Current Psychology (2023) 42:9249–9260
https://doi.org/10.1007/s12144-021-02238-w

# The influence of anxiety sensitivity, & personality on social anxiety symptoms

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Accepted: 15 August 2021 / Published online: 19 August 2021


**Abstract**
A growing research base supports the separate and distinct role of Anxiety Sensitivity (AS) in the etiology of anxiety disorders. AS is a belief that experiencing anxiety will cause negative consequences cognitively, psychologically, and physically. There is an interest in understanding how well transdiagnostic factors such as Anxiety Sensitivity can identify different anxiety disorders. This study examined the role of anxiety sensitivity as measured by the Anxiety Sensitivity Index- 3 (ASI-3; Taylor et al., 2007) in relation to social anxiety symptoms using two different measures: Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1989) and the Brief Fear of Negative Evaluation (BFNE, Leary, 1983). One hundred ninety-eight participants completed self-report measures assessing anxiety sensitivity, trait anxiety, positive and negative affect and social anxiety symptoms. Regression analyses results showed that the ASI-3 *Social Concerns* factor significantly estimated both BFNE and SIAS symptoms. Trait anxiety and positive and negative affect were differentially effective in estimating BFNE and SIAS symptoms. Seven variables accounted for 50% of the variance in self-reported social anxiety symptoms. These findings provide insight into the etiology of Social Anxiety Disorder (SAD) and support the transdiagnostic value and incremental validity of the ASI-3 in predicting social anxiety symptoms.

**Keywords** Anxiety sensitivity · Anxiety sensitivity index-3 (ASI-3) · Social anxiety · Social interaction anxiety scale (SIAS) · Brief fear of negative evaluation (BFNE) · Positive and negative affect

## The Influence of Anxiety Sensitivity, & Personality on Social Anxiety Disorder

For some people, interacting with others comes easily. However, for others, social interactions elicit extreme physiological and psychological arousal and fear that can be crippling. Daily tasks such as grocery shopping, talking on the phone, or even eating in public are avoided because they bring arousal and fear. As a result, the individual may not apply for a job, buy necessary food and supplies, and support themselves. While these descriptions may seem exaggerated, for those diagnosed with Social Anxiety Disorder, it is their reality. To help individuals go through their daily lives with less fear and anxiety related to social interactions, it is important for researchers to understand the intensity and complexity of emotions these individuals experience and identify some potential causal elements of Social Anxiety Disorder.

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## Social Anxiety Disorder: Definitions, Prevalence, and Incidence

Social Anxiety Disorder (SAD) is the persistent fear of social and/or performance situations (DSM-5; American Psychiatric Association, 2013). The National Institute of Mental Health estimates that lifetime prevalence in the United States is about 12.1%. Kessler et al. (2012) estimates the lifetime prevalence for Social Anxiety Disorder to be 6.4%. Lifetime prevalence rates are higher for individuals between the ages of 18 and 64 (Total, 13.0%; Female, 14.2%: Male, 11.8%) (Kessler et al., 2012). Kessler et al. (2012) also assert that the age of onset for Social Anxiety Disorder is between 15 to 17 years of age. While some researchers suggest that SAD is under-reported among adults (Kessler et al., 2005; Kessler et al., 2012), these prevalence rates are still higher than lifetime prevalence rates for other anxiety and mood disorders such as generalized anxiety disorder, Bipolar I-II disorders, panic disorder, and

posttraumatic stress disorder (Kessler et al., 2005). Individuals diagnosed with SAD deal with the disorder for most of their life (National Institute of Mental Health, 2017). For individuals with SAD, the persistent fear of social and/or performance related situations leads to anxiety that can cripple daily activities.

The DSM-5 (American Psychiatric Association, 2013) defined Social Anxiety Disorder (SAD) as "(a). A persistent fear of one or more social or performance situations in which the person is exposed to unfamiliar people or to possible scrutiny by others. The individual fears that he or she will act in a way (or show anxiety symptoms) that will be embarrassing and humiliating. (b). Exposure to the feared situation almost invariably provokes anxiety, which may take the form of a situationally bound or situationally pre-disposed Panic Attack. (c). The person recognizes that this fear is unreasonable or excessive. (d). The feared situations are avoided or else are endured with intense anxiety and distress. (e) The avoidance, anxious anticipation, or distress in the feared social or performance situation(s) interferes significantly with the person's normal routine, occupational (academic) functioning, or social activities or relationships, or there is marked distress about having the phobia. (f) The fear, anxiety, or avoidance is persistent, typically lasting 6 or more months. (g). The fear or avoidance is not due to direct physiological effects of a substance (e.g., drugs, medications) or a general medical condition not better accounted for by another mental disorder" (American Psychiatric Association, 2013, pp. 202–203).

Research has identified two discrete subtypes of Social Anxiety Disorder, generalized social anxiety, and nongeneralized social anxiety (Norton et al., 1997). Generalized social anxiety is a general fear of most social interactions. For example, an individual with generalized social anxiety might avoid using public restrooms, walking into rooms full of people, or eating in front of others because these situations can lead to intense anxiety and/or physical distress. We distinguish nongeneralized social anxiety by the fear and avoidance of one or more specific social interactions. Performance anxiety is an example of nongeneralized social anxiety (e.g., musical performance, giving a speech, playing sports in front of a crowd). Individuals with performance anxiety experience physical and/or emotional distress that is related to performing tasks in front of others rather than just general social interactions.

