non-Solo) X 2 (Testing: Solo, Non-Solo) between-subjects analysis of variance (ANOVA) was computed for total performance scores. This analysis revealed no main effects or interactions. To examine whether performance scores for the first learning session ( $M=16.03$ ,  $SD=5.35$ ), the second learning session ( $M=17.09$ ,  $SD=5.41$ ), and sentence translations ( $M=20.75$ ,  $SD=14.16$ ) differed as a function of solo condition, additional three-way ANOVAs were conducted on scores from each learning session and the sentence translations, but no significant main effects or interactions were found.

### **Gender Role Beliefs (GRB)**

To examine the relationship between the rejection of traditional gender roles and performance scores, several correlational analyses were conducted. As can be seen in Table 2, GRB was significantly correlated with scores on the second learning session for both solo and non-solo conditions, suggesting a potential relationship between GRB and scores on learning session two. As demonstrated in Tables 1 and 3, there were no other significant correlations between scores, neither on the first learning session nor on total scores.

Linear regression analyses were performed to determine the extent to which performance scores from the individual learning sessions were predicted by participants' rejection of traditional gender roles ( $M=5.87$ ,  $SD=1.69$ ), as measured by the GRB. The dependent variable was performance on the second learning session. The main effects of GRB and solo status condition were entered in the first step of the regression. In the second step of the regression, an interaction term with the condition (i.e. solo or non-solo) during the second learning session and mean-centered GRB was entered.

The model predicting participants' performance scores from traditional gender role belief was significant,  $R^2 = .089$ ,  $F(3,106) = 3.45$ ,  $p = .019$ , with a main effect of gender role beliefs,  $\beta = -.92$ ,  $t(106) = -3.18$ ,  $p = .002$ , but not for condition,  $\beta = -.31$ ,  $t(106) = -.31$ ,  $p = .758$ . The main effect of gender role beliefs revealed that rejection of traditional gender role beliefs predicted increased performance. Further, consistent with hypotheses, the interaction term was significant,  $\beta = 1.86$ ,  $t(106) = 3.14$ ,  $p = .002$ . As demonstrated in Figure 1, for participants in the non-solo condition for learning session two, performance decreased as rejection of traditional gender role beliefs increased, *simple slope* =  $-1.09$ ,  $t(106) = -2.64$ ,  $p = .009$ , but for participants in the solo condition, performance marginally increased as rejection of traditional gender role beliefs increased, *simple slope* =  $.77$ ,  $t(106) = 1.81$ ,  $p = .073$ .

### **Previous Solo Status Frequency**

To examine the relationship between previous solo status experience and performance scores, several correlational analyses were conducted. As can be seen in Table 4, previous solo status experience was correlated with total performance score and learning session one material score. To determine if total performance score was predicted by previous solo status frequency ( $M=4.07$ ,  $SD=1.59$ ) and solo condition, a linear regression analysis was conducted. The

dependent variable was total performance scores. The independent variables of previous solo status frequency and solo status condition during testing were entered in the first step of the regression. In the second step of the regression, an interaction term for the condition (i.e. solo or non-solo) during the testing session and previous solo status frequency was entered.

The model predicting performance scores from previous solo status frequency was significant,  $R^2 = .083$ ,  $F(2,104) = 3.11$ ,  $p = .030$ , with neither previous solo status frequency as a significant predictor,  $\beta = -.29$ ,  $t(103) = -1.00$ ,  $p = .320$ , nor test condition,  $\beta = 0$ ,  $t(104) = -.01$ ,  $p = .991$ . Additionally, the interaction term was a marginally significant predictor,  $\beta = .54$ ,  $t(104) = 1.90$ ,  $p = .061$ . As depicted in Figure 2 and in accordance with hypotheses, performance in the solo condition increased as previous solo status experience increased, *simple slope* = 6.21,  $t(103) = 2.98$ ,  $p = .003$ , while performance of participants in the non-solo condition did not vary based on previous solo status experience, *simple slope* = 1.13,  $t(103) = .68$ ,  $p = .501$ .

