

Evidence for the Discriminant Validity of the Revised Social Anhedonia Scale From Social Anxiety

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Abstract

Social anhedonia and social anxiety are two constructs with similar behaviors including avoidance of and withdrawal from social situations. In three studies, the current research aimed to test whether social anhedonia could be discriminated from social anxiety using the most common measure of social anhedonia, the Revised Social Anhedonia Scale (RSAS). In Study 1, an item-level factor analysis of the RSAS found two factors: Social Apathy/Aversion and Social Withdrawal. In Study 2, this two-factor structure was confirmed in a separate sample. In Study 3, a model with social anhedonia and anxiety scale scores loading on separate factors fit better than a model with social anhedonia and anxiety loading on a single factor. Social anhedonia and anxiety displayed differential associations with negative schizotypy and emotion processing. Findings suggest that the RSAS is successful in measuring social anhedonia distinct from social anxiety.

Keywords

social anhedonia, social anxiety, schizotypal personality disorder, avoidant personality disorder, schizoid personality disorder, confirmatory factor analysis

Social anhedonia and social anxiety are two constructs associated with impairment in social functioning that are related to personality pathology (Brown, Silvia, Myin-Germeys, & Kwapil, 2007). Social anhedonia can be defined as a disinterest in social contact and a lack of pleasure derived from relationships with others (Chapman, Chapman, & Kwapil, 1995). In contrast, social anxiety is an apprehension or fear of negative outcomes in social situations, and is characterized by excessive anxiety and physiological arousal (Leary, 1983). Although both social anhedonia and social anxiety may lead to social isolation, researchers have suggested that the behaviors are a result of distinct mechanisms and motivations (Brown et al., 2007; Brown, Silvia, Myin-Germeys, Lewandowski, & Kwapil, 2008). For instance, individuals with social anhedonia may avoid social situations because the situations are uninteresting, whereas individuals with social anxiety may avoid the same situations because the situations are uncomfortable.

The most commonly used measure of social anhedonia is the Revised Social Anhedonia Scale (RSAS; Eckblad, Chapman, Chapman, & Mishlove, 1982; Reise, Horan, & Blanchard, 2011). Social anhedonia, as measured with the RSAS, is considered to be a part of schizotypy (i.e., traits or characteristics similar to schizophrenia but in a diminished form that represent a liability for the development of schizophrenia; Chapman, Chapman, & Raulin, 1976; Chapman, Chapman, Raulin, & Edell, 1978; Meehl, 1962). The RSAS

has been found to be highly correlated with other measures of schizotypy and predict the long-term development of schizophrenia spectrum disorders (Gooding, Tallent, & Matts, 2005; Kwapil, 1998; Kwapil, Miller, Zinser, Chapman, & Chapman, 1997). Thus, social anhedonia is generally thought to be a neurodevelopmental deficit that confers a risk for the development of schizophrenia (Lenzenweger, 2006). Social anxiety, on the other hand, likely arises from a distinct set of processes that also include both genetic and environmental causes including increased attention to threat, self-focused attention, and emotion processing among others (Morrison & Heimberg, 2013). However, it is not completely clear if the items on the RSAS are measuring social anhedonia or something closer to social anxiety. For example, the question “I prefer watching television to going out with other people” could be answered in the affirmative by someone with high levels of social anxiety as well as someone with high levels of social

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anhedonia. Critically, questions like this on the RSAS are meant to measure a lack of interest in socializing, and not to measure whether someone prefers solitary activities to social activities because they are too anxiety-provoking.

The original Social Anhedonia Scale (Chapman et al., 1976) was revised because early research found too much criterion overlap with social anxiety (Eckblad et al., 1982). Items on the original Social Anhedonia Scale were removed because they sounded too much like social anxiety, and additional social anhedonia items were added. To our knowledge, research has not explicitly examined whether the revision was successful in removing items with criterion overlap with social anxiety on an item-level basis. As a result, researchers remain skeptical of the scale's discriminant validity from social anxiety. For example, research comparing social anhedonia and anxiety has eliminated items from the RSAS that have too much criterion overlap with social anxiety (Brown et al., 2007). Typically, researchers have removed these items based on a face-validity approach (i.e., removing items that sound too much like social anxiety). To our knowledge, no previous research has taken a data-driven approach and attempted to test whether clusters of items, or factors, correlate more strongly with social anxiety than others. Thus, the primary goal of the current research was to examine whether groups of items or subfactors of the RSAS could be discriminated from social anxiety.