## How is Social Anxiety Acquired and Maintained?

The most common explanations for why people experience fear of exposure to the scrutiny and potential negative evaluation of others and social anxiety work of evolutionary psychology and cognitive-behavioral models of psychological treatment. The evolutionary approach suggests that fear scrutiny and potential negative evaluation of other people is adaptive for humans. Fearing evaluation from others causes an individual to change their behavior, protecting them from potential social harm (Gilbert, 2001). This suggests that fear of negative evaluation is adaptive in milder forms and beneficial for survival in the social world. From an evolutionary perspective, fear of negative evaluation helps an individual monitor behavior that is socially acceptable and what behavior is potentially going to results in punishment, social exclusion, or ostracism. A person who is insensitive to social cues may be likely to be unresponsive to these signals and be unresponsive to potential punishments. The cognitive-behavioral perspective asserts that fear of negative evaluation emerges and intensifies because the individual develops and maintains a series of distorted cognitions that facilitate emotional dysregulation. Left unchecked, these distorted thoughts lead to fearful thinking and prompt avoidance behaviors. Further, behavioral models of fear acquisition posit the cycle of distorted thinking and avoidance behavior strengthens the individual's negative evaluation of fear. For example, Cook et al. (2019) found that distorted thoughts can predispose someone to fear evaluation, thus exacerbating their social anxiety symptoms. Identifying variables that may predispose an individual to develop social anxiety is an important area for researchers to explore.

## Positive and Negative Affect as Personality Correlates

Positive affect reflects the person's level of positive interaction with the environment. At its highest level, positive affect is defined by enthusiasm, energy, mental alertness, joy, interest, and determination. Low positive affect is evidenced by lethargy and fatigue. Trait positive affect is predisposition related to positive emotional experience and reflects general well-being competence, and effective interpersonal skills. In contrast, negative affect is represented by subjective distress and negative mood states closely associated with fear, anxiety, hostility, scorn, and disgust. Sadness and loneliness are also highly related to negative affect. Trait negative affect is associated with a predisposition toward negative feelings that affect the general ability to think and process information, self-concept, and life perspective.

Positive and negative affect have been linked to the higher order constructs of extraversion (positive affect) and neuroticism (negative affect). Neuroticism and negative affect have been connected to both anxiety and mood disorders (Clark & Watson, 1991a, 1991b; Watson & Clark, 1984) This association between negative affect and neuroticism and anxiety disorders and mood disorders was further supported by Fowles (1994) who found an association with biological motivational systems in animal models. In terms of positive affect and

extraversion, Watson and Clark (1997) and Hermes et al. (2011) consider positive affect and its biological substrate to be the core of extraversion. Watson et al. (1988a) hypothesized that negative affect would be significantly related to anxiety and mood disorders. They found that negative affect was significantly related to any anxiety and mood disorder. In addition, they found low positive affect to be significantly associated with any mood disorder and only social anxiety disorder. Low positive affect and extraversion have been consistently connected to social anxiety (Bienvenu et al., 2001; Bienvenu et al., 2004; Trull & Sher, 1994; Watson & Clark, 1995; Watson et al., 2005). More recently, Kotov et al. (2010) found through meta-analysis that most of the anxiety and mood disorders are defined by higher neuroticism and low levels of extraversion. Given that both positive and negative affect are intrinsically tied to the cores of extraversion and neuroticism they substantively represent these traditional higher order personality constructs.

Research shows that specific personality traits play a large role in explaining the development of social anxiety symptoms. For example, Norton et al. (1997) found that *Extraversion*, *Conscientiousness*, *Openness to Experience* and *Agreeableness* are all negatively correlated with the Social Interaction Anxiety Scale (SIAS) and Social Phobia Scale (SPS), while *Neuroticism* is positively associated with the SIAS and SPS. Norton et al. results showed that levels of *Extraversion* predicted both generalized and nongeneralized social anxiety symptoms, while *Conscientiousness* predicted nongeneralized social anxiety symptoms and *Neuroticism* predicted generalized social anxiety symptoms. In addition, Norton et al. suggest individuals with scores indicative of social anxiety on the SIAS and SPS are more likely to be shy (e.g., behaviorally inhibited), less likely to be comfortable interacting with others, and have a greater predisposition to experiencing negative affect. More recently, Kaplan et al. (2015) assessed the relationship between social anxiety and personality. Their results showed that *Neuroticism* is positively associated with social anxiety symptoms. In addition, Kaplan et al. (2015) found *Extraversion*, *Agreeableness*, and *Openness to Experience* were negatively associated with social anxiety symptoms. Kaplan et al. suggest that high levels of *Openness* may inhibit social anxiety development because the individual is curious and open to novel experiences and may be less likely to avoid situations they fear. Thus, *Openness* may work to break the cycle of fear and avoidance that typifies social anxiety. Both Norton et al. and Kaplan et al. suggest that specific personality traits such as high neuroticism and low extraversion may predispose an individual to developing social anxiety symptoms.

In summary, the current research between positive affect (extraversion) and negative affect (neuroticism) shows that people with high levels of social anxiety symptoms are likely to display lower level of positive affect as well as higher level of negative affect. While the personality traits of neuroticism and extraversion have influenced social anxiety research, anxiety sensitivity has been identified as a transdiagnostic factor that influences the development and maintenance of social anxiety symptoms.

## Anxiety Sensitivity and Social Anxiety Disorder

Anxiety Sensitivity (AS) is an individual difference transdiagnostic variable comprising beliefs that experiencing anxiety causes illness, embarrassment, or additional anxiety (Reiss et al., 1986). The first commonly accepted measure of anxiety sensitivity was the Anxiety Sensitivity Index (ASI) (Reiss et al., 1986). Taylor et al. (2007) developed a version that has improved psychometric properties and proposed that ASI-3 has three lower order factors: *Cognitive Concerns*, *Physical Concerns*, and *Social Concerns*. *Cognitive Concerns* describes an individual's belief that certain cognitive processes (e.g. racing thoughts) would have dire consequences or mean they were going insane. *Physical Concerns* describes an individual's belief that physical symptoms such as rapid heartbeat and hyperventilation will have deadly consequences; one might interpret their racing heartbeat to mean they are having a heart attack. *Social Concerns* refers to a belief that the individual will perform badly in social situations and experience intense criticism and negative evaluation from others. Allan et al. (2014b) expanded this farther by suggesting that not only are there three AS factors, but there are also three different levels of severity: high, moderate, and normative AS.