A second linear regression analysis was conducted to determine if learning session one material score was predicted by previous solo status frequency and solo condition. The dependent variable was learning session one score and the independent variables were previous solo status frequency and solo status condition during the first learning session. Each independent variable was entered in the first step of the regression. In the second step of the regression, an interaction term for the condition (i.e. solo or non-solo) during the first learning session and previous solo status frequency was entered.

Only the first step of the model was significant,  $R^2 = .115$ ,  $F(3,103) = 6.78$ ,  $p = .002$ , with a simple main effect of previous solo status frequency,  $\beta = .99$ ,  $t(102) = 3.20$ ,  $p = .002$ , but no main effect of learning session one condition,  $\beta = -1.48$ ,  $t(102) = -1.51$ ,  $p = .135$ .

### **EAS, STAI, Motivation**

Analyses of participants' total performance scores and scores on the EAS, STAI, and motivation to succeed revealed multiple correlations (see Table 5), with EAS and STAI positively correlated,  $r(103) = .59, p < .001$ , such that participants higher in trait anxiety reported more evaluation apprehension. Further, motivation to succeed and STAI were negatively correlated,  $r(102) = -.35, p < .001$ , such that as participants' anxiety increased, motivation decreased. Interestingly, motivation to succeed was positively correlated with overall performance scores,  $r(107) = .49, p < .001$ , but the other two measures were not. Regression analyses were conducted for each of these three measures, but revealed no significant interactions by testing condition (i.e., solo or non-solo).

### Discussion

The current study revealed insight into new variables that may moderate the effects of solo status on learning. That is, although the make-up of the solo status groups during the three sessions did not affect performance, gender role beliefs and previous experience with solo status moderated the effects of solo status on performance on an academic, non-stereotyped task. These findings extend the literature that has previously focused on measuring how the gender make-up of a group affects performance on stereotyped or non-academic tasks.

The results of the current study suggest that gender role beliefs affected how a female solo learned and performed, such that as rejection of traditional gender roles increased, solo participants during the second learning session displayed greater learning, while non-solo participants' learning was negatively affected. Conversely, adherence to traditional gender roles negatively affected participants' learning as a solo during the second learning session, while positively affecting non-solo learning. The effect of gender role beliefs depended on the participants' conditions during the second learning session and did not appear during either the

first learning session or testing phase, suggesting that these beliefs may have a direct effect on learning.

Thus, rejecting traditional gender roles seems to reduce the unconscious, negative assumptions of self-performance expectations that accompany traditional gender roles, which mixed-gender contexts make salient (Cota & Dion, 1986). Rejecting the traditionally low-status role of females and embracing a view of equality appears to be working as a buffer at least in one learning condition, such that solo participants are able to learn better in comparison to those solos who were more accepting of traditional gender roles (i.e., accepting the low expectations assigned to their status as a female). Therefore, these findings suggest that overcoming the learning and performance detriments of solo status may go hand in hand with embracing female equality, such that women presenting as a solo are not hindered by low expectations, although further research will be needed to better understand this effect and the mechanisms behind it.

Interestingly, adherence to traditional gender roles seems to benefit females who learned the material as non-solos, but increased rejection of these gender roles negatively affected non-solos. While we predicted that accepting traditional gender roles places less pressure on women when they are alongside another female (i.e., you are not the sole representative of your gender and believe others do not expect you to perform well), allowing non-solo women to properly encode new information, the negative effect of traditional gender role rejection on non-solos was not predicted. However, it is conceivable that when one rejects traditional gender roles, she may already feel a need to demonstrate her talent to male group members in an attempt to show equality. This need to assert one's ability may enhance learning when it stands alone (i.e., solo females), but when another female is present (i.e. non-solo), a resulting amplified competitive drive may cause too much pressure, impeding her ability to encode and learn the new

information (Zuckerman & O'Loughlin, 2006; Schmader & Johns, 2003). Female competition is often covert and rarely acknowledged by women (Davidson & Duberman, 1982; Walker, 1994), such that when publically discussing same-sex competition, women tend to define them in terms of gendered norms, despite experiences and personal beliefs contradicting this ideology (Walker, 1994). Additionally, research has shown that female competition is increased among same-sex classmates and in academic environments (Singleton & Vacca, 2007). Thus, the presence of another woman combined with a rejection of traditional gender roles may create too much competitive pressure and motivation, resulting in either insufficient working memory to encode new information, or the activation of a prepotent response that does not result in optimal encoding (i.e., mere effort account; McFall, Jamieson, & Harkins, 2009).

