

Evaluating Aspects of Social Anxiety Disorder in Non-Treatment-Seeking Adults who  
Stutter: Implications for Measurement and Treatment

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## Abstract of Thesis

### Evaluating Aspects of Social Anxiety Disorder in Non-Treatment-Seeking Adults who Stutter: Implications for Measurement and Treatment

Stuttering and social anxiety disorder (SAD) share characteristics such as fear and anxiety toward social situations. Despite similarities, the underlying cognitive biases that perpetuate these characteristics in SAD have only begun to be studied in stuttering. We investigated judgment bias, the overestimation of probability and cost of negative outcomes for social situations, in a sample of persons who stutter (PWS) and a sample of age- and gender-matched typically fluent controls (NPWS). There were no between-group differences for trait anxiety. Although results indicated no between-group differences in judgment bias for social situations, further investigation revealed significant differences in judgment bias for social situations between PWS with high FNE and PWS with low FNE. Group differences were observed between PWS with high FNE, PWS with low FNE, and NPWS for distribution of judgment bias for different types of situations. PWS with high FNE perceived positive and mildly negative social scenarios as more threatening than the other two groups did. Future directions to evaluate potential treatment options for PWS such as measurement of faulty attention or interpretation bias in PWS are discussed.

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## Introduction

Clinical experience, personal anecdotes, and a variety of research fuel the discussion about possible relationships between stuttering and social anxiety disorder (SAD). Current evidence suggests a co-occurrence or shared symptomatology between the two including: fear of negative evaluation, content-specific fear or anxiety toward social situations, and the use of avoidance or safety behaviors such as avoiding eye contact (Iverach et al., 2009; Iverach & Rapee, 2013; Mahr & Torosian, 1999). These findings, however, have been challenged due to concerns regarding methodology and impact on those who stutter (Manning & Beck, 2011). Although the two disorders may share symptoms, the underlying mechanisms responsible for SAD have only recently begun to be investigated in stuttering. The current paper explores symptoms and underlying mechanisms of SAD, specifically judgment bias, in a sample of adults who stutter and of age- and gender-matched typically fluent adults.

### *Defining Social Anxiety Disorder and Stuttering*

Social anxiety disorder (SAD) is characterized by marked or intense fear of social or performance-based situations where scrutiny or evaluation by others may occur (DSM-5; American Psychiatric Association, 2013a). Additional diagnostic criteria include: a) anxiety and avoidance of social situations that interfere with one's social or occupational routine, b) fear, anxiety, and avoidance for at least six months duration, and c) a recognition that one's fear associated with social situations is extreme (DSM-5;

American Psychiatric Association, 2013a). In diagnosing SAD, one must exhibit fear or anxiety in social situations that is deemed by a clinician as out of proportion to those situations (APA; 2013b). Until recently, the presence of stuttering was an exclusion criteria for social anxiety in the *DSM-IV-TR* (Iverach, Menzies, O'Brien, Packman, & Onslow, 2011), meaning that a person could not be diagnosed with SAD if they also stuttered. The American Psychiatric Association (2013b) recently revised its definition of social anxiety in the *DSM-5* to include fear or anxiety in response to social situations that is “unrelated” or “out of proportion to what would normally be felt” for an individual presenting with an additional diagnosis such as stuttering. This change in definition allows persons who stutter to be diagnosed with SAD if they show these ‘out of proportion’ reactions to social situations.

Stuttering is a speech disorder that leads to affective, cognitive and behavioral reactions. Disruptions in the forward flow of speech often lead to affective reactions such as anxiety, behavioral avoidance of social situations, and negative cognitions about oneself as a speaker (Manning, 2010). People who stutter can experience difficulty with social communication and are at risk for disabilities or handicaps due to this difficulty. For example, an individual who stutters can experience negative cognitions or feelings associated with his or her stuttering that limit and ultimately handicap his or her ability to participate in social situations (Yaruss, 2007). Although this parallels the content-specific fear associated with social anxiety disorder (APA; 2013b), these negative cognitions or feelings may not be ‘out of proportion to what would normally be felt’ in all persons who stutter.

### *The current relationship between stuttering and social anxiety*

Fear and anxiety are considered major components in the maintenance of stuttering and SAD (Amir & Bomyea, 2010; Craig & Tran, 2014; Iverach et al., 2009; Iverach & Rapee 2013; Mahr & Torosian, 1999; Messenger, Onslow, Packman, & Menzies, 2004). Symptoms associated with SAD include fear of negative evaluation, expectancies of social harm, negative cognitions, attention biases, and the use of avoidance and safety behaviors such as avoiding eye contact (Clark & Wells, 1995; Iverach & Rapee 2013; Rapee & Heimberg 1997; Rapee & Spence 2004; Rodebaugh et al., 2004). These characteristics have also been reported in persons who stutter using self-report scales (Blumgart, Tran, & Craig, 2010; Messenger et al., 2004; Iverach et al., 2009; Iverach & Rapee 2013). Additionally, persons who stutter have reported increased trait anxiety and content-specific anxiety toward social situations (Craig, 1990; Ezrati-Vinacour & Levin, 2004; Iverach et al., 2009; Iverach & Rapee 2013; Mahr & Torosian, 1999). And while a recent meta-analysis indicates elevated trait and social anxiety in persons who stutter (Craig & Tran, 2014), an earlier study did not find an association between the two disorders (Miller and Watson, 1992). In at least one study, anxiety in social communication correlated with stuttering severity – individuals with a severe fluency disorder reported higher anxiety in social communication than individuals with a mild fluency disorder (Ezrati-Vinacour & Levin, 2004).

Although the studies above suggest a relationship between stuttering and SAD, the magnitude of this relationship remains open to question. Some studies report PWS with fear of negative evaluation significantly greater than controls (Messenger et al., 2004), but others indicate that fear of negative evaluation and trait anxiety are

significantly lower than the level exhibited in SAD (Iverach et al., 2009). Others report heightened social anxiety in PWS using flawed methodology including the exclusive recruitment of treatment-seeking adults who stutter and control groups that are unmatched or heavily inflated with personality disorders (Iverach et al., 2009; Mahr & Torisian, 1999). Manning and Beck (2011) further highlight these methodological drawbacks and emphasize the negative impact of this research on persons who stutter. Additional research and clinical experience support the infrequent co-occurrence of SAD and stuttering and stigmatizing impact of inaccurately labeling persons who stutter with anxiety (Craig, Hancock, Tran, & Craig, 2003; Hinshaw & Stier, 2008; Manning & Beck 2011).

Persons with SAD exhibit a fearful or anxious response to social situations that is “out of proportion” to those situations (APA; 2013b). The same is required for persons who stutter if a SAD diagnosis is made: the fear or anxiety in response to social situations must be either “unrelated” to stuttering or “out of proportion to what would normally be felt” for a person who stutters (APA; 2013b). Despite the reported incidence of heightened fear or anxiety in persons who stutter, we cannot make conclusions regarding the magnitude of their response to social situations without first discussing what would ‘normally be felt’ in typically fluent, non-anxious adults.