The relationship between AS and social anxiety is strong. Based on Cohen's (1992) guidelines for analyzing statistical power in social sciences, Norton et al. (1997) and Gore et al. (2002) both found large effect sizes for correlations between SIAS and ASI-1 total scores ($r$ = .56, $r$ = .64, respectively) and SPS and ASI-1 total scores ($r$ = 64, $r$ = .74, respectively). Thibodeau et al. (2012) found a large effect when comparing the ASI-3 total score and SIPS ($\beta$ = 0.73, $t$ = 6.67, $p$ < .01). However, Olthuis et al. (2014) found a medium effect size ($r$ = .43) between the LSAS and ASI-3 total score, with the ASI-3 *Social Concerns* and *Cognitive Concerns* subscales having medium-sized effects with the LSAS (r = .37 and r = .32 respectively). In summary, these studies report robust correlations between social anxiety and AS.

Allan et al. (2014a) investigated the relationship between ASI-3 subscales and psychopathology. They examined the predictive ability of the ASI-3 dimensions for specific disorders. In this study, the Structured Clinical Interview for DSM-IV-TR (SCID) determined all diagnoses. To determine SAD, the Liebowitz Social Anxiety Scale- Clinician Administered (LSAS-CA) was also used. They found that ASI-3 *Physical*

*Concerns* significantly estimated SAD and Panic Disorder (PD). ASI-3 *Social Concerns* also significantly estimated Social Anxiety Disorder. Olthuis et al. (2014) similarly examined the predictive ability of the ASI-3 factors for anxiety and depressive symptoms. Olthuis et al. (2014) found ASI-3 *Cognitive Concerns* significantly estimated both depression and social anxiety symptoms, while ASI-3 *Social Concerns* estimated social anxiety scores. Anxiety and fear about performing in socially acceptable ways in social situations is both a criterion for ASI-3 *Social Concerns* and Social Anxiety Disorder. Past research has explored the relationship between social anxiety and anxiety sensitivity. The findings that high ASI-3 *Social Concerns* is predictive of SAD sheds much light on the predictive utility of anxiety sensitivity.

## Hypotheses

- H1: The Anxiety Sensitivity Index-3 subscales will predict social anxiety symptoms as measured by the BFNE such that higher Anxiety Sensitivity subscales scores will predict higher BFNE scores while controlling for sex, negative affect, positive affect, and trait anxiety.
- H2: The Anxiety Sensitivity Index-3 subscales will predict social anxiety symptoms as measured by the SIAS such that higher Anxiety Sensitivity subscales scores will predict higher SIAS scores while controlling for sex, negative affect, positive affect, and trait anxiety.

## Method

### Participants

The sample comprised 198 young adults recruited through the Psychology Department's Human Participant pool. For their participation, participants received either research credit or extra credit at the discretion of their instructor. Participants were eligible to complete the study if they were 18 years or older and were fluent in English. Participants were 128 women and 70 men. Ages ranged from 18 to approximately 44 ($M_{Total}$ = 20.67, $SD_{Total}$ = 3.06). The mean age for men was 21.07 years old ($SD_{Men}$ = 3.40). while the mean age for women was 20.45 ($SD_{Women}$ = 2.84). Participants identified as Non-Hispanic White (n = 86; 41.7%), African-American (n = 73; 35.4%), Hispanic/Latinx (n = 21; 10.2%), bi-racial (n = 9; 4.4%), Middle-Eastern (n = 3; 1.5%), and Asian (n = 3; 1.5%). Eighty-four (40.8%) participants identified as first year (28 or fewer college credits), 36 (17.5%) identified as second year (greater than 28 college credit but less than 60 college credits), 39 (18.9%) identified as third year (greater than 60 college credits but fewer than 90 college credits), 32 (15.5%) participants identified as fourth year (greater than 90 college credits), 2 (1%) identified as fifth year (greater than 120 credits), and 5 (2.4%) identified as having six years or beyond.

### Procedure

Participants enrolled in the study through the SONA Experiment Management System and were provided with a URL to complete a series of online questionnaires. Study measures were administered through an online survey (Qualtrics; Provo, UT). Upon completion, participants received contact information for support resources for anxiety disorders. The informed consent described the study as an examination of the relationship between ideas and beliefs about body sensation, sensitivity to environmental and personal stimuli, and the relationship that body sensations, environmental and personal sensitivity may share with personality characteristics. Inclusion criteria were delineated (at least 18 years of age, must be fluent in English). After reading the informed consent, participants either agreed or disagreed to continue on with the study. Individuals that agreed to take part provided a five-or-six-digit identification number twice to validate their SONA account. Individuals then completed basic demographic information including age, date of birth, gender, racial/ethnic background, marital status, current year in college, and household situation (who they live with). Participants then completed: The Brief Fear of Negative Evaluation (BFNE), Social Interaction Anxiety Scale (SIAS), State Trait Anxiety Inventory (STAI), and Anxiety Sensitivity Index-3 (ASI-3). After debriefing, participants received one SONA research credit.

### Measures

**Brief Fear of Negative Evaluation (BFNE; Leary, 1983)** The BFNE is a 12-item self-report measure used to assess the degree to which an individual fears being evaluated negatively by others. Participants rate each item on a 5-point Likert-type scale from 1 (not at all characteristic of me) to 5 (extremely characteristic of me). Possible scores range from 15 to 60, with higher scores showing greater levels of fear that others are evaluating and/or appraising them negatively. Leary (1983) reported excellent internal consistency with a Cronbach alpha of .90 and corresponds to the Cronbach alpha of .92 attained by Watson and Friend (1969) for the full length FNE. Test-retest reliability at 4-weeks was .75 and corresponds to the test-retest coefficient of .65 achieved by Watson and Friend (1969), Cronbach's alpha for the BFNE in this study was .821.

**Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998)** The SIAS contains 20-items rated on a scale from 1 (not at all

typical of me) to 5 (very typical of me). The total score ranges from 16 to 80 with higher scores showing greater anxiety related to social interactions. Mattick and Clarke (1998) reported excellent concurrent, discriminant, and convergent validity, and high test–retest reliability (0.95) and internal consistency with a Cronbach alpha = 0.91. Cronbach's alpha for the SIAS total score in the current sample was .91.