Along with gender role beliefs, a second moderator was identified, revealing that previous solo status experience creates an inoculation effect, even for gendered-solos. As we predicted, females who had more frequently presented as a sole member of their gender during both academic and social situations performed better, perhaps due to greater self-regulation, allowing them to persist longer during the testing session. Thus, while this inoculation effect does not seem to assist during learning, it allowed solo women to persist during performance. These findings suggest that if women are able to continue in a discipline or classroom in which they are a solo, the experience may later enhance their performance, ultimately resulting in more women in high-level positions (i.e. CEOs and faculty members). Importantly, many STEM disciplines may present an additional challenge to women due to the compounding effects of stereotype threat and solo status (Sekaquaptewa & Thompson, 2003), such that other coping strategies will need to be practiced and coupled with experience to overcome the disadvantages felt by women in these fields. A large body of research has demonstrated coping strategies and

moderators for stereotype threat, such as individuation and goal reorienting, and future research should explore how these moderators are affected by solo status and stereotype threat experience (see Smith, 2004 for a review).

Furthermore, consistent with previous research, our results showed that increased anxiety resulted in poorer performance, but did not depend upon condition. Motivation was positively correlated with performance, such that as motivation increased, performance increased, but this was also not dependent upon condition, suggesting that being a solo did not increase anxiety or motivation during learning or performance in the current study. Further, the correlation between STAI and EA was to be expected as the two constructs largely overlap, as is the negative correlation between motivation and EA and STAI, as one would expect motivation to be greatest when anxiety and apprehension are low. While previous research has not explored the role of motivation on performance or learning under solo status directly, consistent with our findings, multiple studies have demonstrated the positive effect of motivation on academic performance (Davis, 2009). Additionally, performance apprehension and anxiety have been shown to affect the performance of solos, but not non-solos, relationships that are inconsistent with the current study's findings (Sekaquaptewa, Waldman, Thompson, 2007; Cohen & Smith, 1995).

This study was not without its limitations. The learning paradigm was novel to participants, and results were inconsistent such that overall learning in the testing session and in learning session one was affected by previous solo experience but in learning session two, learning was affected by the interaction between gender role beliefs and solo condition. The difference between learning in the two sessions may have been because the task was new and participants were just being introduced to the video-conference and information presentation technology, participants' attention was directed more to the task and less to the gender identity of

the confederates. Future research regarding the effects of solo status on learning should include a practice session that allows participants to become familiar with the paradigm and technology in order to help us further understand the current results.

Additionally, the fact that solo status condition by itself did not affect learning or performance effects is troubling, as several previous studies have demonstrated that solo status has a detrimental effect on performance (e.g. Keller & Sekaquaptewa, 2008; Inzlicht & Ben-Zeev, 2003). The absence of this effect in the current study suggests that the video-conference interactions may not have been enough for solo status to affect overall performance. Future research should attempt to increase participants' interactions with the other group members and have them publically perform with the group (i.e., verbally report answers on web-conference), which may create a stronger effect than simply believing one will soon perform publically (Sekaquaptewa & Thompson, 2002; Keller & Sekaquaptewa, 2008). These changes may make the participant's status more salient, as more time will need to be spent looking at the web-conference and contemplating responses, thus increasing realism.

Further, the fact that motivation affected learning not did not differ by solo condition may be at odds with the above competition theory for the effects of gender role beliefs on non-solos. Thus, additional studies will need to further explore the role of gender role beliefs and solo status to paint a clearer picture, allowing us to better grasp the mechanisms behind solo status. This research should include examining women's motivation and competitive drive as the number of women increases to 33% of the group and beyond, as effects may vary if a woman experiences solo status alone (i.e., the only female) or solo status with another female (i.e., females less than 33% of group).