In addition to removing items from the RSAS, other work aiming to discriminate social anhedonia from social anxiety with the RSAS has focused on correlations among scores or random parcels (i.e., randomly dividing the scale into three or more subscales) to increase the precision of measurement in confirmatory factor analysis (CFA) studies (Brown et al., 2008). In contrast, we take a data-driven approach to analyzing specific items on the RSAS to examine whether there are clusters of items that are more strongly correlated with social anxiety than others, and to determine whether social anhedonia can be discriminated from social anxiety. It is possible that random parcels of RSAS items can clearly be discriminated from social anxiety (as found by Brown et al., 2008), but that one or more factors of a multidimensional social anhedonia construct could not be discriminated from social anxiety. Using exploratory factor analysis (EFA) to create factors of items may further increase the precision of this approach by creating manifest variables out of empirical data rather than randomly drawn parcels.

Although the RSAS was developed over 30 years ago, to our knowledge, only four studies have conducted item-level analyses of the scale (Reise et al., 2011), and these studies have yielded mixed results. One potential reason that few researchers have examined the factor structure of the RSAS is the commonly held misconception that a high coefficient alpha means a scale is unidimensional (e.g., Schmitt, 1996;

Sijtsma, 2009) and the RSAS has been shown to have high internal consistency in dozens of studies. Of the four studies examining the RSAS's dimensionality, one found that it was multidimensional and composed of four factors with a principal component analysis (Blanchard, Gangestad, Brown, & Horan, 2000). A second study found that it was unidimensional within an item response theory framework (Winterstein, Ackerman, Silvia, & Kwapil, 2011), and a third study found that a unidimensional model fit the data well with a CFA, but did not test whether a multidimensional model fit the data better (Fonseca-Pedrero et al., 2009). Finally, Reise et al. (2011) found that neither a unidimensional nor a multidimensional model fit the data well within an item response theory framework. At the same time, no studies have used EFA and CFA in separate samples to examine the factor structure of the RSAS, which is a commonly used technique in scale development research (Clark & Watson, 1995). Hence, whether the RSAS is unidimensional or multidimensional is still unclear.

Although research has not taken an item-level approach to discriminating social anhedonia from social anxiety with the RSAS, similar research has discriminated social anhedonia and social anxiety using other self-report measures. For example, the Schizotypal Personality Questionnaire (SPQ; Raine, 1991), which has a subscale for each of the nine schizotypal personality disorder (STPD) symptoms, includes subscales for both social anhedonia (i.e., the No Close Friends subscale) and social anxiety (i.e., the Excessive Social Anxiety subscale). Subscale-level factor analyses have been wildly inconsistent with some studies finding the two scales loading on a single factor (e.g., Raine et al., 1994; Stefanis et al., 2004; Vollema & Hoijsink, 2000) and others finding they load on separate factors (e.g., Bergman et al., 1996; Fogelson et al., 1999; Venables & Rector, 2000). At the same time, research taking an item-level approach has found that rather than nine subscales, the scale includes five factors, including distinct social anhedonia and social anxiety factors (Callaway, Cohen, Matthews, & Dinzeo, 2014; Chmielewski & Watson, 2008; Cohen, Matthews, Najolia, & Brown, 2010). The other factors included Eccentricity, Mistrust, and Unusual Perceptual Experiences. Critically, the social anhedonia and social anxiety factors extracted by Chmielewski and Watson (2008) are not the same as the items that make up the social anhedonia and social anxiety subscales as originally defined. For example, three of the nine items on the No Close Friends (SPQ-NCF) loaded with social anxiety instead of social anhedonia. Thus, it is possible that, like the SPQ-NCF, some of the items on the RSAS are more similar to social anxiety than social anhedonia. In the current research, we take an item-level approach to the RSAS to examine this question. In addition, we used the empirically derived factors of the SPQ from Chmielewski and Watson to examine whether the item-level factors of the RSAS

could be discriminated from social anxiety. We expected to find that the SPQ Social Anhedonia factor would be correlated, and load on the CFAs, with the RSAS, whereas the SPQ Social Anxiety factor would be correlated, and load on the CFAs, with the social anxiety scales.