**The Anxiety Sensitivity Index-3 (ASI-3; Taylor et al., 2007)** Is an 18-item self-report measure that assesses the fear of anxiety symptoms based on the belief that these symptoms may have harmful consequences. The ASI-3 comprises three subscales that assess: *Physical, Cognitive*, and *Social Concerns*. Items that ask about concerns related to physical functioning assessed *Physical Concerns* (e.g., "It scares me when my heart beats rapidly). *Cognitive Concerns* mirror beliefs that the individual is losing control of their mind (e.g., "When I cannot keep my mind on a task, I worry that I might be going crazy"). *Social Concerns* reflect worries about how the individual is perceived by others (e.g., "It is important for me not to appear nervous"). Each of the three factors comprises six items. Respondents show their agreement with each item on a 5-point rating scale from "very little" (coded as 0) to "very much" (coded as 4). Scores range from 0 to 72 for this measure. The psychometric qualities of the ASI-3 are well established (Kemper et al., 2012; Taylor et al., 2007; Wheaton et al., 2012). According to Taylor et al. (2007), Cronbach's alphas ranged from 0.73 to 0.91 for ASI-3 subscales. Wheaton et al. (2012) showed internal consistency for the ASI-3 that ranged from 0.80 to 0.90. In the present study, Cronbach's alpha for the ASI-3 subscales was .898 (Physical), .861 (Social), .940 (Cognitive), and .944 (ASI-3 Total).

**Positive and Negative Affect Scale (PANAS; Watson et al., 1988a, b)** The PANAS measured participants' self-reported mood changes. The PANAS uses 20 descriptors representing positive or negative affect. Positive affect reflects the extent to which a person feels enthusiastic, active, and alert. Negative affect is a dimension of subjective distress and unpleasurable engagement that incorporates a series of unpleasant mood states, including anger, contempt, disgust, guilt, fear, and nervousness (Watson et al., 1988a, b). Watson et al. (1988a, b) reported internal consistency (Cronbach alpha) ranging from .86 to .90 for PA and .84 to .87 for NA. Cronbach's alphas for this study were .917 for PA and .896 for NA.

**The State Trait Anxiety Inventory (STAI; Spielberger et al., 1983)** Is a 40-item self-report scale that measures participants' degree of State and Trait anxiety. The STAI has two scales measuring State (right now, in the moment) and Trait (how they generally feel) anxiety. STAI items use a 4-point Likert scale (State, 1 = Not at all to 4 = Very much so; Trait, 1 = Almost never and 4 = Almost always). Scores range from 20 to 80 for each scale, with higher scores reflecting a greater tendency to experience tensions, excessive autonomic nervous system activity, and a greater inclination to perceive situations as threatening. An example of a state anxiety item is "I am tense." An example of a trait anxiety item is "I feel that difficulties are piling up so that I cannot overcome them." Barnes et al. (2002) reported mean Cronbach's alpha for the STAI-State of .92 and test-retest reliability of .70 and STAI-Trait Cronbach's alpha of .89 with test-retest reliability of .88. Cronbach's alpha for the STAI-State was .934 and .909 for STAI-Trait in this study.

### Data Analytic Plan

Zero-order correlations were computed for all study variables for both the total sample and individually for men and women. Two hierarchical linear regressions were performed to address the primary hypotheses. The covariate of sex (0 = male, 1 = female) was entered at entered at Level 1 followed by trait anxiety at Level 2. Clayton (2018) has championed the need to include sex because research has shown differences between men and women beyond biological/reproductive concerns. Trait anxiety was used to parcel out the relationship between trait anxiety and the ASI-3 factors. Some researchers have asserted that the Anxiety Sensitivity Index was another form of trait anxiety and suggested that trait anxiety be included in analyses to obtain the true variance associated with the ASI (Lilienfeld et al., 1989; Orsillo et al., 1994). Positive and negative affect scores were entered at Level 3 and were important because the multidimensional ASI-3 are theoretically nested below higher order negative and positive affect (e.g., Neuroticism and Extraversion) and trait anxiety factors. ASI-3 subscales (*Physical, Cognitive*, and *Social Concerns;* Taylor et al., 2007) were entered together as a block at Level 4 of both regression equations.

## Results

Means, Standard Deviations, and correlations are presented in Table 1 for each dependent variable . Means, Standard Deviations, and correlations for each dependent variable by sex are presented in Table 2. Prior to the analyses, the data were checked for extreme outliers and for normality. Normality was assessed by obtaining skewness and kurtosis values, assessment of the normality of distributions through examination of the shape of the distributions through histograms. None of the indices of skewness and kurtosis were out of range to prevent the planned analyses. The assumptions of multicollinearity, normality, linearity, and homoscedasticity (Tabachnick & Fidell, 2007) were met. There were also no indications of problems with outliers. One participant had

**Table 1** Means, Standard Deviations, and Intercorrelations for all Study Variables (n = 195)

| | | M | SD | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | ASI-3 | 19.97 | 16.72 | – | | | | | | | | |
| 2. | ASI-Physical | 5.76 | 5.96 | .890** | – | | | | | | | |
| 3. | ASI-Cognitive | 5.55 | 6.41 | .893** | .731** | – | | | | | | |
| 4. | ASI-Social | 8.66 | 6.20 | .847** | .618** | .607** | – | | | | | |
| 5. | STAI-T | 46.12 | 11.44 | .595** | .489** | .564** | .509** | – | | | | |
| 6. | NA | 24.17 | 8.98 | .563** | .480** | .506** | .493** | .598** | – | | | |
| 7. | PA | 30.51 | 9.22 | −.210** | −.195** | −.239** | −0.117 | −.587** | −0.093 | – | | |
| 8. | BFNE | 31.27 | 8.97 | .536** | .378** | .438** | .589** | .458** | .567** | 0.001 | – | |
| 9. | SIAS | 43.10 | 15.86 | .600** | .466** | .473** | .637** | .558** | .512** | −.161* | .686** | – |

*p < 0.05; ** p < 0.01; ASI-3 = Anxiety Sensitivity Index-3 Total Score; ASI-Physical = Anxiety Sensitivity Index-3 *Physical Concerns*; ASI-Cognitive = Anxiety Sensitivity Index-3 *Cognitive Concerns*; ASI-Social = Anxiety Sensitivity Index-3 *Social Concerns*; STAI-T = State-Trait Anxiety Index-Trait;; NA = Negative Affect, PA = Positive Affect; BFNE = Brief Fear of Negative Evaluation; SIAS = Social Interaction Anxiety Scale

missing data across the ASI-3, STAI, and several other variables and was excluded from most of the analyses.