### *Evaluating the World Around Us*

In our daily lives humans encounter numerous social and non-social situations to which we must respond appropriately or risk social stigma or ostracism. These situations

can be positive, negative, or ambiguous (*See Appendix*). The number and variety of situations we encounter require constant information processing, judgment making, and problem solving. Although we would like to think that we are logical beings who can interpret these situations with ease, research shows that despite being equipped with cognitive processes for interpreting new and incoming information, non-anxious people do not form generalizations in ways that statistics or logic would suggest. Instead, individuals make intuitive judgments about situations in their daily lives based on experience, and the way in which they retrieve information is heavily dependent upon the salient features they encounter (Mayer, 1983; Tversky & Kahneman, 1974). Herbert Simon (1956) originally introduced the concept of heuristics, a mechanism for decision-making where the best solutions to problems of judgment are often ‘good enough’ rather than the ‘best imaginable solutions’ because perfection may not be possible or worth the additional demand on memory or processing time.

Although Simon’s intention was that heuristics, or cognitive biases, are often successful tools or ‘short cuts’ for problem solving, research shows that heuristics can lead to errors in judgment, even for the most mundane problems (Schaller, Simpson, & Kenrick, 2006; Tversky & Kahneman, 1973). For example, in a study by Tversky and Kahneman (1973), adults judged whether the letter “r” appeared most often in the first or third position of a word in the English language. Although “r” appears more frequently in the third position, participants estimated that the letter “r” appeared more frequently in the initial position of a word – an incorrect estimation that Tversky and Kahneman (1973) attributed to the increased ease of recalling words that start with the letter “r” rather than words with “r” as the third letter. This study also highlights one of the difficulties in

studying judgment and problem solving – because these cognitive processes occur internally, they can only be inferred indirectly from observed behaviors (i.e., hypothesizing ‘ease of recall’ or a limitation of memory to explain the overestimation that the letter “r” occurs more often in the initial versus third position of a word). Another example of an error-driven cognitive bias is the “dud-alternative effect” proposed by Windschitl and Chambers (2004), where the addition of an implausible alternative – a ‘dud’ in a horse race – increases the judged likelihood that a good alternative will win. Additional cognitive biases include the false consensus effect, where a person overestimates the extent to which others agree with their own beliefs; the confirmation bias, in which a person favors information in agreement with previous knowledge or experience; and hindsight bias, the judgment that an event was predictable after its occurrence (Schaller et al., 2006).

Although the biases mentioned above primarily apply to nonsocial situations, individuals also utilize shortcuts within social situations. Howell and Shepperd (2011) demonstrated the correspondence bias, or the tendency for people to make internal judgments of character as opposed to situational judgments of an individual’s behavior, in a classroom-based demonstration. Students attributed an actor’s action of renting an odd or embarrassing video to the actor’s disposition, whereas they attributed situational factors (i.e., a class assignment) when they were to rent the odd or embarrassing video (Howell & Shepperd, 2011). Similarly, the ‘fundamental attribution error,’ suggests that individuals infer that personality, rather than past experience, has a stronger effect on the behavior of others (Amabile, Ross, & Steinmetz, 1977). Additional shortcuts in social situations include using facial appearance or attractiveness to determine immediate and

implicit judgments of trustworthiness for decision-making tasks (Van't Wout & Sanfey 2008). In Van't Wout and Sanfey's (2008) study, college students were more likely to invest money in individuals who were rated as more attractive and therefore trustworthy.

The accuracy of judgments within social situations is paramount, as social decision-making drives professional and personal relationships. Better judgment or decision-making within social contexts can lead to better social predictions or behavioral outcomes, so ideally the cognitive biases and heuristics individuals use in daily situations adhere to Simon's (1956) 'good enough' policy.

#### *Evaluating the World Around Us: What Goes Wrong in SAD?*

In persons with SAD, cognitive biases often lead to inaccurate evaluations of social events and responses that are 'out of proportion' to what would normally be felt. This results in erroneous decision-making within social situations and the perpetuation of content-specific anxiety. What cognitive biases might lead to these inaccurate evaluations of social events?

Heinrichs and Hoffman (2001) suggest four underlying mechanisms in SAD: faulty attention, inaccurate memory, interpretation bias, and judgment bias. These cognitive biases not only influence the way socially anxious individuals process social information as threatening, but also are causally implicated in SAD based on their response to treatment (Amir & Bomyea, 2010; Taylor & Alden, 2009). That is, these biases are amenable to treatment, thereby reducing the threat perception of social information and social anxiety. Recent research (described below) suggests that some of

these same mechanisms may be present in stuttering, which would make them especially relevant in stuttering treatment, which in turn might help to reduce social ostracism and stigma in persons who stutter.

### *Faulty Attention*

Persons with SAD exhibit attentional biases toward threatening stimuli; that is, they attend more readily to socially threatening stimuli compared to other types of information (Amir & Bomyea, 2010). This bias toward threatening information has been observed in both SAD and stuttering populations using a modified Stroop task, where both groups named the color of socially threatening words (e.g., *failure*) significantly slower than neutral words (e.g., *session*) compared to typical controls (Amir, Freshman, & Foa, 2002; Hennessey, Dourado, & Beilby, 2014; Henrichs & Hoffman, 2001; Hope, Rapee, Heimberg, & Dombeck, 1990). Attention bias has not been studied in stuttering using alternative methodologies. In SAD, however, attention bias for threatening stimuli has also been observed through probe detection tasks and face-in-the-crowd tasks (Amir, Elias, Klumpp, & Preworski, 2003; Gilboa-Schechtman, Foa, & Amir, 1999; Musa, Lépine, Clark, Mansell, & Ehlers, 2003).

Importantly, faulty attention appears amenable to treatment, as socially anxious individuals demonstrate decreased attention to threatening stimuli post treatment (Tobon, Ouiment, & Dozois, 2011). Socially anxious individuals demonstrated decreased attention to socially threatening stimuli during in the probe detection task following cognitive behavioral therapy (CBT) (Pishyar, Harris, & Menzies, 2008).

### *Inaccurate Memory*

Faulty memory also contributes to increased anxiety in persons with SAD, as individuals with SAD encode and recall socially threatening information differently from other types of information (Amir, Coles, Brigidi, & Foa, 2001; Ledley & Heimberg 2006). More specifically, Amir, Foa and Coles (2000) found that individuals with SAD demonstrate an implicit or automatic memory bias for socially threatening sentences. Similar studies have used social and nonsocial word categories or facial expressions of positive and negative emotions with findings supporting a memory bias toward socially threatening information in individuals with SAD (Amir, Bower, Briks, & Freshman, 2003; Amir et al., 2001). Although these findings indicate unique encoding of socially threatening information, few studies have been replicated to verify the impact of a memory bias on the presentation of SAD (Amir & Bomyea, 2010) and no research was found addressing memory bias for socially threatening information in stuttering. Clinical experience, however, provides anecdotal information that PWS may recall socially threatening information differently than other types of social or nonsocial information.