One limitation of these previous studies is that most have included only one indicator of social anhedonia and social anxiety, which makes it impossible to form homogenous latent traits of social anhedonia and social anxiety. In the current research (Study 3), we included four measures of social anxiety to allow social anxiety to form its own factor. This allowed us to examine if a separate factor fit the data better than a model with social anxiety loading alongside social anhedonia. Additionally, we included another measure of social anhedonia to supplement the RSAS, which has not been done in previous research.

Along with testing whether measures of two constructs load on the same or different factors in a CFA, we aimed to discriminate between the two constructs by examining whether they display differential relations with two other groups of constructs in their respective nomological networks (Rubio, Berg-Weger, & Tebb, 2001). First, we examined their relations with other measures of “negative” schizotypy. Social anhedonia is often thought to be related to the negative symptom dimension of schizotypy, which also includes constructs such as physical anhedonia and restricted emotional expression (e.g., Cicero & Kerns, 2010; Kwapil, Barrantes-Vidal, & Silvia, 2008; Raine et al., 1994). Thus, we expected to find that social anhedonia would be more strongly associated with physical anhedonia and restricted emotional expression than would social anxiety.

Second, social anhedonia and social anxiety have been hypothesized to be differentially related to emotion processing. Both social anhedonia and anxiety have been found to be associated with low clarity of emotions (Kerns, 2006; Turk, Heimberg, Luterek, Mennin, & Fresco, 2005). In contrast, people with social anxiety tend to focus on emotions (Salovey, Stroud, Woolery, & Epel, 2002), whereas people with social anhedonia pay little attention to emotions (Kerns, 2006). Thus, we expected to find that both social anxiety and anhedonia would be negatively correlated with clarity of emotions. We also expected to find that social anxiety would be positively correlated with attention of emotions, whereas social anhedonia would be negatively correlated with attention to emotions. In addition, we expected to find that both social anhedonia and anxiety would be associated with maladaptive emotion regulation strategies including increased use of emotional suppression and decreased use of emotional reappraisal.

The primary goal of the current research was to examine whether the RSAS has discriminant validity from social anxiety. In Study 1, we examined the factor structure of the RSAS with an item-level EFA to determine whether factors or subfactors of items could be extracted. In Study 2, we

confirmed the factor structure of the RSAS with a CFA in a separate sample. In Study 3, we examined whether social anhedonia, as measured with the RSAS, could be discriminated from social anxiety by testing a series of CFAs in which social anhedonia and social anxiety loaded on the same and separate factors. Finally, we tested whether the social anhedonia and social anxiety factors displayed differential relations with other measures of negative schizotypy and emotion-processing variables.

Study 1

The primary aim of Study 1 was to examine whether the RSAS is composed of a single factor or more than one factor. If the RSAS is a single unidimensional construct, then we would expect to find that all of the items would load on a single factor in an item-level factor analysis. However, if the RSAS represents a multidimensional construct or a construct composed of several subfactors, then we would expect to find that the best solution would include two or more factors. As mentioned, the RSAS was designed to be a scale of a unidimensional construct, but previous work has provided mixed results on its dimensionality. We expected to find that the RSAS would be composed of more than one factor representing aspects of social anhedonia/withdrawal including lack of pleasure from social experiences, social or interpersonal aversiveness, and social anxiety.

Method

Participants. Participants were 584 undergraduates who completed the study for partial completion of a course requirement. Participants were 42.5% Female, 84.5% White, 8.6% African American, 2.6% Asian, and 4.3% other. The mean age was 18.96 ($SD = 1.54$).

Materials

Social Anhedonia. Social Anhedonia was measured with the RSAS. As described above, the RSAS (Eckblad et al., 1982) is a 40-item true–false questionnaire designed to measure lack of relationships and lack of pleasure from relationships. The RSAS has been found to predict future development of schizophrenia-spectrum disorders (Gooding et al., 2005; Kwapil, 1998; Kwapil et al., 1997), and to load with other measures on a negative schizotypy factor (Cicero & Kerns, 2010; Kwapil et al., 2008). As a comparison with previous research, 36 participants in Study 1 had high enough RSAS scores to meet criteria for negative schizotypy (Kwapil, 1998).