## Demographic Descriptive Statistics

Peters (2000) suggests a cut-off score of 36 or greater on the SIAS to signify potential social anxiety symptoms at 0.93 sensitivity and 0.60 specificity. Using this cut-off score, 63.6% of the sample would meet the criteria for high social anxiety symptoms (n = 124). Weeks et al. (2005) examined the psychometric properties of the BFNE in a clinically diagnosed sample with SAD. BFNE scores of participants with SAD (*M = 46.91, SD = 9.27*) were compared to a nonclinical control group (*M* = 26.81, *SD* = 4.78). Using these scores as a comparison, the current sample's mean BFNE score fell between the two groups (*M* = 31.24, *SD* = 8.93, *Md* = 32). This might suggest that the current sample had moderately elevated BFNE scores, but scored lower than the clinically diagnosed participants identified by Weeks et al. (2005).

The sample's mean ASI-3 total score falls between the high ASI-3 cutoff score and moderate/ high ASI-3 cutoff score proposed by Allan et al. (2014b) which categorizes ASI-3 total scores greater than 23 into high Anxiety Sensitivity and scores above 17 into moderate/ high AS. Within the context of this study, we observed a Mean ASI-3 score of 19.99 (*SD* = 16.26) and a Median of 16.00. A cut score of 23 or greater would identify 39.48% of the study's sample as high anxiety sensitive.

Mean positive affect score for the total sample was 30.51 (SD = 9.22) while mean negative affect scores were 24.17 (*SD* = 8.98). Based upon the normative data collected by Crawford and Henry (2004) this samples' mean positive affect

**Table 2** Means, Standard Deviations, and Intercorrelations for all Study Variables for Men (n = 71; Lower Triangle with Means and Standard Deviations to the Left) and Women (n = 124; Upper Triangle with Means and Standard Deviations to the Right)

| | | M | SD | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | M | SD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | ASI-3 | 19.03 | 17.83 | – | .889** | .870** | .832** | .552** | .497** | −.188* | .479** | .525** | 20.52 | 15.36 |
| 2. | ASI-Physical | 5.06 | 6.29 | .892** | – | .700** | .612** | .479** | .406** | −.196* | .318** | .389** | 6.16 | 5.75 |
| 3. | ASI-Cognitive | 5.55 | 6.95 | .926** | .782** | – | .544** | .547** | .481** | −.228* | .374** | .398** | 5.56 | 6.11 |
| 4. | ASI-Social | 8.42 | 6.67 | .867** | .628** | .696** | – | .402** | .398** | −0.06 | .548** | .571** | 8.80 | 5.94 |
| 5. | STAI-T | 43.87 | 11.77 | .660** | .490** | .605** | .672** | – | .618** | −.564** | .442** | .538** | 47.40 | 11.09 |
| 6. | NA | 23.46 | 8.93 | .665** | .595** | .549** | .644** | .562** | – | −0.10 | .470** | .418** | 24.57 | 9.01 |
| 7. | PA | 31.45 | 9.07 | −.240* | −0.18 | −.260* | −0.20 | −.619** | −0.07 | – | 0.05 | −0.17 | 29.97 | 9.30 |
| 8. | BFNE | 30.54 | 8.87 | .624** | .469** | .545** | .657** | .477** | .739** | −0.08 | – | .661** | 31.69 | 9.03 |
| 9. | SIAS | 43.70 | 15.94 | .721** | .601** | .590** | .747** | .621** | .686** | −0.15 | .739** | – | 42.76 | 15.86 |

*p < 0.05; **p < 0.01; ASI-3 = Anxiety Sensitivity Index-3 Total Score; ASI-Physical = Anxiety Sensitivity Index-3 *Physical Concerns*; ASI-Cognitive = Anxiety Sensitivity Index-3 *Cognitive Concerns*; ASI-Social = Anxiety Sensitivity Index-3 *Social Concerns*; STAI-T = State-Trait Anxiety Index-Trait;; NA = Negative Affect, PA = Positive Affect; BFNE = Brief Fear of Negative Evaluation; SIAS = Social Interaction Anxiety Scale

score fell at the 41st percentile while the samples' mean negative affect score fell at approximately the 90th percentile. This suggests that the total group's positive affect scores were below average, as only 41% of people report having lower positive affect scores. By comparison, negative affect scores exceeded the 50th percentile by a large margin. As positive and negative affect are being used as measures of *Neuroticism* and *Extraversion* for this study, these results suggest the sample showed low *Extraversion* levels and high *Neuroticism* levels.

## How Do Social Anxiety Variables Correlate to Other Study Variables?

Table 1 presents the results of the correlational analysis used to examine the relationships among the total scores for all the study variables. Correlations between the SIAS and all the other study variables were statically significant. ASI-3 *Social Concerns* was strongly associated with the SIAS at .637. The correlations between the ASI-3, ASI-3 subscales, BFNE, STAI-T, and NA were all positive correlations at the $p < .01$ level. Positive Affect was weakly negatively correlated with SAIS at the $p < .05$ level ($r = .161$). The BFNE followed a similar pattern as the SIAS, having positive correlations with the ASI-3. ASI-3 subscales, BFNE, STAI-T, and NA all at the $p < .01$ level. As expected, the BFNE was not significantly correlate with PA ($r = -.093$).

