Effects of Social Context on State Anxiety, Submissive Behavior, and Perceived Social Task Performance in Females with Social Anxiety

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This thesis titled
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Abstract

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Self-discrepancy in one’s gender role traits may elicit anxiety and lower self-confidence in various social contexts for women. Females \((n = 52)\) with elevated social anxiety engaged in both an opinion speech and a semi-structured conversation, with either two separate male or two separate female experimental confederates. It was hypothesized that (a) submissive behavior (i.e., elevated vocal pitch) and (b) state anxiety would be greater, and that (c) self-perceived social performance would be poorer, for participants in the following scenarios: delivering an impromptu speech to a male, versus female, evaluator; and engaging in an impromptu conversation with another female, versus a male. Hypotheses were partially supported. Elevated vocal pitch declined more slowly to baseline vocal pitch for participants in the two scenarios hypothesized to elicit the greatest submissive behavior, versus the alternative two scenarios. Participants reported greater state anxiety and poorer self-perceived social performances when the confederate was a male. Lastly, relationships were tested among the main dependent variables (a-c), trait social anxiety symptoms, gender role trait self-discrepancy, gender role attitudes, self-perceived attractiveness, and estimated menstrual phase status.
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Introduction

Social anxiety disorder (SAD) of the generalized subtype may be defined as a marked fear of being evaluated by, or humiliating oneself in front of, others in a number of both social-interactive and performance situations (American Psychological Association [APA], 2000). SAD is the fourth most prevalent psychological disorder, with a population lifetime prevalence rate estimated to be as high as 13% (Kessler et al., 2005). Previous epidemiological research indicates that women are more likely to be diagnosed with SAD (15.5%) than men (11.1%) (Kessler et al., 1994); although, men with SAD are more likely to seek treatment (APA, 2000; see also Turk et al., 1998; Weinstock, 1999). More recently, Yonkers, Bruce, Dyck, and Keller (2003) found a similar ratio in a longitudinal sample of anxiety disorder patients: 59.26% of their SAD subsample consisted of women, whereas 40.74% of this subsample consisted of men. 

Despite copious research that has addressed symptomological differences between men and women in other female-dominated disorders, such as depression and panic disorder (Weinstock, 1999), there is currently a dearth of research investigating the mechanisms that may underlie reported greater social anxiety severity (e.g., see Turk et al, 1998; but see also Moscovitch et al., 2005) for women, specifically.

Effects of Environmental Factors on Women’s Experience of Social Anxiety

Gender-differentiated manifestations of SAD-related distress or impairment may derive, in part, from cultural demands for specific gender roles in certain social contexts. For example, expected gender roles for men tend to be fairly consistent across various social situations (e.g., behaving in a way that is directive and with greater agency, across
conversational and professional situations). For women, however, appropriate behaviors may be more variant, requiring more frequent contextual adaptation (e.g., ranging from more collective to more individualistic behaviors across conversational and professional situations) (e.g., see Bakan, 1966; Haas, 1979; Maccoby, 1990; Moskowitz, Suh, & Desaulniers, 1994). Furthermore, environmental factors may play an especially important role for women relative to men, in both the onset and expression of SAD-related sequelae. For example, findings from twin studies demonstrate that SAD is unique within the context of phobias (i.e., agoraphobia and animal phobias), in that its origin is indicated to be primarily genetic-based for males, but primarily contextually/environmentally-based for females (Kendler, Jacobson, Myers, & Prescott, 2002). In addition, whereas difficult life events may be equally likely to influence the onset of SAD in both men and women, women with SAD tend to report more negative life events (e.g., death of a family member before the onset of SAD symptoms) than men with SAD (Marteinsdottir, Svensson, Svedberg, Anderberg, & von Knorring, 2007; see also DeWit et al., 2005). Thus, the effects of environmental factors are indicated to be possibly more pronounced for women in the etiology of SAD in comparison to men.

**Gender and the Experience of Situational Social Fears and Avoidance**

Whereas previous research on between- and within-gender differences in SAD has certainly been informative, the overarching limitation to this literature is that these studies have all, to date, been based on cross-sectional data (e.g., see Turk et al., 1998; Xu et al., 2012). For example, in a clinical sample of individuals with SAD of either the generalized or non-generalized subtypes, women endorsed significantly greater fear and
avoidance than men for many social situations involving social performance (e.g., talking to authority and giving a speech in front of an audience). In addition, women reported greater fear (but not greater avoidance) than men for interactive situations including: expressing disagreement or disapproval to people they do not know very well and hosting a party (Turk et al., 1998). The results of Turk et al. (1998) largely replicated findings from a sample of randomly selected community respondents (Stein, Walker, & Forde, 1994). Thus, according to reported accounts from both socially anxious and community individuals, women typically indicate greater fear and avoidance than men in social performance situations, which may be more common in applied settings, such as work and school, than in casual settings (Turk et al., 1998).

Of note, in the study by Turk and colleagues (1998), significantly more men than women held a full-time job. In addition, results from a 2001-2002 national epidemiological study by Xu and colleagues (2012) highlight greater work-related fears, lower rates of employment, and lower individual incomes for women than for men with lifetime SAD. Xu and colleagues speculated that significantly greater work-related fears (e.g., being interviewed) for women with lifetime SAD may be due to greater concerns of work being undervalued and work-related mistakes having greater consequences for women than for men. Given that there are specific implications for the effects of SAD on the daily functioning of socially anxious women, particularly in professional social environments, it is important to investigate environmental effects related to SAD more thoroughly.
Fear and Avoidance for Women in Conversational Situations

The majority of empirical findings regarding SAD and gender, as reviewed above, emphasize possible effects of sociocultural expectations on performance situations. Yet, it is also important to highlight the effects of sociocultural factors on social interaction situations, particularly conversations, for socially anxious females. Namely, some empirical support exists for the notion that women are better conversationalists than men due to greater empathic abilities (e.g., see Aries, 1996; Hutt, 1972). Furthermore, prior research indicates that females are generally more prone to periods of silence when conversing with males (e.g., males tend to interrupt more often than females; i.e., more opportunity for behavioral avoidance of anxiety). In contrast, same-sex conversations for both females and males were found to be characterized by approximately equivalent durations of silence (i.e., less opportunity for avoidant behavior; Zimmerman & West, 1975). (Of note, more recent research on this phenomenon has not been conducted, to the author's knowledge. Thus, it is important to consider effects of time and societal change since this study was published.) Thus, greater cultural expectation, and resulting increases in anxiety (Gilbert, 2001), may exist for socially anxious females to maintain conversation with other females. Socially anxious females may perceive other females to be critical of their conversational abilities, with simultaneous perceptions that the other female is expecting equal contributions to the conversation. This perceived discrepancy may thereby increase anxiety and submissive behavior for the socially anxious individual. This potential phenomenon, of pressures to successfully engage in a social activity that is
stereotypically congruent with one’s gender, is an empirical question that remains to be addressed.

**Stereotype Threat within Social Contexts for Women**

Parallel to the notion of sociocultural-based gender role expectations are gender stereotypes for different types of social situations. Particularly, gender stereotypes may have social anxiety-related cognitive and physiological effects upon women. For example, previous findings pertaining to social anxiety demonstrate that socially anxious individuals tend to have heightened self-focus (Beidel, Turner, & Dancu, 1985; Cacioppo, Glass, & Merluzzi, 1979; Glasgow & Arkowitz, 1975; Spurr & Stopa, 2002), combined with simultaneous scanning of the social environment for clues of negative social outcomes (e.g., see Clark & Wells, 1995). Similarly, Schmader, Johns, and Forbes (2008) have proposed an integrated process model of stereotype threat, which suggests that when an individual is faced with perceived stereotype/social threat, both heightened physiological arousal and self-monitoring may occur due to the motivation to disambiguate what the situation implies about oneself or one’s in-group (e.g., race/ethnicity, sexual orientation, or gender). These coping strategies may then lead to negatively biased information processing of the potential threat and the threatened self – causing negative impacts on working memory efficiency, as well as cognitive and social performance (e.g., see also Johns, Inzlicht, & Schmader, 2008; Forbes, Schmader, & Allen, 2008). For example, in a study by Major, Carrington, and Carnevale (1984), women (and men) who were either high or low in self-rated attractiveness wrote an essay for which they received praise from a fictitious other-sex evaluator, who had presumably
either seen or not seen them prior to giving the praise. High attractive individuals
discounted the praise when they had been seen by the evaluator, attributing less to the
quality of their writing abilities than when they had not been seen by the evaluator.
Alternatively, low attractive individuals were more likely to attribute praise to their own
work when they had been seen versus when they had not been seen by the purported
evaluator. Of note, tendencies to disqualify positive social outcomes, in general, have
been found to occur in psychopathology and for socially anxious individuals (e.g., see
Beck, 1976; Heimberg & Becker, 2002), but to the extent of the author’s knowledge, self-perceived attractiveness has not been tested as a possible mechanism in these tendencies.

Implications derived from cognitive, neuropsychological, and social psychology
research are that stereotype threat bias may augment cognitive, emotional, and
behavioral reactions to potential social threat among women with high social anxiety. In
addition, given that stereotype threat may overwhelm cognitive and physiological
resources, and therefore adversely affect cognitive and social performance (Schmader et
al., 2008), it is reasonable to infer that stereotype threat pertaining to specific social
situations (i.e., interactive versus performance) may augment use of cognitive resources –
leading to even greater state anxiety and poorer self-perceived or observed social abilities
in socially anxious women.

Gender Role Traits and Self-Discrepancy as Possible Mechanisms of Social Anxiety

Gender role traits.

Not only may awareness of social context and related stereotypes be an important
factor in understanding how fear and avoidance are expressed by socially anxious
women, but awareness about the ways in which socially anxious women specifically interpret and respond to these stereotypes may be of additional importance. A self-report-based study included a non-clinical sample of Caucasian-American undergraduates and focused on the associations between self-construal (i.e., social independence versus interdependence), gender, and social anxiety (Moscovitch et al., 2005). Findings demonstrated that, for both genders, greater orientation toward prototypically masculine gender role traits was generally associated with lower social anxiety, whereas greater orientation with a feminine gender role was not significantly associated with social anxiety. Moscovitch and colleagues (2005) interpreted these findings as being consistent with a masculinity model (Bassoff & Glass, 1982; Taylor & Hall, 1982; Whitley, 1983) of anxiety, which posits that greater culturally-defined masculine traits are associated with lower social anxiety.

**Self-discrepancy.**

Moscovitch and colleagues also attributed these findings, in part, to the self-discrepancy theory of social anxiety (e.g., Alden, Mellings, & Ryder, 2001; Baumgardner & Brownlee, 1987; Leary, 2001). According to this model, beliefs that one’s social capabilities fall below culturally expected standards may evoke social anxiety. Thus, a “perceived discrepancy” (p. 668) exists between (a) one’s own perceived abilities (i.e., veridical self-attributes) and (b) the expectations of potential evaluators (i.e., the ought-to-be self-attributions) (e.g., see Alden & Wallace, 1991; Weilage & Hope, 1999; see also Higgins, 1987 for original self-discrepancy theory research).
Furthermore, in a recent self-report study, Roberts, Hart, Coroiu, and Heimberg (2011) investigated differences between individuals with and without SAD in instrumentality and expressiveness (i.e., personality traits traditionally associated with male and female gender roles, respectively), from psychoevolutionary (Trower & Gilbert, 1989; Gilbert, 2001) and self-discrepancy (Higgins, 1987; Higgins, 1996) theoretical perspectives. Results indicated that individuals with SAD scored lower on instrumentality, and they reported a greater discrepancy between their self-perceived and ideal level of instrumentality, compared to control participants.

**Implications for Social Anxiety in Women**

In essence, culturally-determined gender roles may partly serve as a basis of perceived discrepancy, such that discrepancies between an actual gender role orientation and perceived environmental expectations for acting in accordance with stereotypically opposing or congruent gender roles may augment anxiety in socially anxious individuals. To elaborate, Bem (1984) found evidence that sex-typed individuals (i.e., those with a strong gender role orientation) are more likely to behave in accordance with sociocultural delineations of gender appropriateness experienced since youth (e.g., independence for males and interdependence for females; Cross & Madson, 1997), and they are subsequently more likely to perform poorly on tasks that necessitate behaviors that are incongruent with their sex-type.

Conversely, engaging in a social situation involving pressure for behaving in congruence with one’s self-perceived gender role traits, while simultaneously perceiving that one is inept in exercising the related appropriate social behaviors, may cause
perceptions that one falls low on the social hierarchy and, accordingly, lead to greater anxiety. This phenomenon, as explained by Gilbert (2001), may occur among socially anxious persons specifically, because they may exaggerate the value or anticipation of cultural expectations.

The present study aims to examine these two sociocultural circumstances that may affect social performance and anxiety in women: (a) 

\textit{incongruence} between personal and environmentally-pressured gender role traits and (b) feelings of heightened expectations to perform well when the environmental pressure is \textit{congruent} with one’s gender-typical traits. Examples may include (a) performing in a stereotypically “masculine” trait-dominated domain (e.g., asserting opinions and/or presenting to coworkers) and (b) engaging in a stereotypically “feminine” trait-dominated domain (e.g., empathizing with another, unknown female peer). To investigate these social contexts via methodological juxtaposition, the proposed study will investigate, in a sample of highly socially anxious women, the context-effects of feminine-stereotyped strengths (e.g., conversation; see Aries, 1996; Hutt, 1972) and masculine-stereotyped strengths (e.g., giving an opinion speech) on state anxiety, submissive behavior, and perceived social competence.

**Social Context Effects on Submissive Behavior across Sex via Study of Vocal Pitch**

Previous research has examined social anxiety from a physiological/behavioral perspective. Socially anxious persons are evidenced to deem themselves low on the social hierarchy (Gilbert, 2001) and to exhibit increased vocal pitch to signal submissiveness to perceived, socially dominant others (e.g., see Weeks, Heimberg, & Heuer, 2011 for a
study with males only). Relevant to the proposed study, significant increases in mean vocal pitch (i.e., fundamental frequency; F0) may serve as an observable and objective measure of submissiveness in socially anxious individuals (Weeks, Heimberg, & Heuer, 2011; Weeks, Lee, et al., 2012). Weeks, Lee, and colleagues (2012) have reported that while mean F0 significantly and reliably increases for socially anxious men in both social performance and interaction tasks, findings have been less consistent for women. Namely, significant increases in vocal pitch in comparison to healthy controls have been found for women with generalized SAD in a variety of in vivo exposure tasks (planned with the participant). However, in a sample of women with primarily the non-generalized subtype of SAD (76.50%), vocal pitch was not found to be higher on average than the vocal pitch of healthy controls, in a speech performance task (Weeks, Lee, et al., 2012). Yet, both socially anxious men and women reported greater subjective state anxiety after each social task in comparison to non-socially anxious controls. It is possible that Weeks, Lee, and colleagues’ significant versus null findings pertaining to gender are functions of SAD symptom severity. Of relevance to the present study, it is also possible that a limitation to the findings of Weeks, Lee, et al. may be that social context was not systematically controlled or tested, such that moderating confound variables may have affected results among women.