### *Interpretation Bias*

Recall that social situations can be positive, negative, or ambiguous (*See Appendix*). To receive a diagnosis of SAD, an individual's fear or anxiety in response to a variety of social situations must be out of proportion to the actual situation (APA; 2013b). "Out of proportion" can be defined in different ways. For example, a socially anxious individual might misinterpret ambiguous events as threatening (Amir, Foa, & Coles, 1998). This particular interpretation bias has been observed in SAD using a variety of methodologies including written social scenarios, video vignettes, and photos representing neutral, positive, and negative emotions or social events (Amir, Beard, &

Prezeworski, 2005; Stopa & Clark, 2000; Richards et al., 2002; Voncken, Bögels, & deVries 2003). Individuals with SAD also exhibit interpretation bias for unambiguous situations. When compared to non-anxious controls, socially anxious individuals interpret positive and negative social events more negatively (Alden, Taylor, Mellings, & Laposa, 2008; Voncken et al., 2003) or even catastrophically (Stopa & Clark 2000).

In short, socially anxious individuals misinterpret social situations in the direction of being more negative than the situation indicates. They also identify ambiguous events as threatening.

### *Judgment Bias*

Judgment bias is another contributing factor to the ‘out of proportion’ anxiety toward social situations seen in persons with SAD. Judgment bias occurs when persons overestimate the *probability* that a negative event will occur, and exaggerate the negative consequences or *cost* should the event occur (Foa, Franklin, Perry, & Herbert, 1996). Individuals with SAD demonstrate higher estimates of probability and cost to social threats (Butler & Mathews, 1983; Lucock & Salkovskis 1988). Voncken et al. (2003) quantified judgment bias by calculating a “threat score” (multiplying ratings of perceived likelihood and perceived cost of a negative event) and reported an increased estimate of threat for different types of social events in persons with SAD compared to non-anxious controls. Judgment bias has been a target of treatment in SAD, and decreased judgment bias has been documented following safety behavior reduction and exposure therapy (Taylor & Alden, 2010) and CBT (Moscovitch et al., 2012).

To our knowledge neither interpretation nor judgment bias have been studied in persons who stutter. We chose to study judgment bias in persons who stutter for two reasons. First, if PWS exhibit SAD, knowledge of the underlying mechanisms that drive SAD would be useful for theories of stuttering. Second, because treating judgment bias leads to positive treatment outcomes in persons with SAD, if PWS exhibit judgment bias then new treatment options may be available to them.

### *The present study*

If persons who stutter exhibit characteristics similar to those observed in social anxiety disorder – namely, fear of negative evaluation and trait anxiety – they may overestimate *probability* and *cost* for social situations as evidenced by an increased threat score for social situations compared to nonsocial situations. They may overestimate *probability* for negative social events more than negative nonsocial events when compared to age- and gender-matched typically fluent controls. They should also overestimate *cost* for ambiguous and negative social events (Carleton, Collimore, & Asmundson, 2010). This overestimation of probability and cost of social versus nonsocial situations would represent a reaction that is ‘out of proportion’ to the severity of the situation.

### *Research Questions*

1. Is the threat of social situations, relative to non-social situations, greater for PWS than NPWS?
2. Do group differences vary by type of social situation (positive, ambiguous, mildly negative, and profoundly negative situations)?

## Methods

### *Participants*

Fifty adults (12 women) who identified as persons who stutter (PWS) and forty-nine age- and gender-matched adult controls who did not stutter (NPWS) participated in the study. The PWS group ranged in age from 17 to 70 years, and NPWS controls were age-matched to the PWS group within six years of age. Both the PWS and NPWS groups represented a variety of educational and occupational backgrounds. A speech-language pathologist diagnosed 56% of the PWS group with stuttering using standardized assessment procedures. The remaining 44% of PWS was recruited from Washington, D.C. area self-help groups (16%) and a national self-help conference for stuttering (26%), and self-reported a communication diagnosis of stuttering. These self-reports were verified by an SLP's informal observation. PWS participants self-reported attending treatment for 0-3 years (26%), 3-5 years (10%), 6-10 years (10%), greater than 10 years (10%), or not at all (14%). Of those who participated in treatment, 26% reported using Fluency Shaping, 11% reported using Stuttering Modification, 20% reported experience with a combination of techniques, and 43% did not specify a treatment type. All participants in both groups reported the absence of general anxiety disorder, psychiatric disorders, or any speech or language disorder other than stuttering.

Participants were recruited from Speech and Hearing Clinics in Perth, Australia and Washington, D.C.; National Stuttering Association Chapters local to the Washington, D.C. area; the National Stuttering Association Annual Conference in Washington, D.C.;

The SpeakEasy Association of Australia; and snowball sampling of PWS and NPWS participants. The majority (90%) of participants were not currently receiving treatment.

### *Materials*

All participants completed the *Fear of Negative Evaluation* (FNE; Watson & Friend, 1969), the *State-Trait Anxiety Inventory* (STAI-T; Spielberger et al., 1983) in order to characterize the sample of PWS and NPWS. Each participant also completed the *Interpretation and Judgmental Questionnaire* (IJQ; Voncken et al., 2003).

The *Fear of Negative Evaluation* (FNE; Watson & Friend, 1969) is a 30-item questionnaire that measures respondent's concern for perceptions of other people in social situations. Respondents answered true or false for statements such as "I feel very upset when I commit some social error" and "Other people's opinions of me do not bother me." Scores are determined by assigning a value of 1 to each item answered which matches the key (17 true items) and reporting a sum ranging from 0 to 30. Watson and Friend (1969) reported that the mean score was 13.97 for males and 16.1 for females, and that individuals with a low FNE score (9 or below) are affected more by the chance of gaining approval whereas individuals with a high FNE (18 or higher) score are affected more by the possibility of disapproval, or fear of negative evaluation. The FNE has a high level of internal consistency with KR-20 values between .92 and .94 (Leary, 1991). The Kuder-Richardson coefficient is a recognized measure of internal consistency for items with a dichotomous scale (Cortina, 1993).

The *State-Trait Anxiety Inventory* (STAI-T; Spielberger et al., 1983) is a standardized self-assessment of how respondents generally feel about themselves. Participants rated 20 self-descriptions such as “I am content” on a scale from 1 (almost never) to 4 (almost always), with higher scores indicating the absence of anxiety, and “I lack self-confidence” on the same scale, with higher scores indicating the presence of anxiety. Participant responses for anxiety-absent items are reversed and then summed with the anxiety-present responses, resulting in a trend for higher sums to reflect greater trait anxiety. Spielberger et al. (1983) reported the average scores for typical males (mean = 34.89; SD: 9.19), typical females (mean = 34.79; SD: 9.22), and male neuropsychiatric patients (46.62; SD: 12.41) and good correlation with other widely used anxiety scales such as the *Beck Anxiety Inventory*.