Table 2 presents the results of the correlational analysis examining the relationships among total scores for all the study variables separated by sex. Correlations for men had larger effect sizes than the correlations for women. For men, there is a robust correlation ($r = 0.747$) between the SIAS and ASI-3 *Social Concerns*. This finding is similar but somewhat smaller for women ($r = 0.571$). Testing these correlations using Fisher's Z-test was significant ($z = 2.4565$., $p = 0.0139$). For men, the correlations between NA and SIAS and BFNE were large ($r = 0.686$, $r = 0.739$, respectively). In contrast, the effect size between NA and SIAS and BFNE was medium ($r = 0.418$, $r = 0.470$, respectively) for women. Testing for differences between these correlations using Fisher's Z-test was significant for Negative Affect and SIAS ($z = 3.6033$, $p = .00032$) and was significant for negative affect and BFNE ($z = 3.6488$, $p = .00026$). In addition, the relationship between STAI-T scores and the SIAS and BFNE, for men, showed large effect sizes (STAI-T and BFNE, $r = 0.477$ and STAI-T and SIAS, $r = 0.621$). For women, the correlation between the STAI-T and BFNE ($r = 0.442$) had a medium effect size, while the correlation between STAI-T and SIAS ($r = 0.538$) had a large effect size. Fisher's Z-tests were again conducted on the correlations between STAS-T and BFNE and the SIAS across sex was not significant ($z = 0.7441$, $p = 0.4593$; $z = 1.1259$, $p = 0.25{,}848$).

## Which Variables Best Explain Social Anxiety Symptoms?

We performed a hierarchical regression analysis to examine the extent to which sex, Positive and Negative Affect, Trait Anxiety, and Anxiety Sensitivity contributed to the variance explained in social anxiety symptoms as measured by the SIAS and BFNE. Two hypotheses were developed to determine the how well each of the variables estimated social anxiety symptoms. We constructed regression models to examine the unique and cumulative variance for each variable. To control for potential sex/gender differences in social anxiety sex was entered first for each model, followed by trait anxiety as measured by the STAI-T in step two, and both positive and negative affect as measured by the PANAS were entered at step three. Finally, three ASI-3 subscale scores were entered as a block in step four. Forcing variables into the hierarchical regression in an orderly manner is done to determine whether variables added later to the equation add meaningfully to the prediction of the dependent variable. The regression analyses results are presented Table 3 for both hypotheses.

Hypothesis one stated "The Anxiety Sensitivity Index-3 subscales will predict Social Anxiety Disorder symptoms as measured by the BFNE such that higher scores on the Anxiety Sensitivity Subscales will predict higher scores on the BFNE while controlling for sex, negative affect, positive affect, and trait anxiety." The seven variables explained significant variance to BFNE scores $F(7, 187) = 24.452$, $p < .0001$, $R^2 = .479$, (Adjusted $R^2 = .460$). At step one, sex did not explain significant BFNE variance $F(1,193) = 0.443$, $p < .506$, $R^2 = .002$, (Adjusted $R^2 = -.003$). At step two, trait anxiety explained significant variance to BFNE scores $F\ (1, 192) = 50.036$, $p < .0001$, $R^2 = .210$, (Adjusted $R^2 = .202$), $R^2$ change = .206. Positive and negative affect were entered at step three and contributed significant variance to BFNE scores $F$ change $(2, 190) = 27.184$, $p < .0001$, $R^2 = .386$, (Adjusted $R^2 = .373$), $R^2$ change = .176. Both positive and negative affect explained unique variance to the BFNE scores. At step four, *Social*, *Physical*, and *Cognitive* Concerns were entered and explained significant variance to BFNE scores $F$ change $(3, 187) = 11.222$, $p < .0001$, $R^2 = .479$, (Adjusted $R^2 = .460$), $R^2$ change = .094. However, only Social Concerns contributed unique variance to the BFNE scores.

Results showed that trait anxiety ($\beta = 0.224$, $t = 2.319$, $p = .021$), positive affect ($\beta = 0.199$, $t = 2.752$, $p = 0.006$), negative affect ($\beta = 0.280$, $t = 3.767$, $p < 0.0001$), and ASI-3 *Social Concerns* ($\beta = .394$, $t = 5.325$, $p < .0001$) significantly estimated BFNE scores. Sex, ASI-3 *Physical Concerns*, and *Cognitive Concerns* did not explain significant variance in BFNE scores. The results provide partial support for hypothesis one. We hypothesized that high ASI-3 subscale scores will be significantly associated with high scores on the BFNE. The analysis showed that only ASI-3 *Social Concerns*,

**Table 3** Hierarchical Regression Analysis Summary for Sex, Trait Anxiety, Positive and Negative Affect, and ASI-3 Factors Predicting Social Anxiety Disorder as Measured by the Brief Fear of Negative Evaluation and Social Interaction Anxiety Scale (N = 195)

| | Hypothesis 1: Brief Fear of Negative Evaluation | | | | | Hypothesis 2: Social Interaction Anxiety Scale | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Steps and Variables | B | SE B | β | $R^2$ | $\Delta R^2$ | B | SE B | β | $R^2$ | $\Delta R^2$ |
| Step: 1 | | | | .004 | .004 | | | | .001 | .001 |
| Sex | 1.150 | 1.335 | 0.062 | | | −.946 | 2.365 | −.029 | | |
| Step: 2 | | | | .210 | .206*** | | | | .325 | .324*** |
| Sex | −.120 | 1.206 | −.006 | | | −3.762 | 1.971 | −0.114 | | |
| STAI-T | .360 | .051 | .459*** | | | .798 | .083 | .575*** | | |
| Step: 3 | | | | .386 | .176*** | | | | .390 | .065*** |
| Sex | .023 | 1.070 | .001 | | | −3.622 | 1.886 | −0.110 | | |
| STAI-T | .323 | .075 | .413*** | | | .775 | .133 | .559*** | | |
| PA | .268 | .075 | .276*** | | | .306 | .131 | .178* | | |
| NA | .346 | .077 | .346*** | | | .354 | .136 | .201** | | |
| Step: 4 | | | | .479 | .094*** | | | | .507 | .117*** |
| Sex | .498 | 1.005 | .027 | | | −3.175 | 1.170 | −.097 | | |
| STAI-T | .176 | .076 | .224* | | | .494 | .130 | .356*** | | |
| PA | .194 | .070 | .199** | | | .168 | .121 | .097 | | |
| NA | .280 | .074 | .280*** | | | .196 | .128 | .111 | | |
| ASI-Physical | −.187 | .125 | −.124 | | | .105 | .215 | .039 | | |
| ASI-Cognitive | .096 | .119 | .069 | | | −.107 | .205 | −.043 | | |
| ASI-Social | .570 | .107 | .394*** | | | 1.068 | .185 | .418*** | | |
| Total $R^2$ | | | | .479 | | | | | .507. | |