Males and females tend to emit different levels of vocal F0 (i.e., typical male average: 115 Hz; typical female average: 215 Hz; Behrman, 2007, p. 156). In line with typical F0 ranges associated with sex, research indicates that lower frequency of voice is perceived to be attractive and a sign of dominance and health in males (by both male and
female raters; Collins, 2000; Evans, Neave, & Wakelin, 2006; Feinberg, 2004; Puts, 2005; Puts, Gaulin, & Verdolini, 2006), whereas higher frequency of voice is seen to be attractive and a sign of healthiness in females by male raters, as well as a potential mating threat to other female raters (Collins & Missing 2003; Feinberg 2004; Feinberg, DeBruine, Jones, & Little, 2005; Feinberg, Jones, Little, Burt, & Perret, 2008; Puts, Barndt, Welling, Dawood, & Burriss, 2011). In addition, lower vocal pitch has been shown to be related to greater reproductive success for men, but levels in vocal pitch are not related to reproductive success in women (Apicella, Feinberg & Marlowe, 2007). Thus, the evolutionary, and possibly socially engaging, directions of vocal pitch for men and women seem to be inverse to one another.

In addition, whereas the concept of fight versus flight (Cannon, 1932) may be relevant to both men and women with stress and/or social anxiety (e.g., see Trower & Gilbert, 1989), a recent tend and befriend model (Taylor et al., 2000) sheds light on a potentially differentiating mechanism of stress reaction in women. To elaborate, the tend and befriend model suggests that female stress responses have selectively evolved to maximize the survival of self and offspring. Taylor and colleagues (2000) theorize that “females respond to stress [. . .] by befriending, namely affiliating with social groups to reduce risk” (p. 411). To date, research has not explored the relationship between the tend and befriend model and either vocal pitch for women or social anxiety, to the extent of the author’s knowledge.

Therefore, the aspect of a woman’s vocal pitch increasing in the presence of men or other women may suggest differential evolutionary responses to perceived social threat
or attempts to socially engage the other individual(s). To elaborate from an informed theoretical perspective, a woman’s increase in vocal F0 among men may derive from evolutionary mechanisms to seem more attractive. Yet, given that socially anxious individuals have been shown to fear both positive and negative evaluation (e.g., see Weeks, Heimberg, Rodebaugh, Goldin, & Gross, 2012; Weeks & Howell, 2012), vocal F0 may also be blunted within the context of submissive behavior, due to fears of positive attention from men, as well as concerns of negative social reprisal from other women. Thus paradoxically, while higher voice may simulate attractiveness and therefore lead to heightened conspicuousness, a lower voice could also suggest a “fight” response in a masculine domain (e.g., see Weeks, Lee, et al., 2012)—presenting a “lose-lose” scenario for socially anxious women with regard to vocal heuristics for social threat-avoidance.

In summary, Weeks and colleagues (2012) reported results indicating that vocal pitch was higher for women with generalized SAD, when compared to healthy controls during in vivo exposures that took place in the participants’ community. However, the complex phenomenon of vocal pitch adjustment by women across different contextual domains spurs speculation about how social threat-response behaviors may be more nuanced for socially anxious women than for socially anxious men. The present study aims, in part, to replicate and extend upon the previous study by Weeks, Lee, et al. by examining, among socially anxious women, variables such as the sex of the audience member, perceived gender role trait discrepancy, and participant gender attitudes.
**Brief Overview of Study Procedures**

Participants were highly socially anxious women who completed an abbreviated diagnostic interview and self-report questionnaire battery, and engaged in both a semi-structured conversation with “another participant” (in actuality a confederate researcher) and an impromptu opinion speech in front of “a trained speech rater” (also a confederate researcher). For the speech task, participants were given 3 minutes to prepare, but they were told that they could not use their preparation notes during the speech. Participants were randomly assigned to one of two conditions, where confederates in their two social tasks were either (1) both males or (2) both females. Vocal F0, subjective units of distress ratings, and perceptions of interaction and speech performance were collected during and/or after each social task, respectively (see **Measures**). For exploratory analyses, participants also rated their identification with “personality traits” (i.e., stereotypically masculine versus feminine traits) before instructions for either task were given, as well as what personality traits they believed one **ought to have**, in anticipation to each task, in order to do well/be rated well in the social task. Mean differences in self-identification and **ought to have** traits were used to quantify self-discrepancy. Of additional exploratory interest, and to control for the integrity of results, menstrual cycle status (estimated from self-report) and self-perceived physical attractiveness were assessed in the questionnaire packet. Attitudes toward traditional gender roles were assessed via a questionnaire after both social tasks were completed.
Main Hypotheses

To reiterate, based upon previous research on gender role comparison (e.g., Bem, 1984), perceived self-discrepancies (e.g., Alden & Wallace, 1991; Weilage & Hope, 1999), gender (e.g., Burnett, Anderson, & Heppner, 1995), and social anxiety (e.g., Goodman & Kantor, 1983; Turk et al., 1998), differences in the manifestation of social anxiety symptoms and severity may in part be dependent on gender role stereotypes for women. Several hypotheses were generated.

Hypotheses 1 (a-c).

It was hypothesized that trait symptoms of submissive behavior and social anxiety would be positively associated with (a) state submissive behavior (i.e., significant changes in vocal pitch), (b) state anxiety for each social threat task, and (c) perceived inadequacy in social task performance, for the two types of social situations: an impromptu opinion speech and a semi-structured conversation.

Hypotheses 2-4.

Furthermore, an interaction effect of type of social task and sex of the confederate was hypothesized. First, it was expected that when giving a speech in front of a man (as opposed to another woman), women may be relatively sensitive to cultural expectations for more masculine gender role behaviors. Accordingly, it was hypothesized that when presenting in front of a man (in comparison to when presenting in front of another woman) socially anxious women would: (Hypothesis 2) manifest higher submissive behavior (i.e., increase in vocal F0, per findings from Weeks, Lee, et al., 2012);
(Hypothesis 3) report higher state anxiety; and (Hypothesis 4) rate her speech performance as poorer.

Second, it was expected that when socially anxious women converse with another woman (as opposed to a man), she would perceive social pressures to align herself with feminine gender role behaviors and expectations to do well in the conversation. Accordingly, it was hypothesized that when conversing with another woman (versus when conversing with a man), socially anxious women would: (Hypothesis 2) manifest higher submissive behavior (i.e., increase in vocal F0); (Hypothesis 3) report higher state anxiety; and (Hypothesis 4) rate her interaction performance as poorer.

In summary, among the four possible scenarios created by experimental manipulation in the present study (social task and confederate sex), socially anxious women were hypothesized to express the greatest submissive behavior, state anxiety, and perceived performance deficiencies when giving a speech in front of a man and when conversing with another woman, compared to the other two scenarios.

Exploratory Interests

Exploratory Analyses 1 and 2.

It was examined whether gender role discrepancy (i.e., the difference between ought to have and self-identified gender traits) in anticipation to each social task, sex of the social audience member, social anxiety, or attitudes toward traditional gender roles (e.g., items concerning women in the workplace or dominance being associated with men) were related to: (a) submissive behavior displayed (i.e., changes in vocal F0 from baseline to the social task), (b) state anxiety experienced, and (c) social skill inadequacies
perceived for each social task. It was tested whether (1) gender trait self-discrepancy impacted the relationships among confederate sex condition and the main dependent variables (a-c) for each task and (2) whether gender trait discrepancy, gender attitudes, and trait social anxiety each uniquely accounted for a significant amount of variance of the main dependent variables.

**Exploratory Analysis 3.**

The researchers also explored the effect of socially anxious females’ self-perceived physical attractiveness on tendencies to disqualify positive social outcomes, to have concerns of social reprisal from others after receiving positive feedback, and to fear evaluation. For example, socially anxious females who perceive themselves as attractive, but not socially skilled, may be more likely to attribute positive social experiences more to their outward appearance than to their abilities, skills, or social competencies (e.g., see Major, Carrington, & Carnevale, 1984, on misattributions of success for attractive individuals). In addition, these individuals may fear positive evaluation and resulting reprisal from perceived socially dominant others.

**Exploratory Analysis 4.**

Furthermore, given the focus of some of the analyses in the proposed study upon vocal pitch and attractiveness, the researchers also explored whether the state of participants’ menstrual cycles (i.e., follicular phase versus not in follicular phase) may have an effect on results obtained for Hypotheses 2-4. Prior psycho-evolutionary research indicates that a females’ high-fertility (i.e., follicular) phase of her menstrual cycle increases both the fundamental frequency of her vocal pitch (Bryant & Haselton, 2009)
and the level of her attractiveness as perceived by herself and by others (e.g., see Röder, Brewer, & Fink, 2009; however; see Schwarz & Hassebrauck, 2008 for null findings).
Methods

Participants

A total of 65 female participants provided written consent to participate in the present study. All consenting participants met an empirically-replicated cut-off score indicative of probable SAD, via a prescreen measure (see Social Phobia Scale section, below). Participants were recruited by two methods. (1) A department-wide prescreen measure was administered online to undergraduate psychology students at Ohio University. Using online participant sign-up, participants were granted partial academic credit. (2) The study was simultaneously advertised on campus and within the greater Athens, Ohio community, via flyers. The same prescreen measure was administered over the phone to interested callers. Participants recruited by this latter method were compensated $25.00 upon completion of the study procedures. Of the total sample, 12 (14.3%) individuals, all of whom were recruited via the online sign-up method, denied social anxiety symptoms in both the structured interview and social anxiety questionnaires (see Assessments and Measures, below). Thus, these individuals were excluded from completing the rest of the study procedures (i.e., the conversation and speech tasks), and they were compensated with partial academic credit for their time. In addition, one participant was excluded due to equipment malfunction and subsequent loss of data. Consequently, a sample of 52 eligible female participants completed all study procedures. (Please see Table 1 for descriptive statistics concerning age, sexual orientation, relationship status, and race/ethnicity.) Of this eligible sample, 61.5% were
recruited via online sign-up, and 38.5% were recruited via community flyers and telephone eligibility screens.

**Assessments and Measures**

In addition to **Demographic information**, all participants completed the following measures (see Table 2 for means and standard deviations on all measures for the current sample):

**Semi-structured diagnostic interviews.**

*Anxiety Disorders Interview Schedule for DSM-IV; Social Phobia subsection* *(ADIS-IV-SP; Brown, DiNardo, Lehman, & Campbell, 2001).* The ADIS-IV provides probes and questions that assist in assigning DSM-IV diagnoses for a subset of psychiatric disorders, including SAD. In addition, Clinician’s Severity Ratings (CSRs) for diagnoses are made on a 9-point Likert-type rating scale ranging from 0 to 8, with scores of 4 and above indicating clinical severity. The ADIS-IV exhibits strong reliability for the assessment of SAD (Brown et al., 2001), with a kappa of .77 reported for a principal diagnosis of SAD in a sample of 362 anxiety disorder patients who received two independent ADIS-IV interviews. All interviews were conducted by a researcher who has satisfied ADIS-IV training criteria (Brown et al., 2001).

*Liebowitz Social Anxiety Scale (LSAS; Liebowitz, 1987).* The 24-item LSAS is a clinician-administered measure that assesses fear and avoidance in social interaction (11 items; e.g., *going to a party*) and performance (13 items; e.g., *giving a report to a group*) situations over the past week. The LSAS has demonstrated excellent internal consistency (*α* = .96; Heimberg, Juster, Hope, & Mattia, 1995). For the present study, *α* = .86, for
both the anxiety and avoidance subscales. Furthermore, it correlates positively with scores on other measures of social anxiety (Heimberg, Mueller, Holt, Hope, & Liebowitz, 1992). All interviews were conducted by a researcher who satisfied training criteria outlined by Liebowitz (2003). The LSAS was administered to gauge participants’ levels of fear and avoidance of social interaction and performance situations during the past week, as well as to test social fear and avoidance as potential predictors for the main dependent variables.

**Measures of social anxiety.**

For the present study, all social anxiety measures demonstrated good to excellent internal consistency, .81 ≤ αs ≤ .94, with the exception of the subscale pertaining to tendencies to self-attribute reasons to disqualify positive social outcomes of the Disqualification of Positive Social Outcomes Scale (i.e., DPSOS-Self; Weeks, 2010) (α = .62). However, the internal consistency of the DPSOS-Self subscale would be expected to be lower than that of the other measures and subscales, due to its being comprised of only three items.

**State social anxiety ratings.** Participants were asked to record their anticipatory, peak, and post-task state anxiety on a 0 to 100-point Subjective Units of Distress Scale (SUDS) in response to both the speech and conversation tasks. “Anchoring” was completed with each participant, such that: a “0” indicated no distress or anxiety; a “25” was the threshold for anxiety “with which one can easily cope”; a “50” was the threshold for “notably bothersome” distress, with beliefs of being able to “handle” the distress; a “75” was the threshold for “extremely bothersome” distress, as indicated by
concentration difficulty and desire to leave the situation; and a “100” indicated the “worst anxiety ever experienced [or imaginable] in a social situation”. Recommendations by Hope, Heimberg, Juster, and Turk (2006) for administering the SUDS scale were followed for the present study.

**Social Phobia Scale (SPS; Mattick & Clarke, 1998).** The SPS is a 20-item measure of fear of public scrutiny (e.g., I can get tense when I speak in front of other people), with possible total scores ranging from 0-80. The SPS has demonstrated strong internal consistency (as ranging from .89 to .94) and convergent and discriminant validity in clinical, community, and undergraduate samples (Mattick & Clarke, 1998). For the proposed study, an empirically-replicated cut-off score of 24 on the SPS was utilized to screen for eligible participants (i.e., online or over the phone; see Participants) (Brown, Turovsky, et al., 1997; Heimberg et al., 1992). The SPS was re-administered when participants took part in the study, in order to assess for trait fears of public scrutiny and to confirm eligibility.

**Social Interaction Anxiety Scale-Straightforward Items (SIAS-S; Rodebaugh, Woods, & Heimberg, 2007).** The original Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998) is a 20-item measure of anxiety in dyads and groups (e.g., When mixing socially, I am uncomfortable). Rodebaugh and colleagues have reported that the 17 straightforwardly worded items of the SIAS are more valid indicators of social interaction anxiety than the reverse-scored items in both undergraduate and clinical samples. The SIAS-S has demonstrated excellent internal consistency (α = .93) and factorial validity in undergraduate samples. The SIAS-S has also demonstrated strong
construct validity in both undergraduate and clinical samples (Rodebaugh et al., 2007). The SIAS-S was administered to assess trait fears of and anxiety about social interaction.

**Disqualification of Positive Social Outcomes Scale (DPSOS; Weeks, 2010).** The DPSOS is a 13-item self-report assessment of trait-based cognitive tendencies to disqualify positive social experiences. The DPSOS uses a 10-point Likert-type rating scale. Two reverse-scored items are included (for the purpose of potentially detecting response biases), but are not utilized in calculating the DPSOS subscale scores. The DPSOS has two subscales pertaining to two distinct DPSO-related tendencies: (a) *others-oriented* attributions (DPSOS-Other) and (b) *self-oriented* attributions (DPSOS-Self). Both DPSOS subscales have demonstrated adequate internal consistency (all \( \alpha \)s > .68) in undergraduate and clinical samples (Weeks, 2010). Furthermore, both DPSOS subscales have demonstrated strong convergent and discriminant validity, as well as factorial validity in a series of CFAs (Weeks, 2010). The DPSOS was utilized to explore tendencies of socially anxious women to disqualify positive social outcomes, with regard to their perceived levels of attractiveness.