The *Interpretation and Judgmental Questionnaire* (IJQ; Voncken et al., 2003) characterizes interpretation and judgment bias of 24 situations ranging from profoundly negative (e.g., “A friend tells you that a colleague dislikes you.”), mildly negative (e.g., “The newly introduced person doesn’t say anything to you.”), ambiguous (e.g., “Somebody you know looks in your direction.”), to positive (e.g., “Someone makes a compliment about your looks.”). See Appendix for additional examples of each situation type. Part I presented the participants with 20 social situations (e.g. “You are with a group of people. When you start talking, nobody looks at you.) and four non-social situations (e.g. “There is a lot of money debited from your bank account. However, you have never given this order.”). Participants were asked to respond to free-write questions associated with both social situations (i.e. “Why is nobody looking at you?”) and non-

social situations (i.e. “What do you think will happen to your money?”). Data from this section are not reported here.

In Part II, participants were presented with the same 24 situations and four possible interpretations specific to each situation. Each situation contained one profoundly negative, mildly negative, neutral, and positive interpretation. Participants were asked to read the situation and then rank the four possible interpretations from the *most probable to least probable*. Participants then used two visual-analog (VA) scales to rate the *probability* or likelihood of the worst-case scenario and the *cost* or severity of consequence for themselves in the event of the worst-case scenario. To rate probability, participants read each scenario and then placed a vertical line on the VA scale anchored from 0% to 100%. To rate cost, participants read each scenario and then placed a vertical line on the VA scale anchored from “not bad at all” to “very bad.” For example, participants used a VA scale to indicate “How probable do you think it is that they *really* don’t want you in the group because they don’t think you are interesting?” and “How bad would it be for you if they *really* don’t want you in the group because they don’t think you are interesting?” VA ratings were measured in millimeters from the left anchor (i.e., 0% or “not bad at all”) using a ruler. VA ratings for *probability* and *cost* were combined and weighted to create a *perceived threat* score for each type of situation (Voncken et al., 2003). Only the results of Part II of the IJQ are reported here.

### *Procedures*

This study was approved by the IRBs at Curtin University and The George Washington University. After reviewing an information sheet about the study and

verbally consenting to participate in the study, all participants completed a brief individual interview with an investigator who documented the participant's demographic information and verified inclusion in the PWS or NPWS group. Participants then completed the following three paper-and-pencil questionnaires in randomized order: the *Fear of Negative Evaluation* (FNE; Watson & Friend, 1969), the *State-Trait Anxiety Inventory* (STAI-T; Spielberger et al., 1983), and the *Interpretation and Judgmental Questionnaire* (IJQ; Voncken et al., 2003). Participants were instructed to ask the investigator if they had questions about the content of or instructions for the questionnaires. Following completion of the three questionnaires, participants were thanked for their participation and debriefed on the research questions investigated in the study.

#### *Data Coding*

A trained research assistant recorded demographic information and participant responses for the *FNE*, *STAI-T*, and *IJQ* in a spreadsheet. Response entry and scoring of the *FNE* and *STAI-T* followed the original test instructions. Calculation of scoring was automated in the spreadsheet; once the raw data were entered, the program calculated the total score for both instruments. A second trained research assistant verified data entry and scoring for twenty percent of the *FNE* and *STAI-T* data with the original paper copies and found 90% agreement for *FNE* scores and 95% agreement for *STAI-T* scores. Disagreement for all scores was noted as one error per participant scores in data entry and all errors were fixed in the data sheet by the reliability judge.

The *IJQ Part II* judgment responses for *probability* and *cost* were recorded by measuring both the distance from visual analog (VA) scale's left anchor to the participant's response and the length of the VA scale. Measurements were made using a millimeter ruler to create a percentage for *probability* and *cost* values. A *threat score* was calculated for each question answered by the participant by multiplying and creating a percentage from the *probability* and *cost* values per the original *IJQ* scoring instructions (Voncken et al., 2003). A second coder verified the *probability* and *cost* measurements and found 96% reliability for judgment VA scores.

The *IJQ* includes 20 social situations and four nonsocial situations. We considered the sum of the threat scores for the four nonsocial situations to be a baseline score. We also calculated a total threat score for social situations by summing the social threat scores for each participant. To determine if PWS's scores were 'out of proportion' compared to those of NPWS, we calculated a *threat ratio* by dividing the social *threat score* by the nonsocial *threat score*. A significantly larger ratio between social and nonsocial threat between PWS and NPWS groups would then reflect an 'out of proportion' response to social situations for PWS participants.

## Results

An *a priori* power analysis (assuming a medium effect size,  $\alpha = .05$ , power = .95), yielded a total sample size of  $n = 94$  ( $n = 47$  per group) (Faul, Erdfelder, Lang, & Buchner, 2007). Based on this analysis and the final sample size (50 PWS, 49 NPWS), the current power should identify a medium-sized difference between groups. All statistical analyses were performed using SPSS.

Visual inspection of the FNE, STAI, and threat ratio scores revealed non-normal distributions for each of these variables for both groups. Therefore, we report medians and interquartile ranges, and results from non-parametric statistics. Results for the present study are summarized in Table 1.

A Mann-Whitney  $U$  test revealed no significant differences in STAI scores between groups ( $U = 1.22, p = .22$ ). A Mann-Whitney  $U$  test revealed significant differences in FNE between the PWS and NPWS groups ( $U = 2.69, p = .007$ ). The PWS had higher median FNE scores.

### *Between Group Findings for IJQ threat ratio*

Results for IJQ threat ratio are in Figure 2. A Mann-Whitney  $U$  test revealed no significant differences in the distribution of threat ratio scores between PWS ( $Mdn = 0.90$ ) and NPWS ( $Mdn = 0.68$ ) groups ( $U = 1.61, p = .106$ ).

We were interested in evaluating threat ratio scores in relation to *FNE* scores. Visual inspection of the PWS group's *FNE* scores revealed a significant number of

participants whose scores exceeded 18, the suggested cut-off score for high *FNE* (Watson & Friend, 1969). We therefore split the PWS group into high *FNE* ( $n = 22$ ) and low *FNE* ( $n = 26$ ) groups and compared these two groups to the NPWS group ( $n = 44$ ). Five NPWS and 1 PWS had nonsocial threat scores of zero, making a ratio impossible to calculate.

Figure 3 presents the results for threat ratio between the two PWS groups. A Mann-Whitney test indicated that the distribution of threat ratio scores was significantly different between PWS high *FNE* and PWS low *FNE* ( $U = 2.15, p = .031$ ). PWS with high *FNE* reported larger threat ratios than PWS with low *FNE*.