Procedure. As part of a larger study that took approximately 60 minutes, participants completed the RSAS and the demographic questionnaire.

Results and Discussion

Exploratory Factor Analysis. First, we subjected the data to an EFA using *Mplus* Version 7.11 (Muthen & Muthen, 1998-2012). Researchers have suggested that item-level EFA can lead to spurious multidimensionality with maximum likelihood (ML) or principal components analysis (Bernstein & Teng, 1989). ML is based on the assumption that the manifest variables (e.g., the items) are normally distributed and linearly related to each other. With item-level data, these assumptions are less likely to be met (De Bruin, 2004). To guard against spurious multidimensionality, we used the mean and variance adjusted weighted least square (WLSMV) and the categorical specification as recommended by Muthen and Muthen (1998-2012). Critically, WLSMV is a robust estimator that does not have the same assumptions of normally distributed variables as ML and principal component analysis (Beauducel & Herzberg, 2006). This approach is appropriate for categorical data (T. A. Brown, 2006) and has been used in previous research using the RSAS (Reise et al., 2011). The categorical specification in *Mplus* uses a polychoric correlation matrix. To determine the number of factors to be extracted, we incorporated the Hull Method as outlined by Lorenzo-Seva, Timmerman, and Kiers (2011). First, we determined the possible range of appropriate factor structures by examining the scree plot from a parallel analysis (Fabrigar, Wegener, MacCallum, & Strahan, 1999). Then, we extracted each of the possible one- to five-factor solutions with a Quartimin rotation, which is an oblique rotation method. We used this particular rotation method, as opposed to an orthogonal rotation, because we expected the factors to be moderately correlated with each other (Fabrigar et al., 1999). For each of the factor solutions, the comparative fit index (CFI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR) were plotted against the degrees of freedom, to visualize the change in model fit across factor solutions. The st_i value was then calculated to locate the upper boundary of convex hull (i.e., the “elbow” heuristic; Lorenzo-Seva et al., 2011), where the model fit changes little across degrees of freedom. The largest st_i value across the three model fit indices was selected as the most appropriate factor solution. Invariably, this method identified that a two-factor solution fit the data the best.

These two factors represent theoretically distinct constructs of Social Apathy/Aversion and Social Withdrawal. The social apathy/aversion factor included 24 questions about a preference for being alone and a lack of interest in friendships. Example items include “I am usually content to just sit alone, thinking, and daydreaming” and “I attach very little importance to having close friends.” Likewise, Social Withdrawal included 16 questions about the closeness and number of close friends. Example items include “I sometimes become deeply attached to people I spend a lot of time

with (reverse coded)” and “A car ride is much more enjoyable if someone is with me (reverse coded).”

Study 2

The results of Study 1 suggest that the RSAS may be multidimensional. The goal of Study 2 was to confirm the factor structure identified with an EFA in Study 1 with a CFA in a separate sample. If the factor structure found in Study 1 fits the data well in Study 2, then we can be confident that the results reflect the true factor structure of the RSAS and are not due to something specific to the sample in Study 1. We expected to find that the factor structure in Study 2 would fit the data well, and would fit significantly better than an alternative one-factor model.

Method

Participants. Participants were 932 undergraduates who participated in exchange for partial completion of a course requirement. They were 62.0% female, 81.6% White, 10.7% African American, 2.5% Asian American, 1.4% Hispanic, and 3.7% other. The mean age was 18.56 ($SD = 0.95$).

Measures. Like in Study 1, social anhedonia was measured with the RSAS (Eckblad et al., 1982). As a comparison with previous research, 83 participants in Study 2 had high enough RSAS scores to meet criteria for negative schizotypy (Kwapil, 1998).