## **Conclusion**



Overall, although this study is preliminary, it has highlighted two key moderators of solo status' effect on learning. The finding that previous experiences with solo status serving as an inoculation is promising, providing evidence that women who enter academic situations with few or no females and persist, can ultimately dispel the traditionally detrimental effects of solo status despite or even because of solo status experience. Importantly, this effect was observed in our testing session, suggesting that if the information has been properly encoded, solo status will not impede performance for an experienced solo, and will actually result in better performance than non-solo participants, regardless of the non-solos' previous experience. While previous research demonstrated an inoculation effect for African American and Hispanic solos, the research only explored persistence on the task, not actual performance (Johnson & Richeson, 2009). Our findings suggest that an inoculation effect appears for gendered-solos such that previous solo experience actually increases performance, and while this may be in conjunction with increased persistence, future research will be required to confirm this.

Although results did not reveal any direct evidence of the effects of solo status on learning, learning appeared to be affected by the interaction between gender role beliefs and solo status condition. This has implications for women in high-level positions and academia who have likely already been able to reject some of the traditional gender role beliefs, and our findings suggest that it is exactly that rejection which allows solo women to learn and succeed as a solo. Thus, while more research must be conducted to fully understand the impact of solo status and gender role beliefs on learning, our present findings suggest that the negative effects of solo status on learning and performance, which have long been the prevalent focus, can be mitigated by asserting female equality through the rejection of traditional gender roles and the persistence of females in environments where they have so often been soloed. Ultimately, the current study

provides preliminary evidence that these buffers may mitigate the detrimental effects of stereotype threat on a non-stereotyped task, and when coupled with other coping strategies, these buffers may allow women to enter, persevere, and succeed in STEM disciplines where they have been historically underrepresented and misperceived.

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## Appendix A

**Informed Consent Form**

Examining Efficient Note-Taking Strategies  
Psychology Department - College of William & Mary

The purpose of this study is to examine the effects of cognitive ability on problem solving:

- First, you will be introduced, via a webcam, to three other participants who are also partaking in this study. These participants are in other rooms and you will be working with them later on during the study in a focus group and group project. It is suggested that you introduce yourself by telling them your year of education, and an activity or two that you enjoy doing in your free time. You do not need to share with them any information about yourself that you do not feel comfortable sharing. They will also introduce themselves to you, and each other, sharing similar information. This webcam will be recording your group interactions.
- You will then complete a learning session, be introduced to a new group via the video conference and complete a second learning session.
- Next, you will be introduced to your testing group via a new video conference and will then be tested on the information you have learned, asked to recall information and complete basic problems.
- You will then be asked to complete a series of questions rating the material, your motivation to learn the material, as well as other related questions.
- Lastly, you will work with the other participants you have met on a small group project that will integrate all of the information you each learned and then conference about the benefits of learning the material and whether or not it would be beneficial for students to learn and use for note taking.

Your privacy is important to us and we will make every effort to protect your privacy. An arbitrary code number has been assigned to you for this study. The link between this code number and information that could be used to personally identify you will be kept in a password-protected database in a locked location. The results of this experiment will not be linked to any specific individual; we are only interested in group averages. No identifying information will ever be made public.

Please read the paragraph below and sign at the bottom.

The general nature of this study has been explained to me. I understand that I will be partaking in two learning sessions, completing a test as well as questionnaires, and be a part of a group project and focus group. My participation in this study should take a total of about 45 minutes. I understand that my responses will be confidential and that my name will not be associated with any results of this study. I know that I do not have to participate in this study and that if I do choose to participate, I may stop at any time without any penalty. I know that I may refuse to answer any question asked and I also understand that any credit for participation will not be affected by my responses or by my exercising any of my rights. I am aware that my participation will be recorded through the webcam, but that my name or other personal information will not be attached to the video. I also understand I may choose to have my participation not recorded. I am aware that I may report dissatisfactions with any aspect of this

experiment to the Chair of the Protection of Human Subjects Committee, Dr. Lee Kirkpatrick, 1-855-800-7187 or consent@wm.edu. I understand that I may contact Dr. Cheryl Dickter about this experiment to ask any questions or to obtain the results of this study after it is completed at 757-221-3722 or cldickter@wm.edu. I am aware that I must be at least 18 years of age to participate. My signature below signifies my voluntary participation in this project, and that I have received a copy of this consent form.