#### *Between Group Findings for IJQ threat ratio by situation type*

Median threat ratio scores for different types of situations for PWS with high *FNE*, PWS with low *FNE*, and NPWS are summarized in Table 2. Figures 4-6 represent between group comparisons by situation type.

An independent samples Kruskal-Wallis test was conducted to evaluate differences among PWS with high *FNE*, PWS with low *FNE*, and NPWS groups on distribution of threat ratio for ambiguous, profoundly negative, mildly negative, and positive situation types. There were no significant differences in threat ratio scores between groups for ambiguous ( $H(2) = 5.64, p = .06$ ) or profoundly negative ( $H(2) = 5.30, p = .071$ ) situations. These findings suggest that all three groups found ambiguous and profoundly negative social situations equally threatening. There were significant differences for mildly negative ( $H(2) = 12.28, p = .002$ ) and positive ( $H(2) = 12.82, p =$

.002) situations. For mildly negative social situations, PWS with high FNE report the highest threat ratio scores, followed by the NPWS group and the PWS with low FNE group. This same pattern holds for threat ratio scores in response to positive social situations, with the highest threat ratios in the PWS with high FNE group, followed by the NPWS group and PWS with low FNE group.

## Discussion

Cognitive biases exhibited in persons with SAD are noted as effective treatment targets in the reduction of characteristics perpetuating social anxiety (Moscovitch et al., 2012; Pishyar, Harris, & Menzies, 2008; Taylor & Alden, 2010; Tobon, Ouimet, & Dozois, 2011). Although stuttering and SAD share characteristics including fear of negative evaluation and trait anxiety, (Amir & Bomyea; Craig & Tran, 2013; Iverach et al., 2009; Iverach & Rapee 2013; Mahr & Torosian, 1999; Messenger, Onslow, Packman, & Menzies, 2004), cognitive biases have only begun to be studied in persons who stutter. Further, recent changes in the *DSM-5* criteria for SAD propose that persons who stutter must exhibit anxiety or fear for social situations that is ‘out of proportion to what would normally be felt’ (APA, 2013b).

Our findings suggest that not all persons who stutter exhibit a judgment bias for social situations. Only PWS with high FNE reported threat ratios that were significantly higher than those reported by our NPWS sample, and only for mildly negative and positive situations. This suggests that high fear of negative evaluation, as opposed to a diagnosis of stuttering, may be a contributing factor for fear or anxiety that is “out of proportion to what would normally be felt” (APA, 2013b). Because the responses of our PWS with low FNE group mirrored those of non-anxious, typically fluent adults, judgment bias does not appear to be a perpetuating factor of fear or anxiety in stuttering. Interestingly, the three groups (PWS high FNE, PWS low FNE, and NPWS) did not differ in threat ratio scores for ambiguous and profoundly negative social situations,

suggesting that all three of the groups, regardless of FNE score, find these types of social situations high in perceived threat.

### *Implications for stuttering treatment*

The present study highlights the importance of measuring fear of negative evaluation in persons who stutter. PWS with high FNE report significantly higher threat ratio scores for mildly negative and positive situations than PWS with low FNE or NPWS, suggesting that fear of negative evaluation may be a determining factor for how PWS approach different types of situations.

All PWS, regardless of FNE status, consider ambiguous and profoundly negative situations equally threatening, which is contrast with many theories of social anxiety (Carleton et al., 2010; Foa et al., 1996). This calls into question the notion of situational treatment hierarchies. Adult treatment programs often structure practice within situations of increasing difficulty. Our findings suggest that persons who stutter with high and low FNE as well as persons who do not stutter estimate similar probability and cost values for ambiguous and profoundly negative social situations, and because PWS do not overestimate probability and cost for profoundly negative situations there may not be a benefit in practicing in those situations. Interestingly, it is in the supposedly less threatening scenarios (i.e., mildly negative and positive) that we see differences in perceived threat between groups. PWS with high FNE interpret these types of scenarios more negatively than PWS with low FNE and NPWS do. This suggests that PWS with

high FNE may exhibit interpretation biases (Voncken et al., 2003); an intriguing finding that should be explored in more depth.

Our findings add to the current literature supporting the positive management of stuttering. Manning (2010, p. 589) states that effective therapy is positive therapy that is built on successes. If persons who stutter evaluate different types of social situations in the same way as non-anxious, typically fluent individuals, therapy should not highlight unnecessarily challenging situations. The results of our sample also support current research on different kinds of treatment, such as acceptance and commitment therapy, which promotes awareness and understanding of the context rather than on direct changes to the content of thought (Beilby, Byrnes, & Yaruss, 2012).

#### *Revisiting the relationship between stuttering and social anxiety*

A recent meta-analysis by Craig and Tran (2014) suggests that higher levels of trait and social anxiety predominate in persons who stutter compared to a normal distribution of anxiety. Our findings provide a partial replication, in that some of our PWS participants exhibited high FNE scores, similar to those reported by Craig and Tran. But half of our PWS group did *not* exhibit high FNE scores. The majority (90%) of participants in the present study reported that they were not treatment-seeking, and many were recruited from self-help organizations in the U.S. and Australia. Individuals participating in protective activities, such as social support networks, are likely to increase psychological resilience and improve quality of life (Boyle, 2015). Additional factors contributing to resilience in stuttering include increased self-efficacy and healthy

social functioning, and these factors are related to lower levels of psychopathology (Craig, Blumgart, & Tran, 2011). Increased self-efficacy, social support, and healthy social functioning through participation in self-help groups may have influenced the responses of our participants who stutter. Alternatively, this may explain the increase in self-reported fear of negative evaluation and trait anxiety by treatment-seeking adults who stutter (Iverach, 2009).

In short, our sample of non-treatment-seeking persons who stutter did not exhibit trait anxiety, a common characteristic of SAD, when asked to indicate how they *usually* feel. When presented with specific situations in the *IJQ* (IJQ; Voncken et al., 2003), the PWS participants with high fear of negative evaluation demonstrated exaggerated overall probability and cost estimates (i.e., threat ratio) when compared to PWS participants with low fear of negative evaluation. The PWS with high FNE also reported significantly exaggerated probability and cost estimates (threat ratios) for mildly negative and positive events but not for ambiguous or profoundly negative events. This suggests that some, but not all PWS exhibit an ‘out of proportion’ reaction for social situations.

#### *Final Remarks*

The findings of the present study indicate that not all persons who stutter exhibit an ‘out of proportion’ response to social situations. The magnitude of the responses varies as a function of FNE. Persons who stutter with high fear of negative evaluation report significantly higher threat scores for certain types of social situations compared to PWS with low fear of negative evaluation and when compared to NPWS controls.