**Brief Fear of Negative Evaluation Scale-Straightforward Items (BFNE-S: Rodebaugh et al., 2004; Weeks et al., 2005).** The BFNE (Leary, 1983) is a 12-item self-report measure of fear and distress related to negative evaluation from others. Items are rated on a 5-point Likert-type scale. Rodebaugh et al. (2004) and Weeks et al. (2005) have reported that the 8 straightforwardly-worded items are more reliable and valid indicators of fear of negative evaluation than the reverse-scored items in undergraduate and clinical samples, respectively. Consequently, Rodebaugh, Weeks, and colleagues
have suggested utilizing only the 8 straightforward (-S) BFNE items to calculate the total score. The BFNE-S has demonstrated excellent internal consistency (all α’s > .92), factorial validity, and construct validity in undergraduate (Rodebaugh et al., 2004) and clinical (Weeks et al., 2005) samples. The BFNE-S was used as an index of trait fear of negative evaluation.

**Fear of Positive Evaluation Scale (FPES; Weeks, Heimberg, & Rodebaugh, 2008).** The 10-item FPES uses a 10-point Likert-type rating scale and assesses trait levels of fear of positive evaluation. Two reverse-scored items are included (for the purpose of potentially detecting response biases) but are not utilized in the calculation of the FPES total score. The FPES has demonstrated strong internal consistency (all αs > .80) in undergraduate (e.g., Weeks, et al., 2008) and clinical (Fergus et al., 2009) samples, as well as good 5-week test-retest reliability (intraclass correlation coefficient = .70) in undergraduate samples. Furthermore, the FPES has demonstrated strong convergent and discriminant (Weeks et al., 2008; Fergus et al., 2009), as well as factorial, validity (Weeks et al., 2008). Moreover, in a large multisite study of SAD patients, the factorial validity, internal consistency, 4.5 month test–retest reliability, construct validity, and treatment sensitivity of the FPES were strongly supported (Weeks, Heimberg, Rodebaugh, Goldin, & Gross, 2012). In the proposed study, the FPES was employed to explore tendencies of socially anxious women to fear positive social outcomes, with regard to their perceived levels of attractiveness.
Self-report and physiological measures of submissiveness.

**Concerns of Social Reprisal Scale (CSRS; Weeks & Menatti, 2013).** The CSRS is a 14-item self-report measure designed to assess trait social anxiety-related concerns of reprisal due to forming positive impressions on others. The CSRS was designed with specific theoretical relevance for testing the *Bivalent Fear of Evaluation* model (Weeks & Howell, 2012) of social anxiety. Items are rated on a 10-point Likert-type scale. Two reverse-scored items are included (for the purpose of potentially detecting response biases) but are not utilized in the calculation of the CSRS total score. The CSRS demonstrates strong convergent, discriminant, and factorial validity in both undergraduate and clinical samples (Weeks & Menatti, 2013), as well as good internal consistency in an undergraduate sample ($\alpha = .84$) (Weeks & Howell, 2012). For the present study, $\alpha = .86$. The CSRS was administered as a companion scale to the FPES, as well as to measure the relationship between concerns of social reprisal and attractiveness as a result of social anxiety.

**Submissive Behaviors Scale (SBS; Gilbert & Allan, 1994).** The SBS is a 16-item self-report measure that assesses involuntary submissive behaviors (e.g., *I do what is expected of me even when I don’t want to*). The SBS was designed to explore the relationship of evolved mental mechanisms of social rank to psychopathology and was derived from an earlier measure (Buss & Craik, 1986). The SBS has demonstrated adequate internal consistency in both clinical ($\alpha = .82$) and non-anxious control ($\alpha = .74$) samples (Schneier, Heimberg, Belzer, & Liebowitz, 2006). For the present study, $\alpha = .76$. Furthermore, a strong correlation has been demonstrated between SBS scores and scores
obtained on a clinician-administered measure of social anxiety, and patients with
generalized SAD obtained higher SBS scores than nonanxious controls (Schneier et al.,
2006). The SBS was used to examine the extent to which these trait-like tendencies to
behave submissively relate to the state-like cognitions and behaviors evoked by the
speech and conversation tasks.

**Behavioral Assessment of Submissiveness: Change in Vocal Pitch**

*(Fundamental Frequency; F0).* Recall that elevated mean F0 has been previously
linked to social anxiety symptoms (e.g., see Weeks, Lee, et al., 2012). Computerized
Speech Lab (CSL), Model 4500 is a hardware and software system that is used to record
and acoustically analyze speech signals. CSL was used to assess vocal F0 in the present
study. Assessment of vocal F0 (in units of Hz) was limited to approximately the first 10
seconds of clear participant speech during each minute of the impromptu speech and
conversation tasks. Changes in mean vocal F0 from baseline were proposed to be
measured by calculating the difference between the mean levels of F0 obtained during the
respective social tasks to those obtained during the baseline recording. Increase in mean
F0 was assessed, per previous findings by Weeks, Lee, and colleagues (2012), as an
observable, behavioral measure of submissiveness and state social anxiety for each social
task (i.e., speech and conversation).

**Subjective ratings of social task ability.**

*Perception of Speech Performance scale (PSP; Rapee & Lim, 1992).* The PSP is
a 17-item measure that assesses both global (5 items; e.g., *Appeared Nervous*) and
specific (12 items; e.g., *Voice Quivered*) components of participants’ speech
performance. Participants were asked to rate the extent to which they agreed with various statements about their speech from 0 (not at all) to 4 (very much) (hereafter referred to as \textit{PSP-Self}). Objective observers (i.e., research assistants who were blind to the hypotheses of the proposed study) also rated the participants’ speech performances via video review (hereafter referred to as \textit{PSP-Rater}). A summation of all items represented participants’ and observers’ perceived overall quality of speech performance (one total score for each), with higher scores representing more negative perceptions (Rapee & Hayman, 1996; Rodebaugh, 2004). Prior research has found very good internal consistency for the PSP (e.g., .84 to .90 for self-ratings from an analogue sample of individuals who qualified for probable diagnoses of SAD [Orr & Moscovitch, 2010; Rodebaugh, 2004]). For the present study, $\alpha = .87$. Participants completed the PSP-Self immediately after their impromptu speech task. Objective observers later rated participants’ video-recorded conversations, using the same scale (i.e., the PSP-Rater).

\textit{Perception of Interaction Performance (PIP; Reilly & Weeks, 2012).} The PIP is a modified version of the PSP (Rapee & Lim, 1992)—designed to assess individuals’ perceived quality of their social interaction abilities. In the present study, the PIP demonstrated high internal consistency, $\alpha = .90$. The PIP (hereafter referred to as \textit{PIP-Self}) was administered to participants immediately after their impromptu conversation task. Objective observers later rated participants’ video-recorded conversations, using the same scale (hereafter referred to as \textit{PIP-Rater}).
Measures of gender role orientation and gender attitudes.

*Personal Attributes Questionnaire (PAQ; Spence, Helmreich, & Stapp, 1974)*.

The PAQ was developed to assess individuals’ sex-role orientations, in terms of what the authors defined as *instrumentality* (i.e., agency) and *expressiveness* (i.e., communality with others). Items include a list of 24 personality traits, each of which the respondent rates on a scale ranging from 0-4, the extent to which he or she identifies with that trait. The PAQ has three subscales (consisting of 8 items each), which measure individual masculinity (e.g., *very aggressive* and *very dominant*), individual femininity (e.g., *very emotional* and *very aware of feelings of others*), and masculinity-femininity. Only the first two subscales were utilized in the proposed study. Additionally, in the development of the PAQ, all items were endorsed as being ideal for both men and women, but significantly more typical for one sex versus the other. Thus, higher PAQ subscale scores indicate greater identification with either traditionally masculine or traditionally feminine traits. Participants were instructed to rate “personality traits”, but neither masculinity nor femininity was mentioned in the instructions, in order to prevent potential priming of responses. The PAQ demonstrated adequate internal consistency (*α* = .78-.65; Wilson & Cook, 1984), as well as test-retest reliability (*r* = .60) over a 2.5 month time period, in a sample of U.S. Military Academy cadets (Yoder, Rice, Adams, Priest, & Prince, 1982).

In the present study, both the masculine (*α* = .65) and feminine (*α* = .69) subscales of the PAQ demonstrated internal consistencies that neared adequacy (i.e., *α* ≥ .70), but which were still questionable according to cut-off values proposed by Nunnally (1978) for testing *newly constructed* measures. For the current study, PAQ scores were examined to
address the possible function of gender role orientation in the manifestation of SAD symptoms.

*Personal Attributes Questionnaire-environmental pressures (PAQ-env; Burnett, Anderson, and Heppner (1995).* Burnett and colleagues (1995) modified the instructions, but maintained the original items and scoring, of the original PAQ (see above) to develop the PAQ-env form. This modification was made in order to assess individuals’ perceptions of environmental cues that encourage masculinity or femininity. In the present study, both the masculine and feminine subscales of the PAQ-env demonstrated adequate internal consistency with regard to each social task (.69 ≤ α ≤ .80). The PAQ-env was administered in the proposed study to assess for perceived pressures to demonstrate masculine- versus feminine-stereotyped characteristics. In anticipation of each social task, and before knowing/seeing the sex of the confederate, participants were asked to rate the traits that they believed one *ought to have*, in order to be rated and/or perform well for the relevant task.

*Self-discrepancy in gender role traits.* For the present study, self-discrepancies in both feminine-typed and masculine-typed gender role traits were indexed by calculating the difference between respective masculine and feminine subscale scores from the PAQ and PAQ-env (i.e., PAQ-env subscale – relevant PAQ subscale = discrepancy score). Four measures of gender role trait discrepancy were obtained: (1) discrepancy in feminine-typed traits for the (a) speech and the (b) semi-structured conversation tasks; and (2) discrepancy in masculine-typed traits for the (a) speech and the (b) semi-structured conversation tasks.
**Gender Attitude Inventory (GAI; Ashmore, Del Boca, & Bilder, 1995).** The GAI is a comprehensive measure of gender attitudes, including scales for content-specific attitudes toward sex and gender in various domains. The GAI consists of 109 questions, which are divided into 14 content-specific domains. Due to time constraints and the specific interests of the proposed study, the researchers administered only 3 of the 14 GAI domains: (1) Acceptance of Traditional Stereotypes (10 items; score range: 10-70; e.g. *Men are more independent than women*), (2) Endorsement of Family Roles (11 items; score range: 11-77; e.g. *Care of children should be shared equally by both spouses*), and (3) Belief in Differential Work Roles (9 items; score range: 9-63; e.g. *All occupations should be equally accessible to both men and women*). For the purposes of this study, after select items were reverse-coded, a summation of these 3 domains served as a modified total score (hereafter referred to as *GAI-m*), with higher scores indicating more traditional attitudes toward gender roles. In the present study, the GAI-m demonstrated excellent internal consistency, $\alpha = .91$. The GAI-m total score was utilized to examine whether the degree of traditional gender attitudes was related to the extent to which socially anxious women experience state anxiety, submissive behavior, and negative self-ratings of performance in specific social situations. The GAI-m was administered to participants after completing both social tasks. This ordering was to avoid possible priming of participants’ social behavior during the social tasks.
Measures for testing integrity, potential confounds, and exploratory interests.

**Beck Depression Inventory-2nd edition (BDI-II; Beck, Steer, & Brown, 1996).**

The BDI-II is a 21-item self-report measure of depressive symptoms (e.g., *Pessimism* and *Guilty Feelings*). The BDI-II has demonstrated strong internal consistency (all $\alpha$s > .92), convergent validity, and discriminant validity in both outpatient and undergraduate samples (Beck et al., 1996). In the present study, the BDI-II demonstrated excellent internal consistency ($\alpha = .91$). Given that previous research has found significant overlap between social anxiety and depression (e.g., Stein, Tancer, Gelernter, Vittone, & Uhde, 1990), the present study utilized scores obtained on the BDI-II as a potential covariate to statistically control for co–occurring depressive symptoms, thereby increasing the specificity of obtained effects. Specifically, research indicates that depressive symptoms may be related to change in vocal F0 (e.g, see France, Shiavi, Silverman, Silverman, & Wilkes, 2000), increased pauses and decreased productivity in speech (e.g., Pope, Blass, Siegman, & Raher, 1970), lower self-confidence in one’s abilities (e.g., see Campbell, 1986), and greater social disengagement (e.g., Youngren & Lewinsohn, 1980; see Rice, Grealy, Javaid, & Millan Serrano, 2011 for specific findings in women), all of which could have influenced results that were obtained.

**Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988).** The PANAS is comprised of two 10-item scales designed to assess positive affect and negative affect, respectively. The PANAS scales may be administered with different temporal instructions, including “right now” and “today.” The scales have demonstrated
excellent internal consistency (all $\alpha$s $>.85$) and are largely uncorrelated (both $rs < -.15$). In the present study, both the positive affect ($\alpha = .87$) and negative affect ($\alpha = .89$) subscales demonstrated good internal consistency. Previously reported findings support the convergent validity of the scale (Watson et al., 1988). The PANAS was administered to assess *trait* positive and negative affect in *social situations, in general*. The negative and positive affect subscales were administered to potentially statistically control for the effects of negative and positive affect generally experienced in social situations (Watson & Clark, 1992).

**Confederate training and confederate neutrality ratings.** For the present study, confederate training and confederate neutrality ratings were conducted on the basis of a previous study by Reilly and Weeks (2012). No single confederate served as both a speech and conversation role player for any given participant, in order to prevent state anxiety-related habituation effects. All confederates were blind to the study hypotheses throughout the duration of the study, with the exception of knowledge (per neutrality training) that participants included socially anxious persons. Additionally, for each participant, the two confederates were either both male or both female, in order to create a condition of confederate sex.

For the interaction role-play and speech, the confederates were trained and instructed to act neutrally towards the participant. Specifically, for the conversation task, confederates were instructed to act indifferently when conversing with the participant, but without appearing rude/impolite (e.g., to allow the participant to maintain the majority of the conversation; to restrict eye contact and hand gestures which would
communicate social engagement, etc.). For the speech task, they were instructed to make occasional eye contact with the speaking participant, while also making periodic “notes” on a clipboard during the speech. Again, confederates were instructed to act indifferently towards the participant during the opinion speech.

Confederates’ behaviors towards the participant during the semi-structured conversation were rated by trained objective raters who were blind to study hypotheses, in order to ensure that confederates were behaving neutrally during the conversation. These raters assessed the confederate’s neutrality by observing a video recording of the conversation and using the Confederate Responsiveness Form (CRF; modified version from Weeks, Heimberg, & Heuer, 2011) to make neutrality ratings. The CRF is a 1-item rating scale that asks raters to assess how confederates responded to the participant. The scale utilizes a 10-point Likert-style response set ranging from 1 (Very Negative/Rude) to 10 (Very Positive/They got along well). Ratings of 4-6 were categorized in the present study as being “neutral” for the purposes of preliminary analyses (see below).