---

Signature

---

Date

---

Print Name

## Appendix B

## Learning Session 1 Facts:

- Shorthand is an abbreviated symbolic writing method that increases speed and brevity of writing as compared to a normal method of writing a language.
- The earliest known indication of shorthand systems was from Ancient Greece, found on a stone on the Pantheon from the mid-4th century B.C.
- Created to write down Cicero's speeches, the Tironian notes were drafted in a shorthand form consisting of Latin word stem abbreviations and word ending abbreviations. The original Tironian notes consisted of about 4000 signs.
- Today, Japan has a total of 9 shorthand systems which are all used.
- The first modern shorthand systems were geometric, meaning they were based on circles, parts of circles, and straight lines placed strictly horizontally, vertically or diagonally.
- Script shorthands, the first type of shorthand systems, were based on the motions of ordinary handwriting.
- Due to different dialects and accents, some words may be scribed differently due to shorthand's phonetic reliance but can still be easily understood.

## Learning Session 2 Facts:

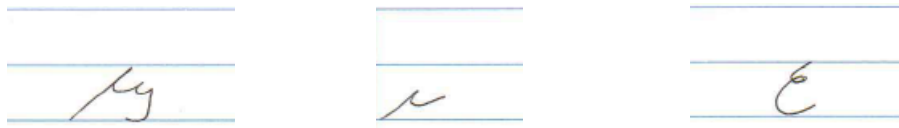
- In the U.S.A., two shorthand systems became very popular, Pitman and Gregg shorthand.
- The Gregg shorthand system was invented in 1888 and is a phonetic writing system, which means it records the sounds of the speaker, not the English spelling.
- Gregg shorthand uses lines of the same thickness but discriminates between similar sounds by the length of the stroke.
- Gregg shorthand has been adopted for 15 different languages.
- Many of the most common words have standard shorthand abbreviations to further increase of the speed of writing.
- Using Gregg shorthand, max speeds of 280 words per minute have been reached.
- Gregg shorthand is geometric and is completely based on elliptical figures and lines that bisect them.

Appendix C

*Learning Session 1 Translations:*



1. We= \_\_\_\_\_ 2. Them= \_\_\_\_\_ 3. To= \_\_\_\_\_



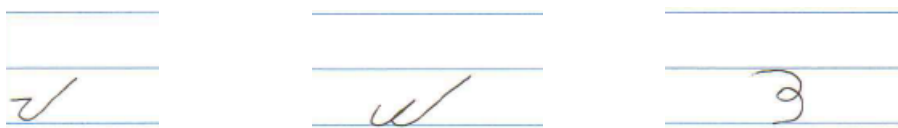
4. Drove= \_\_\_\_\_ 5. Ran= \_\_\_\_\_ 6. Water= \_\_\_\_\_

1. They= Zij 2. A = Een 3. Us=Ons 4. Note= Noot 5. Wrote=Schreef 6. Saw= Zagen

*Learning Session 2 Translations:*



1. They= \_\_\_\_\_ 2. A= \_\_\_\_\_ 3. Us= \_\_\_\_\_



4. Note= \_\_\_\_\_ 5. Wrote = \_\_\_\_\_ 6. Saw= \_\_\_\_\_

1. We= Wij 2. Them= Ze 3. To= Naar 4. Drove= Reed 5. Ran=Liep 6. Water= Dronk

## Appendix D

*Test Questions*

Q1: Modern Japan uses how many different shorthand systems? A: 9

Q2: The first shorthand systems were: A: B

- a. Geometric
- b. Script
- c. Latin
- d. Phonetic

Q3: The original Tironian notes consisted of how many signs? A: D

- a. 1,000
- b. 2,000
- c. 3,500
- d. 4,000

Q4: How are script shorthand systems different from Geometric systems? A: Based on motions of ordinary handwriting, not circles and intersecting lines

Q5: The earliest piece of shorthand was discovered in: A: D

- a. Rome
- b. Egypt
- c. Israel
- d. Greece

Q6: A benefit of shorthand writing is: A: increased writing speed

Q7: The Tironian notes were originally created to: A: Record Cicero's speeches.