Future research should distinguish PWS with high and low FNE in order to accurately characterize each of these groups of persons who stutter. Research questions should address if there are any differences between these groups with respect to other cognitive biases or with respect to their general level of approach for different social situations. Investigating cognitive biases exhibited by persons who stutter, such as faulty attention (Hennessey et al., 2014) or interpretation bias, may be useful in the treatment of persons who stutter.

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## Appendix

Examples of social and nonsocial situations in the *Interpretation and Judgmental Questionnaire* (IJQ; Voncken et al., 2003).

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Situation Type	Example
Ambiguous Nonsocial	You receive a letter, which states 'URGENT' on the envelope.
Ambiguous Social	You are with a group of people. When you start talking, nobody looks at you.
Positive Social	You gave a talk to a group of people. When you are finished, they applaud.
Mildly Negative Social	You are introduced to a friend of one of your best friends. This new person does not say anything to you.
Profoundly Negative Social	You have an argument with a good friend about a topic that you care about. This friend gets angry with you and says that you are wrong.

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Table 1: Range and median (IQR) for PWS and NPWS groups for *FNE* and *STAI-T* (n = 49), *IJQ* threat ratio (n = 48) scores.

Measure	Group	
	PWS	NPWS
FNE		
Range	0-41	1-28
Median (IQR)	17.0 (15.5)	7.0 (13)
STAI-T		
Range	3-69	21-54
Median (IQR)	42.0 (16.0)	38.0 (17.0)
IJQ threat		
Social threat	6.6 (15.0)	5.8 (7.8)
Nonsocial threat	7.73 (12.3)	12.8 (25.9)
Threat ratio	.90 (1.48)	0.68 (0.70)

Table 2: Median (IQR) threat ratio score reported for each situation type for PWS and NPWS participants.

Situation Type	Group		
	PWS High <i>FNE</i>	PWS Low <i>FNE</i>	NPWS
Ambiguous	1.50 (2.58)	0.87 (0.91)	0.69 (0.79)
Profoundly Negative	1.18 (2.56)	0.75 (1.38)	0.77 (0.95)
Mildly Negative	1.01 (1.91)	0.40 (1.01)	0.51 (0.61)
Positive	0.79 (2.03)	0.29 (0.63)	0.40 (0.53)
Total Threat Ratio	1.06 (2.16)	.75 (1.00)	5.88 (7.88)

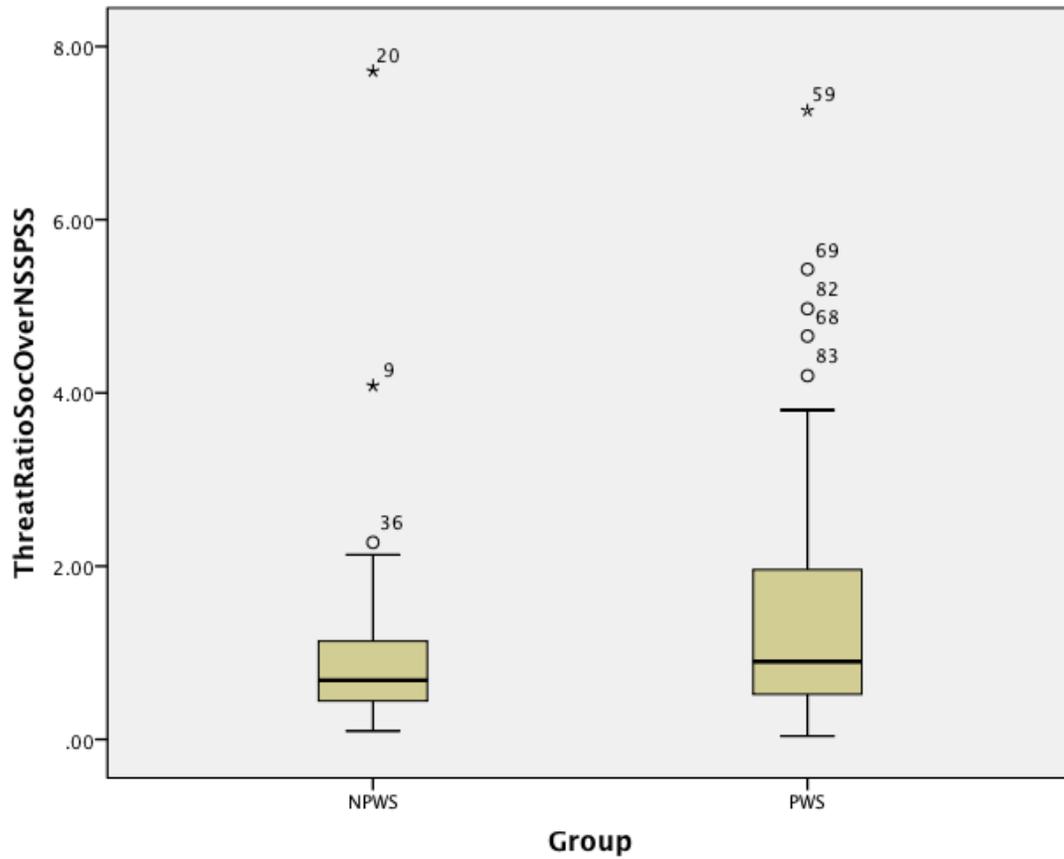


Figure 1: Distribution of threat ratio for social situations and nonsocial situations for NPWS and PWS groups.