Specifically, these ratings were made in order to account for the possibility that differential confederate performance may have affected participant anxiety and self-judgments.

**Perceived commonality with female interviewer.** Stereotype literature suggests that the mere presence of another person (i.e., a stereotype counter-example) in one’s stereotype-threatened in-group (e.g., race, sexual orientation, or gender) can potentially dampen the effects of stereotype threat bias. For example, when a female researcher administered a math test, especially if the researcher was portrayed to be competent in
math, female participants’ math performance was protected under stereotype threat bias (e.g., see Marx & Roman, 2002). For the present study, it was explored whether engaging with the female clinical interviewer at the beginning of the study could: [a] reduce effects of stereotype threat biases against women in a masculine-stereotyped role (i.e., the opinion speech task); and/or [b] potentially increase perceived communality with another female and therefore have effects on variables obtained from the semi-structured conversation task. Thus, to assess whether perceived identification with the female interviewer in the study could affect the strength of the current study’s manipulation effect, a single item about perceived commonality with the female interviewer (i.e., who conducted all participant consent, ADIS-IV-SP, and LSAS procedures) was included in the questionnaire packet. This packet (see Procedures) was administered immediately after the interviews (lasting approximately 20-30 minutes), but before any instructions were given about the social tasks. Participants rated, on a Likert-type scale, from 0 (not at all true) to 9 (very true) the following statement: “I feel that I had things in common with the person with whom I just interacted”.

**Menstrual Cycle Questionnaire (MCQ; Langer & Rodebaugh, 2011).** The MCQ was used to estimate each participant’s phase in her menstrual cycle (i.e., assuming a 28-day menstrual cycle for each participant), as a means of accounting for potentially confounding effects on the proposed study results, regarding Exploratory Hypothesis 4.

**Attractiveness Rating (AR) form (constructed by the principal investigator).** Self-perceived attractiveness was measured by asking each participant to rate, on a 0-9 Likert-type scale (not at all attractive to extremely attractive) her self-perceived
attractiveness across different domains (e.g., physical attractiveness). In the present study, the AR form demonstrated good internal consistency, $\alpha = .89$. Self-perceived attractiveness ratings were obtained in order to test Exploratory Analysis 2.

**Procedures**

Before the first participant arrived, it was randomly determined whether she would interact with and give a speech to either all-male or all-female confederates, as well as whether she would be asked to engage in the conversation or speech task first (in order to counterbalance the social tasks).

Participants were asked to give informed consent after a brief description of the study, which informed that the clinical interview and social tasks were to be video- and audio-recorded, but which did not disclose the measurement of vocal pitch. Nor did the consent form disclose the measurement of gender roles, the specific recruitment and study of women, or the study hypotheses (although these aspects of the study were reviewed during Debriefing).

The principal investigator administered the ADIS-IV-SP and LSAS to confirm high-social-anxiety eligibility status for the study. Eligible participants then completed the battery of questionnaires (excluding the PSP-Self, PIP-Self, PAQ-env, GAI-m, and the SUDS ratings, which were administered at specific times during the course of the study; see Measures section for details).

**Semi-structured conversation task.**

The clinical interview and each social task occurred in separate, closed rooms within the Center for Evaluation and Treatment of Anxiety (CETA) at Ohio University,
as habituation to one’s surroundings may affect state anxiety. Before the social interaction task, participants were informed that they would be engaging in a conversation task with another participant (who was actually a confederate researcher), while being video recorded. They were also informed that a panel of trained researchers would later rate their conversational skills, as a means of inducing sufficiently elevated levels of state social anxiety. Participants were then requested to fill out the PAQ-env form for the present task, to indicate which traits they believed one ought to have to do well in the upcoming social task. After being escorted to the conversation room, the participant and confederate were then introduced and instructed to pretend that they had just arrived at a party early, and that they were getting acquainted with one another for four minutes. Before the conversation task began (signaled by an electronic bell chime that the researcher remote-activated from a different room), the researcher requested that “both” participants (i.e., the actual participant and the confederate) record their anticipatory anxiety (i.e., pre-task SUDS) and then to get into place. Two specific areas had been pre-designated within the test room for where the participant and confederate were to stand, in order to standardize the interaction across participants. While monitoring the test room via video in real-time, the experimenter sounded the chime after the participant and confederate were in place—cueing them to begin their conversation.

Immediately after four minutes of the conversation (indicated by another chiming of the bell), the researcher returned and requested for participants to write down their current SUDS (i.e., post-conversation state anxiety) and their peak SUDS (i.e., from during the task). Following the conversation and final SUDS rating, participants were
immediately asked to complete a questionnaire regarding their perceived social interaction performance (i.e., PIP-Self).

**Social performance/speech task.**

For the speech task, participants were asked to give a four-minute speech. This speech was delivered from a podium and spoken into a microphone, the output from which was routed directly into the CSL 4500 system. Each participant was informed that she had three minutes to prepare for the speech, but that she could not use her preparation notes during the actual speech. Participants were additionally informed that they would conduct their speech in front of, and have the quality of their speech rated by, a research assistant who has “undergone extensive training for rating speeches with the help of an expert professor in the Ohio University Department of Communications.”

Before the three-minute preparation period, participants completed a form (i.e., PAQ-env form) to indicate traits they believe one ought to have, in order to do well at the upcoming speech task. After preparing for the speech, participants were escorted into a different room and asked to stand behind a podium. The speech rater was then requested to come in, and after having introduced the speech rater, participants were requested to provide a current (anticipatory) SUDS rating. Immediately following the four-minute speech, participants were asked to give a current (post-task) SUDS rating, as well as a rating for their peak SUDS during the speech, and to complete a questionnaire regarding their perceived speech performance (i.e., the PSP-Self).

After both social tasks were completed, the participant was asked to complete a measure on attitudes toward gender roles (i.e., GAI-m).
Debriefing and post-study verbal consent.

Lastly, during the debriefing session, participants were asked: (a) their belief of the purpose of the study; (b) if they suspected deception in any procedures involved in the study and, if they believed they had been deceived, to (c) explain the basis for their suspicions. The purposes of the study, the nature of the confederates’ roles, and the intent to analyze participants’ vocal pitch emitted during the social tasks were then divulged to the participant, and verbal consent for use of this deception-related data was requested (and subsequently provided by all participants in the present study).
Data Analytic Strategies and Results

Preliminary Analyses

Participant distributions across conditions.

Of all eligible participants in the present study (see Table 3), 73.1% \((n = 38)\) met diagnostic criteria for SAD (see Assessments and Measures, above). Of those who met SAD criteria, 73.7% \((n = 28)\) met criteria for the generalized subtype. In addition, 44.2% \((n = 23)\) of all participants were randomly assigned to the male-only confederate condition, whereas 55.8% \((n = 29)\) of participants were assigned to the female-only confederate condition. There was no significant difference in the number of generalized versus non-generalized individuals across confederate sex conditions, \(\chi^2(1) = 1.62, p > .05\).

Half (50.0%) of all participants completed the speech task first, and the other 50.0% completed the conversation task first, per counterbalanced social task completion.

Social anxiety across conditions.

It was also tested whether social anxiety severity differed across conditions (i.e., male- versus female-only confederates), as differing levels in social anxiety severity could have impacted study outcomes. A series of independent samples t-tests was conducted for all trait social anxiety measures utilized in the present study. A Bonferroni correction was applied to control for potential alpha inflation with multiple tests \((\alpha = [.05/7] = .001)\). There were no significant differences between participants who were randomly assigned to either confederate sex condition, all \(ts \leq 2.46\), all \(ps \geq .02\). (Note: of all trait social anxiety measures, only the SIAS-S differed between conditions at a \(p\)-value of less than .05, which was no longer significant after the correction).
**Vocal F0.**

To confirm that there was no effect of time on vocal F0 emitted throughout each of the respective social tasks (replicating findings by Weeks, Lee, and colleagues [2012]), and to therefore ensure the appropriateness of the proposed dependent variable for vocal F0 (i.e., a difference score between baseline F0 and an average of vocal F0 from all four time points, per task), a repeated measures analyses of variance (RM ANOVAs), for each task, was conducted. Contrary to expectation and the findings of Weeks, Lee, et al., vocal F0 at Minute 1 of both tasks was significantly higher than vocal F0 at Minutes 2, 3, and 4, all significant within-subjects contrasts $F$s (1,51) ≥ 25.19, all $p$s < .001. There were no significant differences in vocal F0 among Minutes 2-4. On the basis of these results, collapsing significant changes over time (i.e., averaging vocal F0 across all time points) would generate misleading F0-change values for each task in comparison to baseline; thus, factorial repeated measures analyses of variance (RM ANOVAs) and of covariance (RM ANCOVAs) were conducted for the main and exploratory analyses involving vocal F0 as a dependent variable.

**Potential confound variables.**

Analyses and transformations were conducted to ensure that all variables were normally distributed. Multicollinearity concerns were also assessed and ruled out. In addition, independent samples t-tests were conducted to determine whether potential confounds for dependent variables existed with respect to differential recruitment/compensation (i.e., academic credit versus financial compensation), race (i.e., Caucasian versus non-Caucasian), counterbalancing of social tasks (i.e., conversation...
versus speech task completed first), participant detection \((n = 5)\) versus non-detection \((n = 47)\) of confederate-related deception, and neutral \((n = 49)\) versus non-neutral \((n = 3)\) objective confederate neutrality ratings. In addition, an analysis of variance (ANOVA) was utilized to test for potential confounding effects of sexual orientation on the main dependent variables. Lastly, bivariate correlation analyses were conducted to test for potential confounding effects of height and weight (with regard to vocal F0), perceived commonality with the interviewer (see *Perceived commonality with female interviewer* section for details), depression symptoms (i.e., BDI-II scores), and positive and negative affect (i.e., PANAS scores) on the main dependent variables. Preliminary analyses revealed that, with the exception of perceived commonality with the interviewer and negative affect (see below), there were no significant differences across any of these variables, nor were there significant relationships between these variables and any dependent variable measures.

*Perceived commonality with the female interviewer.* Greater perceived commonality with the study interviewer was moderately related to less negative self-perceptions of interaction performance (i.e., lower scores on the PIP-Self), \(r = -.47, p < .001\).

*Negative affect.* Results indicated that trait negative affect (PANAS-Negative Affect subscale for social situations in general) was positively correlated with more negative self-perceptions of interaction performance, \(r = .34, p < .05\). Thus, perceived commonality with the interviewer and trait negative affect in social situations were additionally explored as covariates in analyses pertaining to the interaction task.
Hypotheses 1a, 1b, & 1c

It was hypothesized that trait levels of social anxiety (i.e., scores on measures of fear of public scrutiny [SPS] and social interaction anxiety [SIAS-S]) and self-reported trait submissive behavior tendencies (SBS scores) would be significantly associated with the main dependent variables of the study (i.e., [a] vocal F0; [b] peak SUDS ratings; and [c] perceived social task performance). It was further hypothesized that fear and avoidance of social interaction and performance situations (i.e., LSAS-Interaction and LSAS-Performance subscale scores) would be significantly associated with the main dependent variables (a-c) associated with the respective social task (i.e., semi-structured conversation versus speech task).

Hypothesis 1a.

Due to significant time effects obtained for vocal pitch throughout the social tasks (see Vocal F0 above), a series of RM ANOVAs, one for each of the five measures of social anxiety and submissiveness outlined above, was conducted for Hypothesis 1a. Family-wise Bonferroni adjustments were utilized to control for repeated families of multivariate tests ($\alpha = [.05/5] = .01$).

Contrary to Hypothesis 1, results indicated that neither social interaction anxiety (SIAS-S total scores), fear of public scrutiny (SPS scores), submissive behavior (SBS total scores), fear and avoidance of interactive situations (LSAS-Interaction subscale), nor fear and avoidance of performance situations (LSAS-Performance subscale) significantly interacted with time, confederate sex condition, or type of social task when predicting vocal F0, all multivariate and within-subjects interaction $ps > .05$. It may be
worth noting that a two-way interaction, which approached significance, multivariate F (3, 47), = 2.30, p = .09, $\eta^2_p = .13$, indicated that time effects on vocal pitch in the study may be in part contingent on trait levels of fear of public scrutiny (SPS).

**Hypothesis 1b.**

Two series of bivariate correlations between the five scores pertaining to social anxiety/submissiveness (see above) and either peak SUDS or self-perceived task performance, per relevant social task, were calculated for Hypotheses 1b and 1c. Family-wise Bonferroni adjustments were utilized to control for repeated correlational tests ($\alpha = [.05/5] = .01$). Please see Table 4 for a statistical summary of correlational results. As was hypothesized, for both tasks, higher peak SUDS were moderately and significantly or marginally significantly related to greater trait submissiveness (i.e., SBS). Peak speech SUDS was marginally significantly related to fear and avoidance of performing (i.e., LSAS-Performance subscale) (but also significantly to fear and avoidance of interacting, which was not hypothesized), whereas peak conversation SUDS was marginally significantly related to fear and avoidance of social interaction. No other correlations were significant.

**Hypothesis 1c.**

Please also see Table 4 for a summary of correlational results. Self-perceptions of performance for both the speech and interaction tasks (i.e., PSP-Self scores and PIP-Self scores) were significantly or marginally significantly related to fears and avoidance of their respective social tasks (i.e., LSAS-Performance and LSAS-Interaction subscales). Trait social interaction anxiety (i.e., SIAS-S) was positively and marginally significantly
related only to self-perceived speech performance (PSP-Self scores), whereas trait submissive behavior (i.e., SBS scores) was significantly and positively related only to self-perceived interaction performance (i.e., PIP-Self scores). No other correlations were significant.

**Hypothesis 2**

A factorial RM ANOVA was employed to test Hypothesis 2. Recall that it was hypothesized that submissive behavior (increases in vocal F0, per results from Weeks, Lee, and colleagues [2012]) would be highest when participants (a) *conversed* with another female rather than with a male and (b) gave a *speech* in front of a male rather than a female, respectively. Within-subjects factors included social task (i.e., speech versus conversation) and Time (i.e., Minutes 1, 2, 3, and 4 of each social task). The between-subjects factor was condition (i.e., sex of the confederates). Fundamental frequency (F0) of voice (in Hz) was the dependent variable.

See Table 5 for statistical results. In partial support of Hypothesis 2, in addition to a non-hypothesized effect of time, a marginally-significant, three-way interaction effect among time, task, and confederate sex condition was obtained, multivariate $F(3,48) = 2.41, p = .08, \eta_p^2 = .13$. Thus, changes in vocal F0 over time were contingent on the type of social task in which the participant took part. Furthermore, the interaction effect of time and social task depended on the sex of the confederate researcher involved in that social task. There was also a significant *within-subjects* effect (i.e., time and task) on vocal F0 in the present study, $F(3,48) = 2.74, p = .046, \eta_p^2 = .05$. There was no between-subjects effect of confederate sex condition on vocal F0, overall, $p = .83$. See Figures 1a
and 1b for a graphical depiction of vocal F0 changes for participants, per condition and task. Within-subjects contrasts revealed that there were different directions (i.e., increase versus decrease) of change in vocal F0 halfway (i.e., between Minutes 2 and 3; $F(1,50) = 7.04, p = .01, \eta^2_p = .12$) through the two social tasks; again, the direction of change in each task was contingent of the confederate’s sex.