Q8: What are the two popular shorthand systems used in the U.S.A.? A: Pitman & Gregg

Q9: A \_\_\_\_\_ writing system records the sounds of the speaker, not the spelling. A: phonetic

Q10: Gregg shorthand differentiates between similar sounds by: A: C

- a. Line thickness
- b. Accents
- c. Line length
- d. It is not able to

Q11: Gregg shorthand has been adopted for how many different languages? A: 15

Q12: What is the maximum words per minute recorded using shorthand? A: 280

Q13: Gregg shorthand uses:

- a. Geometric symbols
- b. Script letters
- c. Accents
- d. Greek alphabet

Q14: When was Gregg shorthand invented? A:D


- a. 1800
- b. 1950
- c. 1850

d. 1888

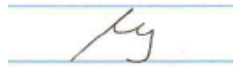
Translate English to shorthand (LS1):



Q15: We = ? A: \_\_\_\_\_



Q16: Them= ? A: \_\_\_\_\_



Q17: Drove= ? A: \_\_\_\_\_

Translate English to Dutch (LS1):

Q18: They: ? A: Zij

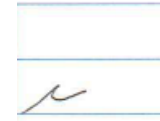
Q19: A: ? A: Een

Q20: Us: ? A: Ons

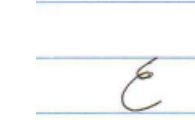
Translate shorthand to English (LS1):



Q21: A=To Q: \_\_\_\_\_



Q22: A=Ran Q: \_\_\_\_\_



Q23: A=Water Q: \_\_\_\_\_

Translate Dutch to English (LS1):

Q24: A=Wrote Q: Schreef

Q25: A=Note Q: Noot

Q26: A=Saw Q: Zagen

Translate English to shorthand (LS2):





Handwritten shorthand for Q39: Zij reed een noot naar ons.

Q39: \_\_\_\_\_ (They drove a note to us)

A: Zij reed een noot naar ons.

Handwritten shorthand for Q40: Wij liep dronk naar ze.

Q40: \_\_\_\_\_ (We ran water to them)

A: Wij liep dronk naar ze.

Handwritten shorthand for Q41: Wij zagen dronk naar ons.

Q41: \_\_\_\_\_ (We saw water ran to us)

A: Wij zagen dronk naar ons.

Handwritten shorthand for Q42: Zij zagen een noot naar ons.

Q42: \_\_\_\_\_ (They saw a note to us)

A: Zij zagen een noot naar ons.

Handwritten shorthand for Q43: Wij schreef een noot naar ze.

Q43: \_\_\_\_\_ (We wrote a note to them)

A: Wij schreef een noot naar ze.

Translate Dutch to shorthand (LS1 & LS2):

Q44: Zij reed een noot naar ze. (They drove a note to them)

Handwritten shorthand for Q44: Zij reed een noot naar ze.

A: \_\_\_\_\_

Q45: Wij zagen een noot zij schreef naar ze. (We saw a note they drove to them)

Handwritten shorthand for Q45: Wij zagen een noot zij schreef naar ze.

A: \_\_\_\_\_

Q46: Zij schreef een noot naar ons. (They wrote a note to us)

*Zij schreef een noot naar ons.*

A: \_\_\_\_\_

Q47: Wij liep dronk naar ze. (We ran water to them)

*Wij liep dronk naar ze.*

A: \_\_\_\_\_

Q48: Zij reed dronk naar ons. (They drove water to us)

*Zij reed dronk naar ons.*

A: \_\_\_\_\_

## Appendix E

**Gender Role Beliefs Scale** (1, Strongly Agree – 7, Strongly Disagree)

1. It is disrespectful to swear in the presence of a lady.
2. The initiative in courtship should usually come from the man.
3. Women should have as much sexual freedom as men.
4. Women with children should not work outside the home if they don't have to financially.
5. Thus husband should be regarded as the legal representative of the family group in all matters of law.
6. Except perhaps in very special circumstances, a man should never allow a woman to pay the taxi, buy the tickets, or pay the check.
7. Men should continue to show courtesies to women such as holding open the door or helping them on with their coats.
8. It is ridiculous for a woman to run a train and a man to sew clothes.
9. Women should be concerned with their duties of childbearing and housetending rather than with the desires for professional and business careers.
10. Swearing and obscenity is more repulsive in the speech of a woman than a man.