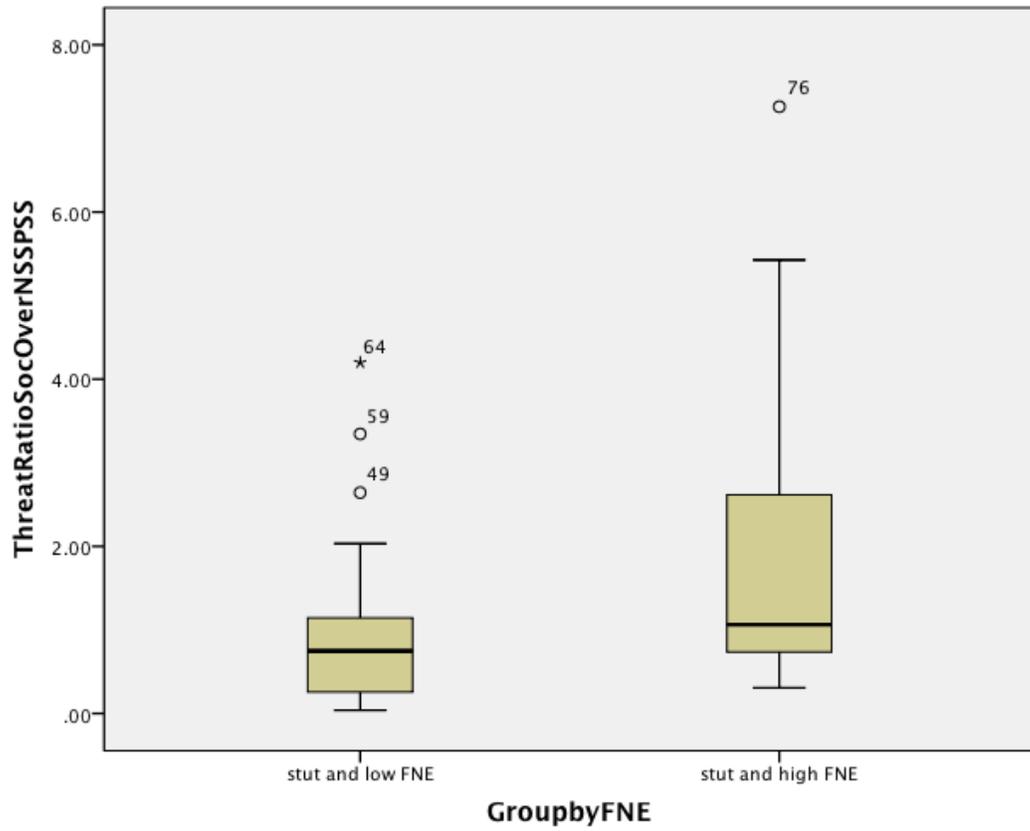


Figure 2: Distribution of threat ratio for PWS low FNE and PWS high FNE groups.

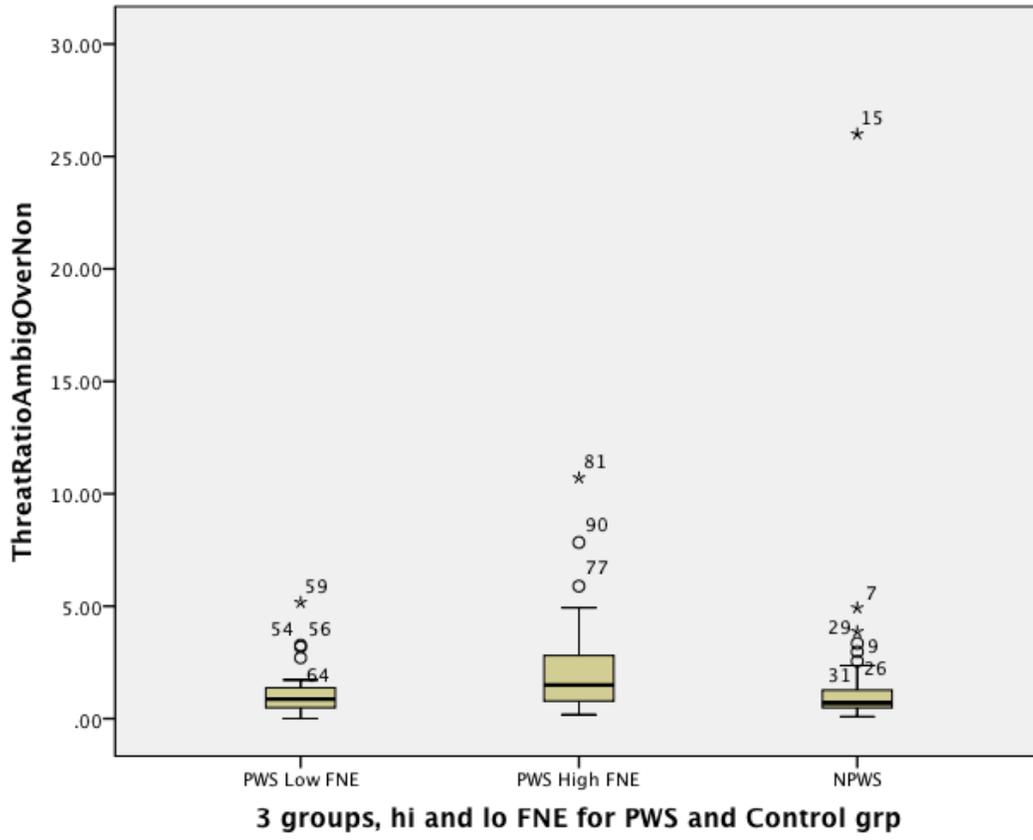


Figure 3: Distribution of threat ratio for ambiguous situations for PWS with low FNE, PWS with high FNE, and NPWS groups.

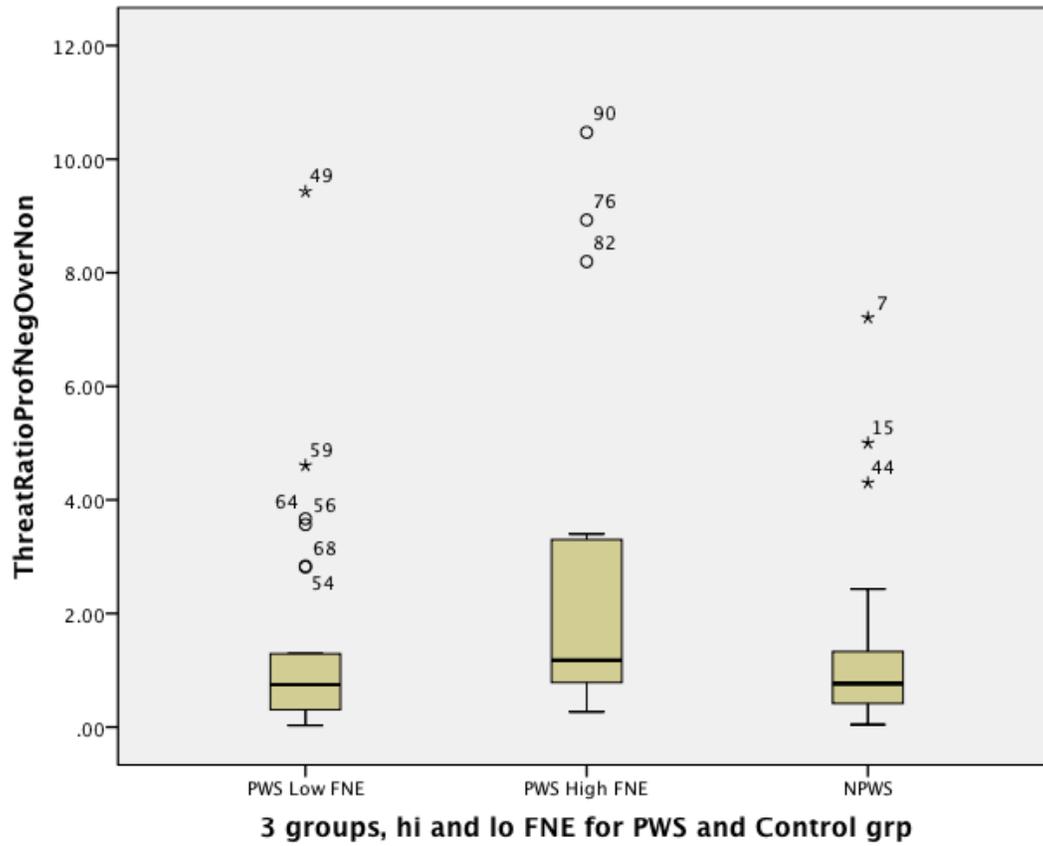


Figure 4: Distribution of threat ratio for profoundly negative situations for PWS with low FNE, PWS with high FNE, and NPWS groups.