**Trends of habituation of vocal pitch for each social task.**

Trends indicated that over time, vocal F0 was highest (i.e., 207.38 Hz on average) in participants’ commencement (i.e., in Minute 1) of both tasks. Vocal F0 declined up to Minute 2, regardless of the type of social task or confederate sex condition. In the speech task, participants’ vocal F0 reached near-baseline vocal F0 levels (i.e., 181.16 Hz) at Minute 2 (per the constraint of only using one-minute intervals) if the speech rater was female and at Minute 3 if the speech rater was male—suggesting possible, slower habituation to the task when the speech rater was male. However, in the conversation task, participants’ vocal F0 declined to near-baseline F0 at a similar rate, regardless of confederate sex condition, and continued to decline into Minute 3 (reaching baseline) if the conversation partner was another woman.

**Trends of vocal pitch change from Minute 2 to Minute 3.**

Halfway through the task (i.e., from Minute 2 to 3), vocal F0 continued to decline on average (toward baseline) when participants presented their speech in front of a male and when participants conversed with another female. However, when presenting a speech in front of a female and when conversing with a male, participants’ vocal F0 slightly increased (i.e., between approximately 5 to 10 Hz) from Minutes 2 to 3, after
having reached approximate baseline vocal F0 at Minute 2. Thus, direction of vocal F0 change temporarily diverged halfway through each social task, differentially for participants in either confederate sex condition. Thus, in partial support of Hypothesis 2, there was slower habituation of submissive behavior in the conversation, versus speech, task when the social audience member was another woman, and slower habituation in the speech, versus conversation, task when the social audience member was male. Interestingly, the two alternative contexts that predicted faster habituation were also characterized by brief and small spikes in vocal F0 halfway through the tasks. However, these increases were marginal and potentially due to floor effects from the previous minute.

When selecting for participants who met criteria for SAD of the generalized subtype (recall, \( n = 28 \)), there was no longer a significant three-way interaction effect, \( \text{multivariate } F(3,24) = 1.19, p = .34, \eta_p^2 = .13. \)

**Hypothesis 3**

A factorial RM ANOVA was employed to test Hypothesis 3. Recall that it was hypothesized that reported state anxiety (SUDS) would be highest when participants (a) *conversed* with another female rather than with a male and (b) gave a *speech* in front of a male rather than a female, respectively. Within-subjects factors included social task (i.e., speech versus conversation) and Time (i.e., Pre, Peak, and Post). The between-subjects factor was condition (i.e., sex of the confederates). State anxiety (SUDS) was the dependent variable.
Please see Figures 2a and 2b for a graphical depiction of SUDS ratings, per task and condition, for the overall sample. Contrary to Hypothesis 2, there was no three way interaction effect of confederate sex condition on reported SUDS, $p = .18$, $\eta_p^2 = .07$, after controlling for the within-subjects effects of time and type of task. (Of note, per an independent samples t-test and when not controlling for time and type of task, participants reported marginally significantly higher peak SUDS in the male-, versus female-, confederate condition for the conversation [$t = 1.76$, $p = .099$], but not the speech, $p = .21$). When controlling for confederate sex, there was a significant two-way interaction of time and the type of social task when predicting SUDS ratings, multivariate $F(2, 49) = 15.58$, $p < .001$, $\eta_p^2 = .39$. Within-subjects contrasts indicated that the change from peak to post SUDS significantly changed, depending on the type of social task. Specifically, participants’ reports of state anxiety decreased from peak- to post-task more dramatically in the conversation task. This effect suggests less of a habituation effect of self-reported state anxiety in the speech task, versus the conversation task, for participants in the present sample.

Results were replicated when selecting for individuals with generalized SAD. A multivariate two-way (but not three-way) interaction effect was significant only for time and type of task, $F(2,25) = 12.57$, $p < .001$, $\eta_p^2 = .50$. Increase in SUDS occurred between pre and peak SUDS, differentially for the social tasks, within subjects contrasts $F(1,26) = 4.60$, $p = .04$, $\eta_p^2 = .15$, and decreases occurred between reported peak and post-task SUDS, with steeper decline in the conversation task, within subjects contrasts $F(1,26) = 12.78$, $p = .001$, $\eta_p^2 = .33$. SUDS were higher overall for the speech, versus
conversation, task, per a pairwise comparison test, \( p < .001 \). There was a marginally significant between-subjects effect of confederate sex condition for overall SUDS ratings, \( F(1,26) = 3.10, p = .09, \eta_p^2 = .11 \).

To explore the main effect of confederate sex, independent samples t-tests indicated that without controlling for time, type of task, or interaction effects, participants reported significantly greater peak state anxiety when conversing with a male (\( M = 59.27; SD = 27.32 \)) than when conversing with another female (\( M = 40.92; SD = 17.01 \)), \( t(23.78) = 2.16, p = .04 \). For the speech task, there was no significant difference in peak SUDS for participants in the male confederate (\( M = 80.60; SD = 13.95 \)) or female confederate (\( M = 69.69; SD = 23.19 \)) condition, \( t = 1.53, p = .14 \).

**Hypotheses 4a & 4b**

Two one-way ANOVAs were conducted to test Hypothesis 4, which stated that socially anxious females would: (a) rate their social interaction performance (i.e., PIP-Self scores) as worse when conversing with another woman versus a man and (b) rate their speech performance (i.e., PSP-Self scores) as worse when presenting in front of a man versus another woman. The study condition (i.e., *all male* versus *all female* research confederates) served as the binary independent variable, and the PIP-Self and PSP-Self scores served as the respective dependent variables. See Figure 3 for a graphical depiction of results.

**Hypothesis 4a (Speech Task).**

Consistent with hypothesis, there was a significant between-groups effect of confederate sex condition on participants’ perceived *speech* performance, \( F(1, 50) = \)
4.46, $p < .05$, $\eta^2_p = .08$. Specifically, participants rated their performance as worse after giving their speech in front of a male speech-rater ($M = 43.61$; $SD = 9.96$) than when in front of a female speech-rater ($M = 37.17$; $SD = 11.62$). Results partly held after selecting for only individuals with SAD of the generalized subtype (i.e., marginal significance), $F(1, 24) = 3.72$, $p = .07$, $\eta^2_p = .13$.

**Hypothesis 4b (Conversation Task).**

Contrary to hypothesis, participants rated their performance as worse after conversing with a male ($M = 27.96$; $SD = 12.11$) than with another female ($M = 21.52$; $SD = 9.78$), $F(1, 50) = 4.50$, $p < .05$, $\eta^2_p = .08$. Given that preliminary analyses revealed significant relationships between PIP-Self scores and both perceived commonality with the female interviewer and negative affect (PANAS-Negative Affect subscale) (see Preliminary Analyses), the following variables were then entered as covariates: (a) the rating of this commonality with the interviewer and (b) negative affect in social situations. There remained a significant difference between confederate-sex conditions, $F(1, 48) = 7.27$, $p = .01$, $\eta^2_p = .13$, for self-perceived interaction performance. Furthermore, these results held when selecting only for participants with SAD of the generalized subtype), $F(1, 24) = 8.72$, $p < .01$, $\eta^2_p = .27$.

**Exploratory Analyses 1a, 1b, & 1c**

The authors also explored the extent to which self-discrepancy (i.e., pressures to be consistent with gender-role orientations that are predominantly masculine versus feminine and which differ from one’s self-identified traits), gender role attitudes, and social contexts (social interaction versus performance) predicted: (a) submissive behavior
displayed (i.e., vocal F0 across time); (b) state anxiety experienced before (anticipatory),
during (rating of peak state anxiety), and immediately after (post) the social tasks; (c) and
social skill inadequacies perceived for each social task. First, to determine trends in self-
discrepancy, median and standard deviations were computed for each discrepancy
measure (see Table 6; median was used rather than mean, as there were negative
discrepancy values [i.e., beliefs that one ought to have less respective gender traits for a
given task than was self-identified on a trait level). Consistent with the theory of self-
discrepancies for women, depending on gender trait-stereotyped domains, and on the
average, participants reported that they ought to have more masculine traits in both the
speech and (albeit unexpected and to a lesser extent) conversation tasks, as well as fewer
feminine traits in the speech task. On average, participants reported very low discrepancy
in feminine traits for the conversation task, which was expected, in order to explore if
socially anxious women experience greater distress and submissiveness among social
pressures to perform well in a social situation consistent with self-perceived gender role
orientation traits. (See Appendix A for preliminary correlational analyses among gender-
trait self-discrepancy, trait social anxiety severity, and the main dependent variables.)

Equations for Hypotheses 2-4 were reanalyzed for Exploratory Analyses 1, but for
each social task, separately (i.e., task was removed as a within subjects factor). This was
done, because discrepancy rating scores pertained to specific social tasks. Reported
discrepancies in masculine and feminine traits, for each anticipated social task (see
Measures) were entered as covariates. Recall, dependent variables included (a) vocal F0,
(b) SUDS ratings, and (c) perceptions of performance.
Exploratory Analysis 1a.

Of the four RM ANOVAs (one for each task and masculine or feminine trait discrepancy), there were no significant interaction effects, all $p > .05$. However, when selecting for only participants with SAD of the generalized subtype (recall, $n = 28$), and for the *speech* task, there was a significant three-way interaction effect of time, confederate sex condition, and self-discrepancy of feminine traits, multivariate $F(3,22) = 3.19, p = .04, \eta^2_p = .30$. Trends indicated that perceived pressures to suppress femininity (i.e., -1SD below the mean) was associated with slightly higher vocal F0 for both confederate sex conditions, in comparison to mean participant discrepancy and discrepancy +1SD above the mean (i.e., perceived pressures to express more femininity). At high self-discrepancy (to suppress femininity) vocal F0 was also more variable over time for the female confederate condition, such that habituation was faster (high vocal F0 at Minutes 1 and 4, but reaching baseline F0 at Minute 3) than the male confederate condition (i.e., slower decline that never reached baseline). At mean self-discrepancy in femininity for the speech, vocal F0 was higher in the female versus male confederate condition at Minutes 1 and 4; participants reached baseline vocal F0 by Minute 3 for both conditions—suggesting no differences in habituation. Vocal F0 was parallel over time for both conditions at +1SD above the mean, with vocal F0 being higher in the female confederate condition during the speech. There were no significant interaction effects for the conversation task or for masculinity, all multivariate $Fs \leq 1.37$, all $p \geq .28$. Thus, for socially anxious women, self-discrepancy in feminine traits for the speech may have affected vocal pitch changes over time—resulting in faster vocal
habituation, yet more dynamic variability over time, in the female confederate condition versus the male confederate condition.

**Exploratory analysis 1b.**

There were no significant interaction effects (all $ps > .05$), with the exception of the equation testing self-discrepancy in masculine traits for the speech. For this equation, there was a three-way interaction among time, confederate sex condition, and discrepancy in masculine traits, $F(2,47) = 6.04, p < .01, \eta^2_p = .20$, when predicting speech SUDS. The interaction effect occurred between peak and post SUDS, per within-subjects contrasts, $F(1,48) = 6.67, p < .05, \eta^2_p = .12$. Trends indicated that greater perception that one ought to exhibit more masculine traits was associated with increasing SUDS ratings overall, faster decline in self-reported state anxiety (i.e., SUDS) from peak to post, and less differences in SUDS between conditions. There were no significant interaction effects among individuals with SAD of the generalized subtype, all $ps \geq .12$.

**Exploratory analysis 1c.**

Using a univariate ANOVA, there were no interaction effects for self-discrepancy (of either gender trait orientation) and condition for self-perception of interaction or speech performance, all $ps \geq .12$, including when controlling for perceived commonality with the interviewer or negative affect for the semi-structured conversation task. There were, however, significant or marginally significant main effects for both condition and discrepancy in masculine traits (both $Fs [1, 48] \geq 3.48$, both $ps \leq .056$) when predicting perception of speech performance, such that greater self-discrepancy in masculine traits ($t = 2.55$) and male confederate condition ($t = 1.96$) were associated with poorer perceived
speech performance, even when controlling for one another. In addition, being in the male confederate condition, but not self-discrepancy, was associated with significantly worse perception of interaction performance, both condition ps ≤ .05. Thus, perceived pressures for exemplifying one’s feminine traits to other females in the conversation did not moderate perceived interaction performance.

Among individuals with generalized SAD, there was a significant interaction between condition and discrepancy in masculine traits when predicting perception of speech performance, $F(1,24) = 4.93, p < .05, \eta^2_p = .17$, and marginally significantly so when predicting perception of interaction performance, $F(1,24) = 3.06, p = .09, \eta^2_p = .11$. Increasing discrepancy in masculine self-discrepancy resulted in fewer differences in scores between the confederate sex conditions, such that higher self-discrepancy was associated with worse perception of speech performance in the female confederate condition. There were no significant interactions regarding discrepancy in feminine traits, both ps > .05.

**Exploratory Analyses 2a, 2b, & 2c**

To further explore the effects of these culture-related personality traits and values on social anxiety for women, three linear regressions were conducted for each social task (totaling six equations). For all six equations, level of acceptance of traditional (i.e., stereotypical) gender roles (i.e., GAI-m scores), gender role trait discrepancy for masculine and feminine traits in anticipation for each task, and the social anxiety symptoms relevant to the social task (i.e., social interaction versus performance fear and avoidance subscale scores obtained on the LSAS, respectively) were entered
simultaneously as independent variables. For each social task, there were three dependent
variables: (a) peak vocal F0\(^8\) in the relevant task (b) peak SUDS; and (c) perceived
performance for the relevant social task (PSP-Self or PIP-Self scores, respectively). Of
note, one participant was missing due to lack of time to complete the GAI-m.

**Exploratory Analyses 2a.**

The model was non-significant for peak vocal F0 for both the speech and
conversation tasks, both \( F \)s (5, 45) ≤ .69, both \( ps > .05 \). These models were also non-
significant when selecting only for those with generalized SAD, both \( F \)s (5, 22) ≤ 1.31,
both \( ps ≥ .30 \).

**Exploratory Analyses 2b.**

When testing the model with peak SUDS in the *speech* task as the dependent
variable, the model was significant, \( F \) (5, 45) = 2.88, \( p < .05 \). There were no predictor
variables that uniquely predicted peak SUDS in the speech task, above the other
variables, all \( ps ≥ .10 \). When testing the model with peak SUDS in the *conversation* task
as the dependent variable, the model neared significance, \( F \) (5, 45) = 2.10, \( p = .08 \);
however, there were no unique significant predictor variables, all \( ps > .05 \). Both models
were non-significant when selecting only for those with generalized SAD, both \( F \)s (5, 22)
≤ 1.96, both \( ps ≥ .13 \).

**Exploratory Analyses 2c.**

When testing the model with perception of *speech* performance (PSP-Self) as the
dependent variable, the model was significant, \( F \) (5, 45) = 2.52, \( p < .05 \). There were no
predictor variables that uniquely predicted perception of speech performance for this
model, above and beyond the others, all $p s \geq .09$. When testing the model with perception of social interaction performance (PIP-Self) as the dependent variable, the model also was significant, $F (5, 45) = 3.57, p < .01$. Again, none of the predictor variables uniquely predicted perception of interaction performance, all $p s \geq .09$. Both models were non-significant when selecting only for those with generalized SAD, both $F$s (5, 22) $\leq 2.04$, both $p s \geq .11$.