Results and Discussion

Model fitting was done with *Mplus* 7.11 software (Muthen & Muthen, 1998-2012) using WLSMV parameter estimates with the categorical option for all variables. This option uses a polychoric correlation matrix. Two fit statistics were used to assess whether the models provide good fit to the data (Hu & Bentler, 1998): (a) RMSEAs < .05 and (b) CFI > .95. To examine whether the two-factor model identified in Study 1 was the best model of these data, we examined whether the two-factor model fit better than a one-factor model using χ^2 difference tests with the “diffest” command for categorical data in *Mplus*. This serves as a second check for the potential of spurious multidimensionality.

In the two-factor model, all of the items loaded only on the factor on which they had the strongest loading in Study 1. For the one-factor model, all the items were specified to load on a single Factor 1. Since all the items loaded above .35 on at least one factor in the two-factor model EFA, all items were included in this analysis. If an item loaded on more than one factor in the EFA in Study 1, it was only included on the factor on which its loading was highest in the CFA in Study 2. This two-factor model fit the data

reasonably well, RMSEA = .03, CFI = .93. All of the items had significant factor loadings on their factors. For social apathy, the factor loadings for the 24 items ranged from .36 to .91. The factor loadings for the 16 social withdrawal items ranged from .28 to .82. The full factor loadings matrix can be found in Table 1. These factors were highly correlated with each ($r = .65$). Additionally, this two-factor model fit significantly better than did a one-factor model with all items loading on a single factor, $\chi^2(3) = 92.21, p < .001$.

Although the fit statistics suggest that the RSAS is multidimensional, these factors are highly correlated. Although WLSMV extraction is less likely to result in spurious multidimensionality than ML, it is still possible that the factors found in Study 1 and confirmed in Study 2 are not truly distinct. In Study 3, we further examined whether the factors were distinct by examining their zero-order correlations with social anxiety and other variables. If a spurious factor was extracted, then we would expect both factors to have the same relations with other variables. If the factors are truly distinct, then we would expect to find that they would have differential relations with social anxiety. In addition, if the factors are truly distinct, then it is likely that one factor would measure something closer to social anxiety, and would load along with other social anxiety factors in a CFA. In particular, the factor we called Social Aversion may be most likely to load with social anxiety, since both involve the experience of unpleasantness in social situations. At the same time, if the factors are not distinct, then we would expect them all to load on a single factor, which would suggest a hierarchical structure to the RSAS. Thus, we examined whether both would load on a single factor or whether one would load on a factor with social anxiety scales in Study 3.

Study 3

The first goal of Study 3 was to further examine whether the factors identified in Study 1 and confirmed in Study 2 are truly distinct from each other. If they are distinct, then we would expect them to have differential relations with social anxiety and at least one factor to load with social anxiety in a CFA. The second goal was to examine whether the RSAS has discriminant validity from social anxiety. If social anhedonia and social anxiety are distinct constructs, then we would expect a model with the social anhedonia scales loading on a “social anhedonia” factor and all social anxiety scales loading on a “social anxiety” factor would fit the data better than (a) a factor model with all the manifest variables loading on a single factor and (b) factor models in which any of the RSAS factors identified in Study 1 and Study 2 loaded on the social anxiety factor.

In addition, if social anhedonia and social anxiety are distinct constructs, then we would expect the two factors to display differential relations with negative schizotypy and emotion processing. We expected to find that (a) social

Table 1. Factor Loadings for the Item-Level Confirmatory Factor Analysis in Study 2.

Item	Factor 1: Social Apathy/Aversion	Factor 2: Social Withdrawal
1	.87	
2	.91	
3	.76	
6	.36	
10	.43	
13	.51	
14	.49	
17	.72	
21	.62	
22	.60	
23	.66	
24	.53	
25	.60	
26	.51	
27	.46	
28	.73	
29	.41	
32	.69	
34	.55	
35	.41	
37	.53	
38	.70	
39	.44	
40	.50	
4		.48
5		.49
7		.50
8		.66
9		.51
11		.54
12		.28
15		.76
16		.55
18		.47
20		.61
30		.45
31		.53
33		.37
36		.76

anhedonia, but not social anxiety, would be strongly associated with negative schizotypy (i.e., restricted expression and physical anhedonia); (b) both social anxiety and social anhedonia would be associated with decreased clarity of emotions, but social anhedonia would be associated with decreased attention to emotion, whereas social anxiety would be associated with increased attention to emotion; and (c) both social anhedonia and social anxiety would be associated with decreased emotional reappraisal but increased emotional suppression.