**Evaluation Apprehension Scale:** (1, Strongly Disagree – 5, Strongly Agree)

1. I feel apprehensive while preparing for a test.
2. I feel tense when I am studying for a test or exam.
3. I am calm when I am studying for a test.
4. I feel peaceful when I am studying for a test.
5. I feel fear and uneasiness when taking an exam or being evaluated.
6. I feel self-assured when taking an exam.
7. I feel fearful when preparing for a test.
8. I feel ruffled when the test is handed to me.
9. I am jumpy and nervous while taking a test.
10. I feel composed and in control while taking an exam.
11. I am bothered and tense when I am being evaluated.
12. I feel satisfied when my exam is completed.
13. I feel safe during evaluative situations.
14. I feel flustered and confused when I start a test.
15. I am cheerful after I turn in my test.
16. I feel happy about how I did in evaluation situations.
17. I feel dejected and humiliated an hour before an exam.
18. I feel pleased and comfortable while taking a test.
19. I feel confident while taking a test.
20. I feel unhappy throughout an exam period.

**State Trait Anxiety Scale:** (1, Not at all- 4, Very much)

1. I feel calm
2. I feel secure
3. I feel tense
4. I feel strained
5. I feel at ease
6. I feel upset
7. I am presently worrying over possible misfortunes
8. I feel satisfied
9. I feel frightened
10. I feel uncomfortable
11. I feel self-confident
12. I feel nervous
13. I feel jittery
14. I feel indecisive
15. I am relaxed
16. I feel content
17. I am worried
18. I feel confused
19. I feel steady
20. I feel pleasant

**Current Motivation Scale:** (1, Strongly Disagree – 7, Strongly Agree)

1. I think I am up to the difficulty of this task
2. I probably won't manage to do this task
3. I feel under pressure to do this task well
4. After having read the instruction, the task seems to be very interesting to me
5. I am eager to see how I will perform in the task
6. I am afraid I will make a fool out of myself
7. I am really going to try as hard as I can on this task
8. For tasks like this I do not need a reward, they are lots of fun anyhow
9. It would be embarrassing to fail at this task
10. I think everyone could do well on this task
11. If I can do this task, I will feel proud of myself
12. I would work on this task even in my free time

**Solo Status Frequency Questions:** (1, Never- 5, Always)

1. I have frequently felt like the only person of my gender in social situations at William and Mary.
2. I have frequently felt like the only person of my gender in academic situations at William and Mary.
3. I have frequently felt like the only person of my gender in social situations outside of William and Mary.
4. I have frequently felt like the only person of my gender in academic situations outside of William and Mary.

Table 1

*Correlations of GRB and Performance Scores by Condition of Learning Session 1*

Measure	Solo at Learning Session 1					Non-Solo at Learning Session 1				
	GRB	L.S. 1	L.S. 2	Sentence	Total	GRB	L.S. 1	L.S. 2	Sentence	Total
GRB	1					1				
L.S. 1	-.193	1				-.096	1			
L.S. 2	-.102	.744**	1			-.010	.735**	1		
Sentence	-.178	.748**	.711**	1		.002	.692**	.623**	1	
Total	-.179	.875**	.852**	.960**	1	.021	.850**	.809**	.951**	1

*Note.* \* $p < .05$ , 2-tailed., \*\* $p < .01$ , 2-tailed

Table 2

*Correlations of GRB and Performance Scores by Condition of Learning Session 2*

Measure	Solo at Learning Session 2					Non-Solo at Learning Session 2				
	GRB	L.S. 1	L.S. 2	Sentence	Total	GRB	L.S. 1	L.S. 2	Sentence	Total
GRB	1					1				
L.S. 1	.116	1				-.210	1			
L.S. 2	.260*	.794**	1			-.321**	.698**	1		
Sentence	-.073	.655**	.649**	1		-.104	.759**	.678**	1	
Total	.044	.842**	.840**	.945**	1	-.190	.874**	.824**	.962**	1