*p < .05; **p < .01; ***p < .001. BFNE-$R^2$ = .479 ($F$(7, 187) = 24.592, $p$ < .0001) SIAS-$R^2$ = .507 ($F$(7, 187) = 27.456, $p$ < .0001). ASI-Physical = Anxiety Sensitivity Index-3 *Physical Concerns*; ASI-Cognitive = Anxiety Sensitivity Index-3 *Cognitive Concerns*; ASI-Social = Anxiety Sensitivity Index-3 *Social Concerns*; STAI-T = State-Trait Anxiety Index-Trait; PA = Positive Affect; NA = Negative Affect

not *Physical* or *Cognitive Concerns*, was significantly associated with BNFE scores. In fact, ASI-3 *Physical Concerns* evidenced a negative relationship with BFNE scores ($\beta$ = −.124, $t$ = −1.499, $p$ = .136). While ASI-3 *Cognitive Concerns* showed a weak effect on BFNE scores ($\beta$ = .069, $t$ = .807, $p$ = .421).

Hypothesis two stated "The Anxiety Sensitivity Index-3 subscales will predict Social Anxiety Disorder symptoms as measured by the SIAS such that higher scores on the Anxiety Sensitivity-3 Subscales will predict higher scores on the SIAS while controlling for sex, negative affect, positive affect, and trait anxiety". The seven variables explained significant variance to SIAS scores $F$(7, 187) = 27.456, $p$ < .0001, $R^2$ = .507, (Adjusted $R^2$ = .488). Once more sex did not explain significant variance to SIAS scores $F$ change (1193) = 0.160, $p$ < .690, $R^2$ = .001, (Adjusted $R^2$ = −.004). At step two, trait anxiety explained significant variance to SIAS scores $F$ change (1192) = 93.063, $p$ < .0001, $R^2$ = .325, (Adjusted $R^2$ = .318), $R^2$ change = .324. Positive and negative affect explained significant variance to SIAS scores at step three with $F$ change (2, 190) = 10.105, $p$ < .0001, $R^2$ = .390, (Adjusted $R^2$ = .377), $R^2$ change = .065. Both positive and negative affect explained unique variance to the SIAS scores. *Social*, *Physical*, and *Cognitive* Concerns were entered at step four, and explained significant variance to SIAS scores $F$ change (3, 187) = 14.822, $p$ < .0001, $R^2$ = .507, (Adjusted $R^2$ = .488), $R^2$ change = .117. However, only Social Concerns contributed unique variance to the SIAS scores.

Finally, Trait anxiety ($\beta$ = 0.356, $t$ = 3.786, $p$ < 0.0001) and ASI-3 *Social Concerns* ($\beta$ = 0.418, $t$ = 5.795, $p$ < .0001) were the only significant variables estimating SIAS scores. Contrary to the hypothesis, neither ASI-3 *Physical* nor *Cognitive Concerns* significantly estimated SIAS scores ($\beta$ = 0.039, $t$ = 0.487, $p$ = 0.627; $\beta$ = −0.043, $t$ = −0.523, $p$ = 0.601). Sex ($\beta$ = −0.097, $t$ = −1.835, $p$ = .068), positive and negative affect ($\beta$ = 0.097, $t$ = 1.385, $p$ = 0.168; $\beta$ = 0.111, $t$ = 1.530, $p$ = 0.128) also did not reach statistical significance in this model. In summary, these results provide partial support for hypothesis two. Unlike the results observed for the BFNE scores, both ASI-3 *Physical* and *Cognitive Concerns* exhibited weak relationships with SIAS scores. ASI-3 *Physical Concerns* did not show a negative relationship with SIAS scores as it did with BFNE scores.

## Discussion

This study examined the relationships between the lower order factors of the ASI-3 using a hierarchical regression approach. The regression models also used trait anxiety, negative and positive affect, while statistically controlling for biological sex to estimate social anxiety symptoms in a convenience sample of young adults. Social anxiety symptoms, as measured by the BFNE and ISAS were significantly related and consistent with past research using the ASI. This research supports studies showing that ASI-Social Concerns may provide a reasonable estimate of SAD (e.g., Allan et al., 2014a; McWilliams et al., 2000). This study extends previous research using the Anxiety Sensitivity Index by showing that ASI-3 Social Concerns was specifically associated with social anxiety symptoms. Neither Cognitive nor Physical Concerns significantly estimated social anxiety symptoms while controlling for biological sex, trait anxiety, and positive and negative affect. These results conflict with the results of Allan et al. (2014a) who used a group of treatment seeking adults and found SAD diagnoses were related to ASI-3 Physical Concerns controlling for gender and the other ASI-3 factors. Similarly, Olthuis et al. (2014) recruited a sample of 85 treatment-seeking adults ($M_{age}$ = 36.3, $SD_{age}$ = 11.4). They found ASI-3 *Social Concerns* and *Cognitive Concerns* were significantly related to Liebowitz Social Anxiety Scale (LSAS) scores ($\beta$ = .34, $t$ = 3.39, $p < .01$; $\beta$ = .23, $t$ = 2.08, $p < .05$, respectively). Results from the current research suggest that inclusion of trait anxiety is necessary to control additional variance attributed to other more focused measures of anxiety. While these results are based on a cross-sectional sample of convenience, they add to our understanding of characteristics that potential risk factors for the development of social anxiety symptoms and social anxiety disorder.