**Exploratory Analysis 3**

See Appendix A for preliminary correlation analyses with measures of self-rated attractiveness, trait social anxiety, and submissiveness.

The effect of a socially anxious female’s perceived attractiveness (AR form) on her subjective self-ratings of (a) speech (PSP-Self scores) and (b) social interaction (PIP-Self scores) performance was explored, given previous research suggesting that attractive individuals may have a high tendency to disqualify positive social outcomes by attributing their success to their attractiveness and not to their efforts (Major, Carrington, & Carnevale, 1984). These exploratory analyses entailed four partial correlations. In other words, an adjustment was made for self-perceived physical attractiveness (i.e., the partialled out variable) when correlating: (i) the tendency to disqualify positive social outcomes by attributing those outcomes to others (DPSOS-Others total score) or (ii) the tendency to disqualify positive social outcomes directly to the self (DPSOS-Self total score), and both (iii) self-perceived and (iv) objective rater social performance ratings in both the speech and interaction tasks (i.e., PSP-Self and PIP-Self scores, as well as PSP-Rater and PIP-Rater scores, respectively).
Using a Bonferroni correction to control for repeated tests ($\alpha = \frac{.05}{8} = .006$), bivariate (non-partialled) correlations revealed that self-rated attractiveness was negatively, yet only marginally significantly, associated with an objective rater’s negative perception of participant interaction performance, $r = -.35, p = .01$. Self-perceived attractiveness was significantly associated with participant self-ratings of perception of poor interaction performance, $r = -.45, p < .007$. Self-attractiveness ratings did not significantly correlate with speech performance ratings, both $rs \leq .007$, both $ps \geq .83$.

Both self-perceived and objective performance ratings in the conversation (PIP-Self and PIP-Rater) related positively, yet only marginally significantly, to both trait tendencies to disqualify positive social outcomes at the level of oneself and to others, all $rs \geq .35$, all $ps \leq .07$; however, neither self-perceived nor objective performance in the speech were significantly related to tendencies to disqualify positive social outcomes, all $rs \leq .28$, all $ps \geq .15$. These findings held when selecting for those who met criteria for the generalized subtype of SAD.

After partialling out self-attractiveness ratings, the relationship between perception of interaction performance and disqualifying to the self remained marginally significant, $r = .31, p = .03$—suggesting that self-perceived attractiveness may not have played a significant role, in the full sample, in the association between perception of interaction performance and disqualifying positive outcomes on the basis of others. When selecting only for those who met criteria for the generalized subtype of SAD, the above partialled relationships were all non-significant, all $rs \leq .30$, all $ps \geq .13$, suggesting either
greater effects of perceived self-attractiveness on the relationships between
disqualification of positive social outcomes and perceived and objective performance, or
lower statistical power, among the clinically severe participants.

**Exploratory Analysis 4**

The state of participants’ menstrual cycles (i.e., follicular phase versus not in
follicular phase) was also examined, in order to determine whether menstrual cycle phase
(estimated from MCQ responses) affected the constructs that were measured for
Hypotheses 1-4. (See Table 7 for a distribution of participants in follicular phase, across
condition and SAD status.) Two series of independent t-tests were employed to determine
if women estimated to be in the follicular phase versus not in follicular phase
significantly differed, per social task, on the following variables: (a) peak F0 for each
task; (b) peak state anxiety (SUDS ratings) for each task; (c) self-perceived and objective
performance during the social interaction task (PIP-Self and PIP-Rater scores) and (d)
speech task (PSP-Self and PSP-Rater scores); and (e) self-rated level of attractiveness
(AR form). Family-wise Bonferroni adjustments were utilized ($\alpha = [.05/5] = .01$) for
series of analyses pertaining to each social task.

Twenty (45.5%) of participants included in the following analyses reported
current use of a hormonal contraceptive. Due to potential influences of hormonal effects
of birth control on one’s natural menstrual cycle, and associated affective changes and
basal hormonal levels (e.g., see Liening, Stanton, Saini, & Schultheiss, 2010; Paige,
1971), analyses were first conducted separately for participants who endorsed or denied
hormonal contraceptive use and then explored within the collapsed sample.
Use of contraceptives.

Analyses were first conducted for participants \((n = 19)\) who endorsed contraceptive use. Among these women, 52.6% were estimated to be in follicular phase. Results indicated that, for women who were versus were not in the estimated follicular phase, there were no significant differences among any of the dependent variables. Of note, peak F0 during the conversation task \((M = 223.96, SD = 22.78; \text{versus } M = 205.17, SD = 20.94)\) and negative objective ratings for the speech task \((M = 25.0, SD = 5.76; \text{versus } M = 19.56, SD = 5.27)\) were marginally significantly greater in women in the estimated follicular phase, both \(t(17) \leq 2.04, \text{both } p \leq .08\). These findings show mixed corroboration with past research that women in the follicular phase emit higher vocal pitch and are perceived by others to be more facially attractive by both males and other females (e.g., see Bryant & Haselton, 2009; Roberts, Havlicek, et al., 2004). Among participants who met criteria for generalized SAD \((n = 13)\), there were no (marginally) significant differences, all \(t$s \leq |1.89|$, all \(p$s \geq .20$.

No use of contraceptives.

Analyses were then conducted for participants \((n = 25)\) who denied use of a hormonal contraceptive. Among these women, 60.0% were estimated to be in follicular phase. Results indicated that, again, peak F0 during the conversation task was only marginally significantly greater in women who were in the estimated follicular phase. \((M = 224.51, SD = 22.49; \text{versus } M = 206.75, SD = 27.18)\). Also, peak SUDS during the speech task was only marginally significantly greater in women who were not in the estimated follicular phase \((M = 79.80, SD = 18.20; \text{versus } M = 60.0, SD = 25.74)\), both \(t$s
(23) ≤ 2.09, both ps ≤ .09. These latter results appear to contrast with past research, which found that physically healthy women had significantly greater increases in cardiovascular stress (i.e., increase in blood pressure) during a speech task, when in the follicular compared to luteal menstrual phase (as was confirmed with serum sex hormone level analyses) (Miller & Sita, 1994). Among participants who met criteria for generalized SAD (n = 12), there were no (marginally) significant differences, all ts ≤ |2.81|, all ps ≥ .19.

**Collapsed groups.**

When collapsing the above two groups, results indicated that there were no significant differences among the dependent variables with regard to menstrual phase; self-rated physical attractiveness was only marginally, significantly greater in women who were in the estimated follicular phase, t (42) = -2.32, p = .03, (M = 5.32 [i.e., “average-looking”], SD = 1.93; versus M = 3.95 [i.e., “below-average-looking”], SD = 1.96), after using the Bonferroni adjustment. Among participants who met criteria for generalized SAD (n = 23), there were no (marginally) significant differences.
Discussion

To the author’s knowledge, no findings pertaining to sociocultural effects on SAD symptom manifestation in women, across social contexts, have been reported to date. Although the extant literature suggests that these phenomena may influence SAD, there had yet to be an experimentally controlled study which manipulated the effects of social context on females’ experience of social anxiety symptoms and their perceived social capabilities. The function of sociocultural elements that underlie social anxiety and avoidance warranted investigation for the purposes of better understanding SAD, as well as improving the assessment, psychoeducation, and treatment for women with SAD.

Patients with SAD may or may not have limited insight into the mechanisms which affect their specific social fears (e.g., feeling greater anxiety and sweating more when performing in front of a specific authority figure [who happens to be a male] versus another authority figure [who happens to be a female]). If a pattern exists between social context and anxiety in socially anxious women, then enhanced understanding of this pattern may inform whether treatment for SAD could be augmented by: (a) provision of psychoeducation entailing effects of sociocultural expectations on maladaptive cognitions, behaviors, and life interference; and (b) tailoring of treatment plans for graduated exposures (a keystone therapeutic technique in the gold-standard treatment of SAD: cognitive-behavioral therapy; e.g., see Heimberg, Liebowitz, Hope, & Schneier, 1995) in order to more effectively account for social context and gender norms. Regarding point (b) above, tailoring exposures based upon implicit effects of society and
culture may help to more effectively and efficiently address the client’s fear and avoidance responses to social situations.

To summarize the results of the present study, preliminary analyses indicated that participants who felt they had more in common with the study interviewer (another female) tended to rate themselves as less negatively after the interaction task. These findings suggest that (a) perhaps having engaged in a structured conversation with another woman before completing the tasks could have, by default, exposed these participants to interacting with another woman with whom they identified—thereby reducing the intensity of the “exposure” involving a conversation task. Also, (b) identification with another woman in a position of authority (i.e., the primary experimenter) could have protected participants from stereotype threat during the interaction task (e.g., see Marx & Roman, 2002).

For Hypothesis 1a-1c, when also incorporating social context (i.e., type of social task and confederate sex) into the analyses, self-reported trait social anxiety and submissive measures did not significantly relate to vocal F0 in the social tasks, contrary to Hypothesis 1a. Some of these trait measures (i.e., fear and avoidance of social situations, submissiveness, and social interaction anxiety) did differentially relate to state anxiety and perception of performance, per partial support of Hypotheses 1b and 1c. Furthermore, trait self-reported submissiveness was associated with state anxiety and perception of performance regarding the conversation, but not speech, task.

Hypothesis 2, which stated that there would be a significant interaction effect of social task and condition (i.e., sex of the confederate), was supported to a marginally
significant extent. When evaluating contextual effects on change in vocal F0 for socially anxious women, the interaction effect of *time* (which was not hypothesized) and type of social task was contingent on the sex of the social audience member. Specifically, vocal F0 habituated to a slower extent for the two scenarios that were hypothesized to elicit the greatest distress and behavioral submissiveness: conversing with another female and presenting an opinion speech in front of a male, per self-discrepancy theory. Interestingly, halfway into each social task, vocal F0 slightly increased for the two contexts hypothesized to elicit the least submissive behavior. However, to note, this interaction effect did not replicate when selecting for a smaller sample of women who met criteria for SAD of the generalized subtype, potentially due to a lack of statistical power. The finding in the overall sample contributes complexity to previous findings of consistent, elevated vocal F0 among women with generalized SAD, compared to non-socially anxious women (Weeks, Lee, et al., 2012), as well as potential explanation for non-significant results when comparing vocal F0 of women with non-generalized SAD to vocal F0 of non-socially anxious women, during an impromptu speech task. In other words, the latter null effect may be, in part, explained by the interactive confound variables of social context.

It was also hypothesized (Hypothesis 3) that there would be an interaction effect of social task type and confederate sex condition when predicting change in state anxiety. In only partial support of Hypothesis 3, there was a significant two-way interaction of time and the type of social task when predicting SUDS ratings. Specifically, the extent of the decline in reported state anxiety from peak- to post-task was stronger in the
conversation task than the speech task—suggesting less habituation of participants’ perceived anxiety in the speech task. There were no significant differences in peak state anxiety between the confederate sex conditions for either social task. Contrary to Hypothesis 3, SUDS overall (i.e., on average) were marginally significantly higher for participants conversing with male, versus female confederates, when not controlling for time. Also contrary to Hypothesis 3, there was no significant confederate sex difference in the speech task. When selecting for individuals with generalized SAD, these results were replicated, only the difference in peak SUDS between confederate sex conditions for the conversation task became significant.

Consistent with Hypothesis 4a, participants rated their performance as significantly worse after giving their speech in front of a male speech-rater than when in front of a female speech-rater. Results held after selecting for only individuals with SAD of the generalized subtype, per marginal statistical significance.

Contrary to Hypothesis 4b, participants rated their interaction performance as significantly poorer when the conversation partner was male, versus another female, even when controlling for the rating of perceived identification with the female interviewer and negative affect in social situations. Results held when selecting only for participants with SAD of the generalized subtype. Thus, socially anxious women may engage in more negative post-event self-ratings of social performance with or among men, in general, versus with other women.

With regard to the exploratory effects of gender-trait discrepancy, gender attitudes, self-perceived attractiveness, and estimated menstrual cycle phase on the main
dependent variables, exploratory correlational analyses (see Appendix A) supported a *masculinity model* (Bassoff & Glass, 1982; Taylor & Hall, 1982; Whitley, 1983) of social anxiety, in that social anxiety severity was positively and significantly associated with discrepancy in masculine traits (i.e., perceiving that one *ought to* have more masculine-typed traits to do well in social situations) but not discrepancy in feminine traits.

In addition, median trends indicated that participants tended to perceive that they ought to enhance their masculine-typed gender role traits, but suppress their feminine-typed gender role traits, for the speech task. For the conversation task, participants tended to report pressures of enhancing masculine-typed traits, to a lesser extent than for the speech task, but tended to report limited self-discrepancy in feminine-typed gender role traits.

For Exploratory Analysis 1a, after covarying for gender role traits in their respective equations, there were no interaction effects among time, task, or confederate sex when predicting vocal F0. Among those with generalized SAD, there was significant three-way interaction effect of time, confederate sex, and discrepancy in *feminine*-typed traits for the *speech* task, with beliefs that one ought to suppress femininity during the speech predicting higher variability over time and slower habituation of vocal F0 in the male, versus female, confederate condition.

For Exploratory Hypothesis 1b, there was a three-way interaction among time, confederate sex condition, and discrepancy in masculine traits when predicting speech SUDS. Greater perception that one ought to exhibit more masculine traits was associated with increasing SUDS ratings overall, faster decline in self-reported state anxiety (i.e.,
SUDS) from peak to post, and less differences in SUDS between confederate sex conditions. There were no significant interaction effects among individuals with SAD of the generalized subtype.

For Exploratory Analysis 1c, results indicated that perception of necessity to enhance one’s masculine-typed traits significantly predicted poorer self-perception of speech performance, after controlling for confederate sex condition. Also, after controlling for self-discrepancy in masculine traits, being in the male confederate condition predicted worse perception of speech performance. Among participants with generalized SAD, there was a significant interaction between condition and discrepancy in masculine traits when predicting perception of speech performance, and marginally significantly so when predicting perception of interaction performance; increasing discrepancy in masculine self-discrepancy resulted in fewer differences in scores between the confederate sex conditions. There were no significant interactions regarding discrepancy in feminine traits. Thus, among highly socially anxious women, perceptions that one ought to suppress feminine traits influenced social contextual effects on autonomic, objective submissive behavior. When giving an opinion speech, perceptions that one ought to engage more masculine-typed traits influenced social context’s effects on self-reported state anxiety and perception of performance.

Also, per Exploratory Analysis 2, the amount of variance for which aspects of each main dependent variable (i.e., peak vocal F0, peak state anxiety, and speech and interaction performance ratings) that could be accounted for by traditional/stereotypical gender role attitudes, gender role trait discrepancy, and social anxiety for performance
and interaction situations, respectively, was then explored. Results indicated that the full model (with all predictor variables entered simultaneously) was non-significant when predicting peak vocal F0 for either social task. However, the full model predicted a significant amount of variance for peak state anxiety during the speech and perceived poor performance for both the speech and conversation tasks, but not for peak anxiety in the conversation (i.e., this equation had a marginally significant model effect). No single predictor uniquely accounted for a significant amount of variance in these models. Thus, peak vocal F0 in the present sample was not accounted for by social anxiety, gender role attitudes, or gender trait discrepancy, altogether. However, these latter variables may significantly contribute to perceived distress, as well as to negative post-event self-assessment, for differing social contexts.