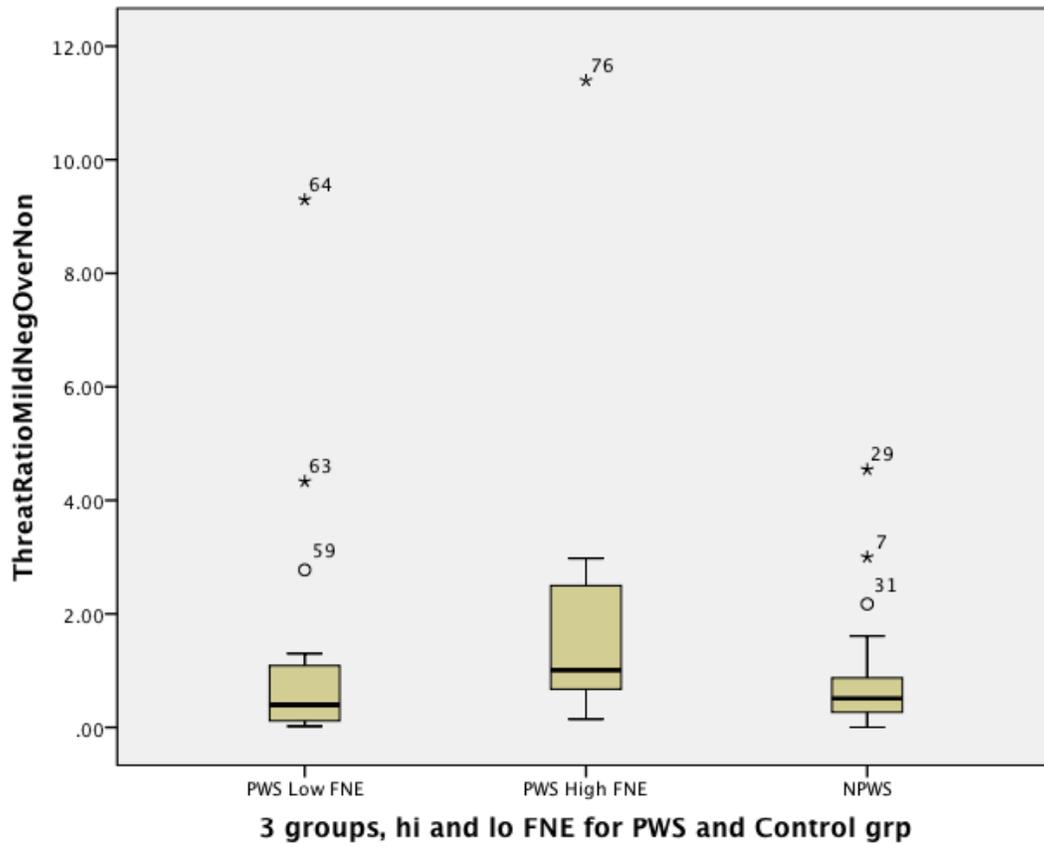


Figure 5: Distribution of threat ratio for mildly negative situations for PWS with low FNE, PWS with high FNE, and NPWS groups.

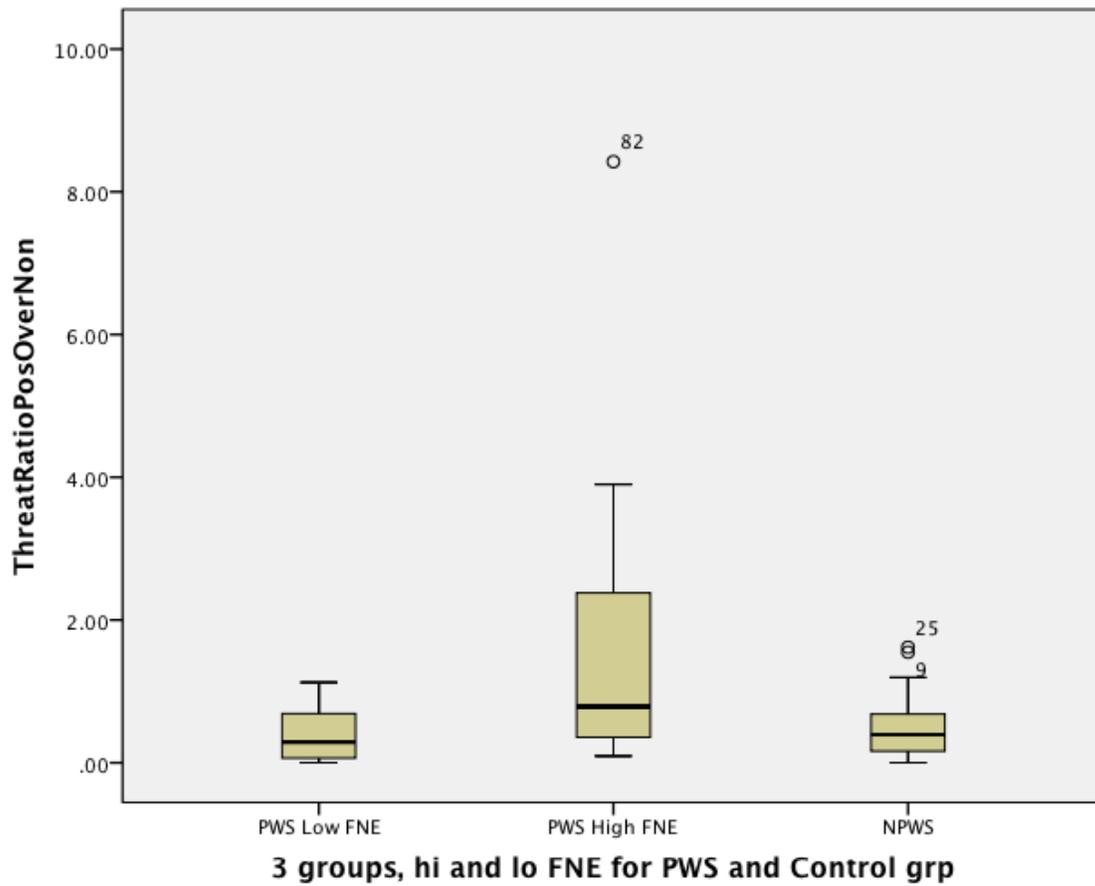


Figure 6: Distribution of threat ratio for positive situations for PWS with low FNE, PWS with high FNE, and NPWS groups.