*Note.* \* $p < .075$ , 2-tailed., \*\* $p < .01$ , 2-tailed

Table 3

*Correlations of GRB and Performance Scores by Condition of Testing Session*

Measure	Solo at Testing					Non-Solo at Testing				
	GRB	L.S. 1	L.S. 2	Sentence	Total	GRB	L.S. 1	L.S. 2	Sentence	Total
GRB	1					1				
L.S. 1	-.138	1				.015	1			
L.S. 2	-.054	.817**	1			-.071	.617**	1		
Sentence	-.050	.802**	.746**	1		-.120	.617**	.571**	1	
Total	-.075	.910**	.881**	.963**	1	-.093	.794**	.757**	.950**	1

*Note.* \* $p < .075$ , 2-tailed., \*\* $p < .01$ , 2-tailed

Table 4

*Correlations of Previous Solo Status Frequency and Performance Scores*

Measure	Previous SS	L.S. 1	L.S. 2	Sentence	Total
Previous SS	1				
L.S. 1	.310**	1			
L.S. 2	.184	.736**	1		
Sentence	.170	.715**	.665**	1	
Total	*.226	.860**	.830**	.955**	1

Note. \* $p < .05$ , 2-tailed. \*\* $p < .01$ , 2-tailed



Table 5

*Correlations of EAS, STAI, Motivation to Succeed, and Total Performance*

Measure	STAI	EA	Motivation	Total
STAI	1			
EA	.594**	1		
Motivation	-.354**	-.174	1	
Total	-.131**	.030	.493**	1

*Note.* \*\* $p < .01$ , 2-tailed

Figure 1. Interaction of total performance scores and rejection of traditional gender roles by learning session 2 condition

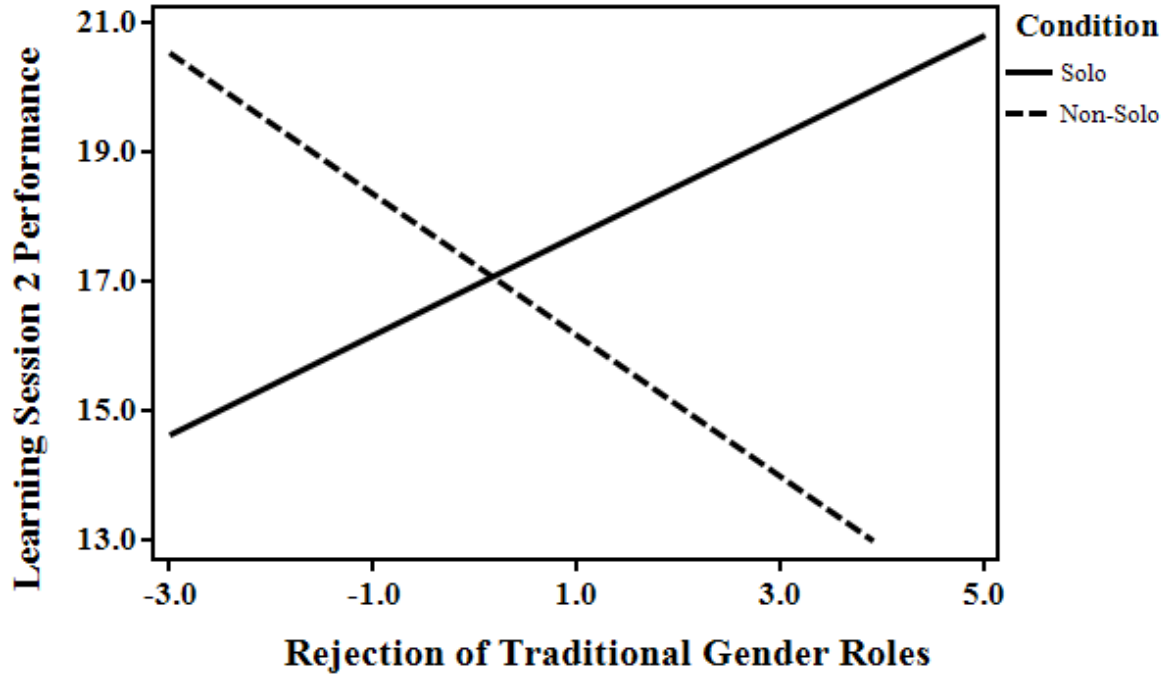


Figure 2. Interaction of total performance scores and previous solo status experience based on testing condition