In addition, for Exploratory Analysis 3, the extent to which self-perceived attractiveness may affect the relationships among perceptions of performance and tendencies to disqualify positive social outcomes, to fear evaluation of others, and to have concerns of social reprisal from perceived dominant others was also explored. Results indicated (see Appendix A) that greater self-rated attractiveness was significantly related to lower fears of positive or negative evaluation. Thus, greater self-perceived physical attractiveness could serve as a protective factor for future-oriented concerns about social evaluation. In addition, greater self-perceived attractiveness was marginally significantly related to lower tendencies to disqualify positive social outcomes.

After partiaalling out self-attractiveness ratings, the relationship between perception of interaction performance and disqualifying to the self remained marginally
significant—suggesting that self-perceived attractiveness may not have played a significant role in this relationship. When selecting only for those who met criteria for the generalized subtype of SAD, the above partialled relationships were all non-significant. Thus, self-beliefs of attractiveness may have an effect on the relationship between tendencies to disqualify positive social outcomes and how negatively a socially anxious woman may rate her performance in a conversation. It is important to note, however, that one’s subjective beliefs of attractiveness could be inherently influenced by social anxiety-related biases (i.e., a negatively-biased mental self-representation; e.g., see Heimberg, Brozovich, & Rapee, 2010), and possibly related to lower overall self-esteem. It is also possible that the non-significant results were due to lower statistical power in the SAD subsample.

It was lastly explored (i.e., Exploratory Hypothesis 4) whether participants in follicular phase versus not in follicular phase of their menstrual cycle (per self-report of dates and estimated durations during menses) differed in: (a) peak vocal F0, (b) peak state anxiety for each task, (c) perceived performance in the conversation task or speech task, or (d) self-rated level of attractiveness. Among all participants, women who were estimated to be in follicular phase rated themselves as marginally, significantly more attractive than women not in follicular phase. Among only women who endorsed contraceptive use, those who were in estimated follicular phase had marginally significantly greater peak F0 in the conversation and were rated worse in speech performance by objective raters, compared to those who were estimated to be in non-follicular phase. Among only participants who denied contraceptive use, those who were
in estimated follicular phase also had marginally significantly greater peak F0 in the conversation, but reported lower peak state anxiety ratings during the speech task, compared to those who were in an estimated non-follicular phase. Thus, it may be important for researchers to consider menstrual cycle phase and contraceptive use in women when dependent variables include vocal F0, perception of speech performance, and reported state anxiety, or when addressing how attractiveness may relate to other social anxiety-related constructs and objective participant performance.

In conclusion, with regard to vocal F0, consideration of the tend and befriend model (Taylor et al., 2000), and differing effects of social context, may shed light on the interpretation of the present findings; caution is warranted for interpretation due to the non-replicated status of present results. Specifically, recall that there was slower habituation of submissive behavior in the conversation, versus speech, task when the social audience member was another woman, and slower habituation in the speech, versus conversation, task when the social audience member was male. Thus, while Hypothesis 2 was not specifically supported, with regard to overall elevation in vocal F0, an unexpected result in differential habituation rates of vocal F0 (which may be an objective measure of anxious submissive behavior to perceived dominant others) do provide theoretical support for contextual effects on socially anxious women’s response to perceived social threat. With regard to the unexpected, and albeit relatively small, increases in vocal F0 (two to three minutes into each task) for the scenarios hypothesized to elicit the least amount of submissive vocal behavior: it is imperative for future research
to determine if this effect is due to social phenomena or if it is due to floor effects from participants having reached baseline vocal F0 at the previous minute.

It is also important to consider the nature of the conversation task, such that confederates were trained to allow the participant to maintain the majority of the conversation, in order to reduce potential avoidance behavior in the conversation task and to elicit anxiety and distress. To recapitulate, previous research indicates that men tend to dominate conversations with women, but same-sex (i.e., both male and female) interactions tend to result in equal communication time for interaction partners (e.g., see Zimmerman & West, 1975). It is possible that participants rated their performance as worse when conversing with a male, versus a female, in the present study, because they may have interpreted the pressures to maintain equal conversation time with a male as a sign of an unsuccessful conversation.

The impacts of self-discrepancy in gender role traits, among various gender-stereotyped domains, may be important to explore further in social anxiety research and treatment. Given differential effects of perceived necessity to suppress femininity or to enhance masculinity, it is possible that a masculinity model of social anxiety does not take into account the effects of social context or of potential stereotype threat on women’s comfort with engaging traits that are culturally typed as “feminine”. For example, it is possible that the masculinity model is inherently based on traditionally male-dominated perspectives of appropriate professional behavior (e.g., suppressing emotionality and enhancing assertiveness). Although beyond the scope of the current study, women may thus feel compelled, more often than men, to adjust their social
behaviors to conform to social mores across contexts (e.g., assertive versus empathetic and warm). The social pressures to alter behavior and to appeal to other individuals may have enhancing effects on both stereotype threat bias and social anxiety for women, as is evidenced by results of the present study. In addition, greater self-perceived attractiveness among socially anxious women may serve as a protective factor with regard to trait social anxiety symptoms. Lastly, when researching these phenomena among socially anxious women, it may also be of importance to consider menstrual cycle phase.

Research Implications

The results of the present study suggest that, when evaluating changes in anxiety over time, social context matters. It may also be important to counterbalance or standardize the sex of the leading researcher before a social task is completed for a study, as changes in stereotype threat bias may have effects on participants’ self-perceptions of performance. In addition, and importantly, the current results may at first be seen as contrasting previous findings on social threat-induced increases in vocal pitch F0 for females with SAD (see Weeks, Lee et al., 2012). However, this may not be the case. In the Weeks, Lee et al. study (2012), the nature of the in vivo tasks completed by SAD patients was tailored to the patients’ social fears, and was therefore not standardized across participants. It is possible, therefore, that there was an imbalance of interaction-versus performance-based exposures with males versus females, resulting in vocal F0 means that were associated with submissive behavior for the majority of tasks in that study. The present study is novel in that (a) it assesses social contextual effects and (b)
potential effects of perceived gender-typed trait discrepancy in (c) the first study to test gender roles and social anxiety with experimental manipulation of independent variables.

Clinical Implications

The present study provides preliminary results that may have implications for assessment and treatment outcomes for women with SAD. Specifically, female gender of the clinician, as well as psychoeducation from female clinicians about cultural stereotype threats, may help to assuage patients’ negative post-event self-ratings after exposure work. In addition, the present study may provide additional support for the importance of critically evaluating social context with female patients when planning graduated social exposures, such that performance fears may elicit significantly greater state anxiety than interaction fears. Also, post-event self-ratings were more negative when the confederate was male, versus female. Considering that gender role attitudes and gender role discrepancy simultaneously predict negative self-ratings of two different social contexts in the present study (i.e., conversation and speech), as well as greater state anxiety during a speech, discussion of gender roles and gender role discrepancy with female SAD patients may have therapeutic effects on negative, post-event self-assessments of social events, particularly regarding exposures among males. In addition, addressing female patients’ perceived self-attractiveness may have an effect on patients’ fears of evaluation from others. For example, recent research suggests that there is high comorbidity between eating disorders and SAD, and that social anxiety may serve as a barrier to treating eating disorders (e.g., see Goodwin & Fitzgibbon, 2002; McLean, Miller, & Hope, 2007), suggesting pervasive low self-esteem about one’s physical appearance. If lower-
perceived attractiveness is associated with higher trait social anxiety and related cognitions and behaviors (e.g., disqualifying the positive), then further research should attempt to determine causality within this relationship. Also, it may be important to address sociocultural pressures on women (e.g., popular media) in therapy, in order to facilitate more adaptive attribution tendencies for positive and negative social outcomes. Finally, there were many interactive effects of time on the main dependent variables. This may bolster encouragements from manualized treatments for social anxiety disorder (e.g., see Hope, Heimberg, Juster, & Turk, 2004), as well as potentially other anxiety disorders, to plan exposures that will last for several minutes.

Limitations and Future Directions

The present study is preliminary in nature, in that it is the first to test social context and gender-role discrepancy in socially anxious women via experimental manipulation. Accordingly, there are several limitations which may inform future research in this area. First, with regard to the dependent variable of vocal pitch, it is possible that the vocal patterns emerging from the current study were actually random outcomes. Due to the novelty of utilizing vocal pitch as a potential measure of state submissive behavior for highly socially anxious women specifically, it is imperative that the methodology and findings be replicated in future research before its application to treatment or clinical interpretation. Second, the nature of the social tasks (i.e., a speech to only one individual and a semi-structured conversation) was very specific and may reflect non-generalizability to daily experiences. Again, replication and extension of the current study may inform the generalizeability of the current study’s results. It is also important
to consider the nature of the confederate roles in the present study. It is possible that the “neutrality” of the male conversation confederates was seemingly too unnatural. Thus, it is worth noting that while this design issue did not increase suspicions of deception for these participants, it may have presented a confound that led to increased anxiety in response to interacting with male versus female confederates in the present study, which was contrary to hypothesis. In addition, the study was conducted among female participants who ranged widely in social anxiety severity, ranging from sub-clinical threshold to SAD of the generalized subtype. Thus, in the current sample, there is a degree of variability and generalizeability with regard to social anxiety severity. However, in order to formally examine clinical implications, this study will require replication in a demographically diverse, SAD patient sample—potentially as part of therapeutic exposure work. Furthermore, as there are individual differences in comfort with different social situations, future research on this topic area would be strengthened by planning social exposures tailored to participants’ fears (within performance and interaction situations) beforehand, rather than standardized exposures (see, for example, Weeks, Lee, et al., 2012). In order to examine the potential link between vocal F0 and state anxiety ratings at specific time points, future studies should obtain state anxiety ratings at the start of each minute of the task, as well.

It is also important to address the limited nature in which follicular/non-follicular phases were determined for the present study. These estimations were based upon self-report data and population averages (i.e., 14 days, per phase, of the typical 28-day cycle). To truly determine menstrual cycle phase, it is highly recommended that future
researchers conduct hormone tests via a urine sample from participants to determine menstrual cycle phase. Also, the “high fertility risk” period tends to specifically be toward the end of the follicular phase, and this was not assessed. This shorter period of time may have greater effects on vocal pitch changes in females, thus warranting attention in future studies. Finally, given that many of the present results were approaching significance (see Results), it bears mention that the recruitment and inclusion of additional participants may lead to enhanced power—increasing the probability of rejecting the current study’s null hypotheses.
References


Footnotes

1 The cited authors did not report a significance test of this effect, but visual inspection of the distribution of means suggested that the durations of silences were nearly identical across same-sex conversation partners.

2 Baseline vocal acoustic levels were originally proposed to be obtained via audio recordings of the interview at the beginning of each study. However, due to an unforeseeable technical malfunction, baselines were instead obtained from recordings of the participants’ voice at the conclusion of the present study procedures, approximately 10 minutes after the last social task was completed.

3 It was proposed that participants were to be instructed to indicate the extent to which they experience the various positive and negative feelings listed in the PANAS in social situations, at the moment. However, there were concerns of an approximate 20-30 minute time difference between administration of the questionnaire packet and social task completion, as well as the confound that participants had engaged in a social situation (i.e., the interviews) by default.

4 A fixed alpha level (.05) was divided by the number of repeated tests conducted for relevant Hypotheses, in order to correct for alpha inflation and to conservatively interpret “significance” of p-values.

5 In order to employ a multivariate approach to the present analyses, and to reduce potential alpha inflation caused by repeated tests, the authors also computed two composite social anxiety variables (social interaction and performance anxiety/avoidance, respectively)—resulting in three variables of interest (including
submissive behavior). The composite variables included: (1) LSAS-interaction subscale X SIAS-S total scores (i.e., social interactions; (2) LSAS-performance subscale X SPS total scores (i.e., performance situations). When entering these variables into an RM ANOVA design, predicting vocal F0, neither Box's Test of Equality of Covariance Matrices, nor subsequent multivariate effect tests, were computed; there were fewer than two nonsingular cell covariance matrices. In other words, there were more dependent variables than cases in any cells, even when: (a) only testing one of the composite variables as a between-subjects factor, without task or confederate sex condition entered into the equation or (b) creating a sole composite variable of LSAS, SIAS-S, and SPS total scores. Thus, non-composite variables were utilized, resulting in five separate RM ANOVAS.

6 For this test, the assumption of homogeneity of variances was violated (i.e., Levene’s test, \( p < .05 \)). Thus, a Welch’s approximate t-solution (Welch, 1936; 1938) was employed for calculating the p-value.

7 Recall that a SUDS rating of “50” signified the lower threshold of “distressing” anxiety, whereas a “25” signified the lower threshold of anxiety with which one can easily cope.

8 A repeated measures design could not be utilized for this hypothesis, as the number of independent variables was too large for a repeated measures analysis (i.e., would cause integer overflow and result in a failed execution of the equation).