Method

Participants. Participants were 443 undergraduates who participated in exchange for partial completion of a course requirement. Participants were 56.2% Female, 86.0% White, 6.8% African American, 2.5% Asian, and 4.5% other. The mean age was 18.62 ($SD = 0.87$).

Measures

Social Anhedonia. Like in Study 1 and Study 2, social anhedonia was measured with the RSAS (Eckblad et al., 1982). For Study 3, we calculated two subscale scores for social apathy/aversion and social withdrawal following the factor structure identified in Study 1 and confirmed in Study 2. As a comparison with previous research, 32 participants in Study 3 had high enough RSAS scores to meet criteria for negative schizotypy (Kwapil, 1998).

Social Anxiety. The first measure of social anxiety was the Social Interaction and Anxiety Scale (SIAS; Mattick & Clarke, 1998). The SIAS is a 20-item self-report questionnaire, scored on a 5-point Likert-type scale from 0 (*not true of me at all*) to 4 (*extremely true of me*). It examines cognitive, affective, and behavioral reactions toward situations that require interactions with people. The second measure of social anxiety was the Social Thoughts and Beliefs Scale (STBS; Turner et al., 2003). The STBS is a 21-item self-report questionnaire, scored on a 5-point Likert-type scale from 1 (*never characteristic*) to 5 (*always characteristic*). The third measure of social anxiety in Study 3 was the Liebowitz Social Anxiety Scale (LSAS; Liebowitz, 1987). The LSAS is a 24-item self-report questionnaire in which participants are asked to rate how much they fear and avoid social situations on a scale from 0 (*never*) to 3 (*usually*).

Schizotypal Personality Questionnaire. The SPQ (Raine, 1991) is a 74-item *yes-no* questionnaire with subscales for all nine symptoms of *DSM-III* STPD. As mentioned, one recent item-level EFA of the SPQ found that it has a five-factor structure including separate and homogenous social anhedonia and social anxiety factors, each including a mixture of items from various subscales (Chmielewski & Watson, 2008). Other factors include eccentricity, mistrust, and unusual perceptual experiences. These three factors were not used in the current research. We scored the SPQ as these five factors as opposed to the original nine subscale scores. In the current research, we expected to find that the social anxiety factor would be strongly correlated with measures of social anxiety, whereas the social anhedonia factor would be strongly correlated with the two RSAS factors. Moreover, we expected to find that the social anxiety factor would load with the social anxiety subscales and the social anhedonia factor would load with the RSAS factors in a CFA.

Negative Schizotypy. The first measure of negative schizotypy was the Restricted Expression subscale of the Dimensional Assessment of Personality Pathology–Basic Questionnaire (DAPP-BQ; Livesley & Jackson, 2002), a 16-item subscale designed to measure reduced expression of emotions. It has been found to correlate with schizoid, schizotypal, and avoidant personality disorder (APD; Bagge & Trull, 2003), as well as with other negative schizotypy scales (Kerns, 2006). The second measure of negative schizotypy was the Physical Anhedonia Scale (PhysAnh; Chapman et al., 1976), a 61-item true–false questionnaire designed to measure a lack of pleasure from or interest in physical sensations.

Emotion Processing. The first measure of emotion processing was the Trait Meta-Mood Scale (TMMS; Salovey, Mayer, Goldman, Turvey, & Palfai, 1995). The TMMS is a 30-item scale in which participants are asked to indicate how strongly they agree with statements on a scale from 1 (*strongly disagree*) to 5 (*strongly agree*). In the current research, we used the attention to emotions and clarity of emotions subscales. The second measure of emotion processing was the Emotion Regulation Questionnaire (ERQ; Gross & John, 2003). The ERQ is a 10-item scale in which participants rate their agreement with statements on a scale of 1 (*strongly disagree*) to 7 (*strongly agree*). The ERQ contains subscales for Cognitive Reappraisal and Expressive Suppression.