### ASI-3 Social Concerns Estimated Social Anxiety Symptoms

This suggests that individuals that have a greater propensity to believe they will perform badly in social situations and be subjected to scrutiny and negative evaluation and because of their poor performance are more likely to display social anxiety symptoms. Partial support was found for estimating social anxiety symptoms using the BFNE. ASI-3 *Social Concerns* significantly estimated social anxiety symptoms, while ASI-3 *Cognitive* and *Physical Concerns* did not. There are no published studies we are aware of that examined the specific nature of the relationship between the BFNE and the ASI-3 subscales. Carter et al. (2009) recruited a convenience sample of 100 undergraduates ($M_{age}$ = 19.68, $SD$ = 1.49) and found moderate correlations between the BFNE and ASI-3 subscale (e.g.,.53, .30, .56 for the *Physical*, *Cognitive*, and *Social Concerns)*. Unfortunately, they stopped short of estimating BFNE scores using a more rigorous regression approach with statistical controls. In contrast to Carter et al. the current research shows that ASI-3 *Social Concerns* significantly estimated BFNE scores. This relationship is unsurprising as ASI-3 *Social Concerns* measures one's tendency to believe that behaviors they display in social contexts will cause them to be subjected to the scrutiny and potential negative evaluation of others.

### Positive and Negative Affect

Positive and negative affect were used to estimate social anxiety symptoms for both the BFNE and the SIAS. The results for the BFNE showed a familiar pattern of high negative and low positive affectivity. These results are similar to those obtained in a variety of other studies (Bienvenu et al., 2001; Bienvenu et al., 2004; Trull & Sher, 1994; Watson & Clark, 1995; Watson et al., 2005) and provide additional support for the unique role that negative and positive affectivity play in relation to social anxiety symptoms. The current study extends this relationship to the BFNE using a statistically well-controlled research design. In contrast, positive and negative affect were not significant estimators of social anxiety symptoms using the SIAS and does not support previous research (Kaplan et al., 2015). It is plausible that including trait anxiety as a covariate removed most of the shared variance associated with both negative and positive affect. The results show that the regression coefficients associated with trait anxiety in our model for the SIAS were larger than those associated with the BFNE (see Table 3). It is also notable that BFNE and SIAS scores were mid-range between scores obtained from treatment seeking patients diagnosed with social anxiety disorder and normal controls. The current research also suggests that trait anxiety may play a significant role in psychological distress associated with social interactions or performance anxiety. Further, discomfort with social interactions associated with social anxiety may not necessarily be linked to positive and negative affectivity which are the core element of extraversion and neuroticism but to trait anxiety. Interestingly, positive affect and BFNE score were not significantly correlated and showed a small magnitude of effect (see Table 1). In contrast, the SIAS scores were significantly correlated with both positive and negative affect. Past studies have shown a relationship between Neuroticism and Extraversion with SIAS scores (Kaplan et al., 2015).

The current study is one of a few to quantify the relative magnitudes of effect associated with the positive and negative affect and social anxiety symptoms. Arditte Hall et al. (2018) examined what they termed affective and empathic forecasting in individuals with social anxiety disorder and found that individuals with higher levels of social anxiety were more likely to believe that both the person they were interacting with and their self would feel more negative

affect in response to a negative social interaction. Arditte Hall et al. (2018) suggest that there is a link between affect and social anxiety, but they did not include a measure of positive and negative affect. Cohen and Huppert (2018) examined positive emotions and their relationship with social anxiety. Their study included the positive and negative affect scale (PANAS) and assessed their relationship with social anxiety; however, they used the Social Phobia Inventory (SPIN) and the Leibowitz Social Anxiety Scale (LSAS) to measure social anxiety symptoms. Since the researchers were specifically studying the positive emotion pride and its relationship with social anxiety, they removed any items in the PANAS that pertained to pride and added a separate measure to assess pride. They found that the PANAS without pride did not significantly estimate social anxiety symptoms, but the emotion pride significantly estimated social anxiety symptoms. In summary, additional research is needed to explain the relationship between positive and negative affect and social anxiety.

## Limitations

The current study has several strengths, including the use of multiple indicators of the social anxiety construct and a combination of self-report psychopathology measures. However, several limitations need to be acknowledged. First, participants used in this study were a convenience sample recruited from the University's Human Participants Research Pool. The sample's mean BFNE and SIAS scores, measures of social anxiety symptoms were approximately mid-range between a treatment seeking sample normal controls. Second, participants completed self-report measures online rather than in person. Once again, the online data in this study yielded similar Means, Standard Deviations and reliability coefficients as the face-to-face studies. Further, Kilin and Firat (2017) suggest that there is little or no difference between self-report data collected compared to in-person. Another limitation of this study is the use of the SIAS. Norton et al. (1997) suggest that the SIAS is an adequate measure of anxiety laden social interactions that are characteristic of social anxiety. However, this suggests that the SIAS is not a comprehensive measure of social anxiety and must be used with other instruments to a more complete assessment of social anxiety. For example, Gore et al. (2002) used both the SIAS and Social Phobia Scale (SPS) to determine which of the measures would be best at predicting anxious response to a social challenge. Their results showed the measures were better together than used separately. That is the combined SPS and SIAS best estimated social anxiety.

In summary, the current study showed that ASI-3 *Social Concerns* significantly estimated social anxiety symptoms as assessed by the SIAS and fear of negative evaluation as assessed by the BFNE. This is consistent with the idea that ASI-3 Social Concerns is a transdiagnostic risk factor for social anxiety symptomatology and is consistent with past research that suggests ASI-3 *Social Concerns* significantly estimates social anxiety symptoms. Further research should use other indicators of social anxiety symptoms, in combination with the STAI-T and the PANAS to determine if ASI-3 *Social Concerns* significantly estimates social anxiety symptom measures other than the SIAS and the BFNE. We need further research to reveal the complex etiology of social anxiety.

## Declarations

**Conflict of Interest** Author A declares that she has no conflict of interest. Author B declares he is an Associate Editor for Current Psychology.

**Ethical Approval** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent: Informed consent was obtained from all individual participants included in the study.

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