9 Based upon self-report, zero participants endorsed being possibly pregnant. Six participants were excluded from results, due either to incompletion of necessary items on
the MCQ to estimate menstrual cycle phase, or due to participants’ lack of knowledge of the onset date of their last period of menses. Two additional participants were excluded due to unusually disparate dates between the onset of their last period of menses and the study procedures (i.e., more than 60 days).
### Table 1

**Participant Descriptive Statistics for Age, Sexual Orientation, Relationship Status, and Race/Ethnicity**

<table>
<thead>
<tr>
<th>Mean Age (SD)</th>
<th>% Sexual Orientation&lt;sup&gt;a&lt;/sup&gt;</th>
<th>% Relationship Status&lt;sup&gt;b&lt;/sup&gt;</th>
<th>% Race/Ethnicity&lt;sup&gt;b,c&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>H</td>
<td>H-B</td>
<td>B</td>
</tr>
<tr>
<td>19.9 (2.8)</td>
<td>84.6</td>
<td>7.7</td>
<td>3.8</td>
</tr>
</tbody>
</table>

*Note: % Sexual Orientation [H = heterosexual; H-B = heterosexual with some bisexual experience; B = bisexual]; % Relationship Status [S = single; M = in a monogamous relationship; NE = in a non-exclusive relationship]; % Race/Ethnicity [C = Caucasian-American; A = Asian; AA = African-American; L or B = Latina [of reported Spanish or Mexican ancestry] or Biracial.  
<sup>a</sup>Data missing for two participants due to non-responding to the item; no participants reported homosexual sexual orientation.  
<sup>b</sup>Data missing for one participant due to non-responding to the item.  
<sup>c</sup>With the exception of Asian participants, all participants reported American generation status as being 1<sup>st</sup> or higher. Among Asian participants, 25.0% reported being citizens of non-American nationalities, predominantly China.*
### Table 2

*Means and Standard Deviations of All Measures*

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LSAS-Total</td>
<td>59.69 (19.50)</td>
</tr>
<tr>
<td>SPS</td>
<td>29.89 (12.68)</td>
</tr>
<tr>
<td>SIAS-S</td>
<td>34.15 (14.35)</td>
</tr>
<tr>
<td>FPES</td>
<td>30.37 (15.09)</td>
</tr>
<tr>
<td>BFNES-S</td>
<td>27.46 (8.36)</td>
</tr>
<tr>
<td>DPSOS-S</td>
<td>13.33 (6.31)</td>
</tr>
<tr>
<td>DPSOS-O</td>
<td>34.84 (13.85)</td>
</tr>
<tr>
<td>PANAS-P</td>
<td>30.87 (7.04)</td>
</tr>
<tr>
<td>PANAS-N</td>
<td>21.94 (7.10)</td>
</tr>
<tr>
<td>SBS</td>
<td>32.38 (8.43)</td>
</tr>
<tr>
<td>CSRS</td>
<td>37.17 (18.61)</td>
</tr>
<tr>
<td>PIP-Self</td>
<td>24.37 (11.24)</td>
</tr>
<tr>
<td>PIP-Rater</td>
<td>20.40 (8.52)</td>
</tr>
<tr>
<td>PSP-Self</td>
<td>40.02 (11.28)</td>
</tr>
<tr>
<td>PSP-Rater</td>
<td>22.10 (7.82)</td>
</tr>
<tr>
<td></td>
<td>Pre</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------</td>
</tr>
<tr>
<td><strong>SUDS:</strong> Speech</td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>57.71</td>
</tr>
<tr>
<td>Peak</td>
<td></td>
</tr>
<tr>
<td>Post</td>
<td></td>
</tr>
<tr>
<td><strong>SUDS:</strong> Conversation</td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>39.50</td>
</tr>
<tr>
<td>Peak</td>
<td></td>
</tr>
<tr>
<td>Post</td>
<td></td>
</tr>
<tr>
<td><strong>Vocal Pitch (Hz):</strong></td>
<td></td>
</tr>
<tr>
<td>Speech</td>
<td></td>
</tr>
<tr>
<td>Min1</td>
<td>203.78</td>
</tr>
<tr>
<td>Min2</td>
<td></td>
</tr>
<tr>
<td>Min3</td>
<td>189.27</td>
</tr>
<tr>
<td>Min4</td>
<td>190.33</td>
</tr>
<tr>
<td>Conversation</td>
<td></td>
</tr>
<tr>
<td>Min1</td>
<td>210.99</td>
</tr>
<tr>
<td>Min2</td>
<td></td>
</tr>
<tr>
<td>Min3</td>
<td>190.11</td>
</tr>
<tr>
<td>Min4</td>
<td>188.33</td>
</tr>
</tbody>
</table>

*Note:* See **Methods** for descriptions of all measures and abbreviations.
Table 3

*Distribution of SAD Status across Confederate Sex Conditions*

<table>
<thead>
<tr>
<th>SAD Status</th>
<th>Count</th>
<th>Confederate Sex Condition</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td>Subclinical</td>
<td>5</td>
<td>9</td>
<td>14</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>% within Condition</td>
<td>21.7</td>
<td>31.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of Total</td>
<td>9.6</td>
<td>17.3</td>
<td>26.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Generalized</td>
<td>3</td>
<td>7</td>
<td>10</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>% within Condition</td>
<td>13.0</td>
<td>24.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of Total</td>
<td>5.8</td>
<td>13.5</td>
<td>19.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Generalized</td>
<td>15</td>
<td>13</td>
<td>28</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>% within Condition</td>
<td>65.2</td>
<td>44.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of Total</td>
<td>28.8</td>
<td>25.0</td>
<td>53.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>23</td>
<td>29</td>
<td>52</td>
<td>52</td>
<td></td>
</tr>
</tbody>
</table>

*Note:* SAD = social anxiety disorder; M = all-male confederate condition; F = all-female confederate condition. Distribution of SAD status did not significantly differ across conditions, $\chi^2 (2) = 2.22, p = .34$
### Table 4

**Hypotheses 1b and 1c: Bivariate Correlation Results**

<table>
<thead>
<tr>
<th></th>
<th>SPS</th>
<th>SIAS-S</th>
<th>SBS</th>
<th>LSAS: Performance</th>
<th>LSAS: Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Peak SUDS:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speech</td>
<td>ns</td>
<td>ns</td>
<td>.24†</td>
<td>.25†</td>
<td>.37*</td>
</tr>
<tr>
<td><strong>Peak SUDS:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conversation</td>
<td>ns</td>
<td>ns</td>
<td>.37*</td>
<td>ns</td>
<td>.34†</td>
</tr>
<tr>
<td><strong>PSP-Self</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ns</td>
<td>.29†</td>
<td>ns</td>
<td>.24†</td>
<td>.35†</td>
</tr>
<tr>
<td><strong>PIP-Self</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ns</td>
<td>ns</td>
<td>.46*</td>
<td>.46*</td>
<td>.49*</td>
</tr>
</tbody>
</table>

*Note: SUDS = Subjective Units of Distress Scale; PSP-Self = (Self) Perception of Speech Performance Scale (Rapee & Lim, 1992); PIP-Self = (Self) Perception of Interaction Performance Scale (Reilly & Weeks, 2012); SPS = Social Phobia Scale (Mattick & Clarke, 1998); SIAS-S = Social Interaction Anxiety Scale-Straightforward Items (Mattick & Clarke, 1998; Rodebaugh, Woods, & Heimberg, 2007); SBS = Submissive Behavior Scale (Gilbert & Allan, 1994); LSAS = Liebowitz Social Anxiety Scale (Liebowitz, 1987). Family-wise Bonferroni adjustments were utilized to control for repeated correlational tests ($\alpha = [.05/5] = .01$); ns = non-significant (all $rs \geq .21$; $ps > .05$); *$p < .01$; †$.01 \leq p \leq .08$.**
Table 5.

*Hypothesis 2: Simple and Interaction Effects on Vocal Pitch*

<table>
<thead>
<tr>
<th>Variable</th>
<th>$F(df)$</th>
<th>$p$</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>35.09(3,48)</td>
<td>&lt;.001</td>
<td>.14</td>
</tr>
<tr>
<td>Task</td>
<td>.667(1,50)</td>
<td>ns</td>
<td>.01</td>
</tr>
<tr>
<td>Task X Condition</td>
<td>8.43(1,50)</td>
<td>ns</td>
<td>.003</td>
</tr>
<tr>
<td>Time X Task X Condition</td>
<td>2.41(3,48)</td>
<td>.08</td>
<td>.13</td>
</tr>
<tr>
<td>Change at Minute 2 to 3</td>
<td>7.04(1,50)</td>
<td>=.01</td>
<td>.12</td>
</tr>
</tbody>
</table>

*Note:* Vocal pitch was measured via fundamental frequency (F0) in Hz. Time = minutes of speech task. Task = impromptu speech versus semi-structured conversation, both of which all participants completed. Condition = confederate sex (i.e., all-male or all-female). Minute 2 to 3 = time at which there was an interaction effect, across both tasks and conditions.
Table 6

Descriptive Statistics for the Gender Role Trait Self-Discrepancy Scores

<table>
<thead>
<tr>
<th></th>
<th>Median</th>
<th>SD</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speech: F</td>
<td>-2.06</td>
<td>5.80</td>
<td>-21</td>
<td>10</td>
</tr>
<tr>
<td>Speech: M</td>
<td>11.50</td>
<td>5.96</td>
<td>-4</td>
<td>23</td>
</tr>
<tr>
<td>Conversation: F</td>
<td>1.00</td>
<td>4.78</td>
<td>-11</td>
<td>17</td>
</tr>
<tr>
<td>Conversation: M</td>
<td>7.00</td>
<td>5.44</td>
<td>-5</td>
<td>17</td>
</tr>
</tbody>
</table>

Note: Self-discrepancy scores were obtained by calculating the difference ($X_2 - X_1$) of subscale scores (F = feminine-typed traits; M = masculine-typed traits) on the Personal Attributes Questionnaire (PAQ; Spence et al., 1974), where $X_2 =$ traits that participants believed one ought to have in order to do well for a task. $X_1 =$ participant self-identification with gender role traits. Speech = ought to have ratings in anticipation of the impromptu speech task. Conversation = ought to have ratings in anticipation of the semi-structured conversation task.
Table 7

*Distribution of Estimated Follicular Phase Status across Confederate Sex Conditions and Social Anxiety Disorder (SAD) Status*

<table>
<thead>
<tr>
<th>Confederate Sex Condition</th>
<th>SAD Status</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Subclinical</td>
<td>Non-Generalized</td>
<td>Generalized</td>
</tr>
<tr>
<td>Follicular Phase</td>
<td>11</td>
<td>14</td>
<td>9</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Non-Follicular Phase</td>
<td>8</td>
<td>11</td>
<td>3</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>Total</td>
<td>44</td>
<td>12</td>
<td>9</td>
<td>23</td>
<td></td>
</tr>
</tbody>
</table>

Note: Distribution of SAD status did not significantly differ across conditions and SAD status, $\chi^2 (1) = .02, p = .90.$
Figures 1a. Impromptu speech task: Mean vocal pitch in Hz

Figures 1b. Semi-structured conversation task: Mean vocal pitch in Hz

Figures 1a. and 1b. Mean vocal F0 values for the full sample, across speech and conversation time points (4 minutes), per confederate sex condition. Vocal pitch was measured via fundamental frequency (F0) in Hz. Average baseline vocal F0 = 181.16 (22.77) Hz. In the full sample, a three-way interaction occurred among time, social task, and sex of the confederate, multivariate $F(3,48) = 2.41, p = .08, \eta_p^2 = .13$. For each social task, there were no significant between-subjects effects for any time point.
**Figure 2a.** Impromptu speech task: Mean Subjective Units of Distress (SUDS)

**Figure 2b.** Semi-structured conversation task: Mean Subjective Units of Distress (SUDS)

*Figures 2a. and 2b.* Participant mean SUDS ratings before, at peak SUDS during, and immediately after the each task, per confederate sex condition. In the full sample (as shown), no significant interaction effect occurred. There were no significant differences for any state anxiety ratings between conditions. * = marginally significant difference (i.e., $p \leq .099$) among the entire sample and a significant difference (i.e., $p < .05$) among those with social anxiety disorder of the generalized subtype.
Figure 3. Mean level of self-reported perception of social task performance

Figure 3. Mean (and standard error) for the perception of interaction performance (PIP-Self scores; Reilly & Weeks, 2012) and perception of speech performance (PSP-Self scores; Rapee & Lim, 1992), per confederate sex condition (i.e., both male versus both female confederates for the interaction and speech tasks). * = significant difference (i.e., $p < .05$).
Figures 4 (a-b). Effects of perceived pressures for lower femininity and greater masculinity on vocal pitch in the speech task.

4a. Lower feminine-typed traits

4b. Higher masculine-typed traits

Figures 4(c-d). Effects of perceived pressures for higher femininity and lower masculinity on vocal pitch in the speech task

4c. Higher feminine-typed traits

4d. Lower masculine-typed traits
Figures 4 (a-d). Mean vocal pitch for the generalized SAD subsample, across speech time points (4 minutes), and per confederate sex condition (i.e., M = Male-only confederates versus F = Female-only confederates). Vocal pitch was measured via fundamental frequency (F0) in Hz. Average baseline vocal F0 was 181.16 Hz (SD = 22.77). Among those participants with generalized SAD, there was a marginally significant three-way interaction effect of time, confederate sex condition, and self-discrepancy of feminine traits, $F(3,22) = 3.19, p = .04, \eta^2_p = .30$, as well as with (at change from Minute 2 to 3) self-discrepancy of feminine traits, $F(6,21) = 2.51, p = .055, \eta^2_p = .42$. There were no significant interaction effects for the conversation task or for masculinity. Encircled areas on the graphs indicate times at which the three-way interaction effects occurred.
Appendix A: Additional Correlational Results

Exploratory Analysis 1

To determine relationships among these variables, two series of bivariate correlational analyses were conducted. For each series, relationships among Minutes 1-4 mean vocal F0, SUDS ratings, and gender trait discrepancy ratings (for each respective social task) and social anxiety severity (i.e., LSAS total scores) were analyzed.

Correlation analyses.

Vocal F0 at any time point was not significantly associated with either SUDS ratings or perceptions of interaction or speech performance, all ps > .05. In support of the masculinity model of social anxiety (e.g., see Bassoff & Glass, 1982; Moscovitch et al., 2005; Taylor & Hall, 1982; Whitley, 1983), social anxiety severity was positively associated with greater self-discrepancy of masculine-typed, but not feminine-typed traits, in anticipation of either social task, both rs ≥ .34, both ps ≤ .01.

Conversation task.

As was hypothesized, greater discrepancy in feminine traits (i.e., perceiving that one ought to have more feminine traits to do well in the conversation task) was positively and significantly related to vocal pitch during the first and last minutes of the task, both rs ≥ .42, both ps ≤ .01, whereas the there was a non-significant trend that greater discrepancy in masculine traits (i.e., greater endorsements of masculine traits needed to do well) tended to be negatively related to vocal pitch during the first half of the 4-minute task, both rs ≤ -.18, but positively related to the second half of the task, both rs ≥ .19, all ps ≥ .18. Interestingly, reported peak SUDS were marginally and negatively significantly
related to discrepancy in feminine traits, \( r = -0.34 \), both \( p = .055 \). Yet, Minutes 1 and 4 in the social task, in tying these results to exploratory findings for vocal F0, are arguably more related to anticipatory and post SUDS ratings.

**Speech task.**

Neither discrepancy in masculine nor feminine traits significantly related to vocal F0 throughout the speech task, all \( ps \geq .10 \). Reported SUDS ratings were not significantly related to discrepancy in either masculine or feminine traits, all \( ps \geq .10 \).

**Exploratory Analysis 3**

In order to explore the potential effect of a female’s self-perceived physical attractiveness (AR form scores) on tendencies to have concerns of social reprisal and to consequently fear positive evaluation and engage in greater disqualification of positive social outcomes, bivariate correlations were computed among self-rated attractiveness and (1) concerns of social reprisal (i.e., CSRS scores); (2) disqualification of positive social outcomes (DPSOS-Others and DPSOS-Self scores); (3) fear of positive evaluation (FPES scores), and (4) fear of negative evaluation (BFNES-S scores; for the purposes of discriminating between types of fears of social evaluation). A Bonferroni correction of \( (\alpha = [.05/5] = .01) \) was applied for repeated tests.

Results indicated that self-rated attractiveness was significantly and negatively related to fears of positive and negative evaluation, both \( rs \leq -.41 \), both \( ps < .01 \). Self-perceived physical attractiveness was marginally significantly and negatively related to tendencies to disqualify positive social outcomes, both \( rs \leq -.26 \), \( ps \leq .09 \). A small and non-significant relationship was obtained between self-perceived attractiveness and concerns of social reprisal, \( r = -.08 \), \( p > .05 \). When selecting for participants who met
criteria for generalized SAD, greater self-rated attractiveness was significantly and
negatively related to the following: fear of positive evaluation and attributing reasons to
disqualify positive social outcomes to oneself, both $r \leq -.49$, both $p \leq .01$. 