Results and Discussion

Zero-Order Correlations. We first examined the zero-order correlations among the social anhedonia factors from the RSAS with the four social anxiety measures and the SPQ social anhedonia measure. To test whether one of the social anhedonia factors was more strongly correlated with the other variables than the other, Z scores were calculated to compare correlated coefficients as suggested by Meng, Rosenthal, and Rubin (1992). As can be seen in Table 2, the Social Apathy/Aversion factor was more strongly correlated with the STBS ($Z = 5.08, p < .001$), SIAS ($Z = 1.96, p = .050$), LSAS ($Z = 4.74, p < .001$), and SPQ Social Anxiety factor ($Z = 6.29, p < .001$) than was the Social Withdrawal factor. In addition, the social withdrawal factor was more strongly correlated with the PhysAnh ($Z = 2.40, p = .016$), but less strongly with the DAPP-BQ–Restricted Expression ($Z = 2.39, p = .017$) than was the Social Apathy/Aversion factor. Both factors were equally negatively correlated with attention to emotions ($Z = 1.36, p = .174$), but Social Apathy/Aversion was more strongly negatively correlated with clarity of emotions ($Z = 3.32, p < .001$). Finally, both factors were equally negatively correlated with Emotional Reappraisal ($Z = 0.21, p = .833$) and positively correlated with Emotion Suppression ($Z = 1.07, p = .285$).

Table 2. Correlations Among All Variables in Study 3.

Measure	1	2	3	4	5	6	7	8	9	10	11	12	13
Social Anhedonia													
1. Social Apathy/Aversion	.77												
2. Social Withdrawal	.50*	.67											
3. SPQ–Social Anhedonia	.54*	.35*	.77										
Social Anxiety													
4. STBS	.33*	.08	.46*	.93									
5. SIAS	.15*	.05	.18*	.27*	.96								
6. LSAS	.26*	.02	.25*	.55*	.20*	.94							
7. SPQ–Social Anxiety	.49*	.19*	.61*	.71*	.22*	.58*	.83						
Negative Schizotypy													
8. Physical Anhedonia	.33*	.46*	.19*	.13*	.08	.11*	.15*	-.76					
9. DAPP–BQ–Restricted Expression	.49*	.40*	.46*	.50*	.22*	.27*	.53*	.25*	.88				
Emotion Processing													
10. TMMSA	-.27*	-.36*	-.25*	-.14*	-.06	.01	-.09	-.27*	-.38*	.85			
11. TMMSC	-.24*	-.13*	-.26*	-.40*	-.17*	-.27*	-.35*	-.11*	-.44*	-.24*	.82		
12. ERQ–Reappraisal	-.21*	-.21*	-.21*	-.18*	-.10*	-.03	-.15*	-.24*	-.20*	.24*	.12*	.85	
13. ERQ–Suppression	.40*	.35*	.37*	.30*	.10	.16*	.40*	.22*	.68*	-.34*	-.28*	-.10*	.72
Mean	4.21	2.17	1.88	45.58	52.26	31.47	5.58	18.71	38.12	28.96	28.30	29.09	12.68
Standard deviation	3.33	1.95	2.45	13.40	19.33	20.14	3.91	4.58	11.18	7.21	6.63	7.04	4.76

Note. SPQ = Schizotypal Personality Questionnaire; STBS = Social Thoughts and Beliefs Scale; SIAS = Social Interaction Anxiety Scale; LSAS = Liebowitz Social Anxiety Scale; ERQ = Emotion Regulation Questionnaire; TMMSA = Trait Meta-Mood Scale Attention to Emotions Subscale; TMMSC = Trait Meta-Mood Scale Clarity Subscale; DAPP–BQ = Dimensional Assessment of Personality Pathology–Basic Questionnaire. Numbers on the diagonal (in italics) are Cronbach's alpha.

* $p < .05$.

The social anxiety measures were also positively correlated with the negative schizotypy measures and emotional suppression, but negatively correlated with clarity of emotions emotional reappraisal. Taken together, these results suggest that the social anhedonia factors have similar relations with these variables. The only exception is that social withdrawal seems to be less strongly correlated with social anxiety than apathy/aversion. Overall, this pattern of bivariate correlations question whether the factors identified in Study 1 and Study 2 represent distinct factors.

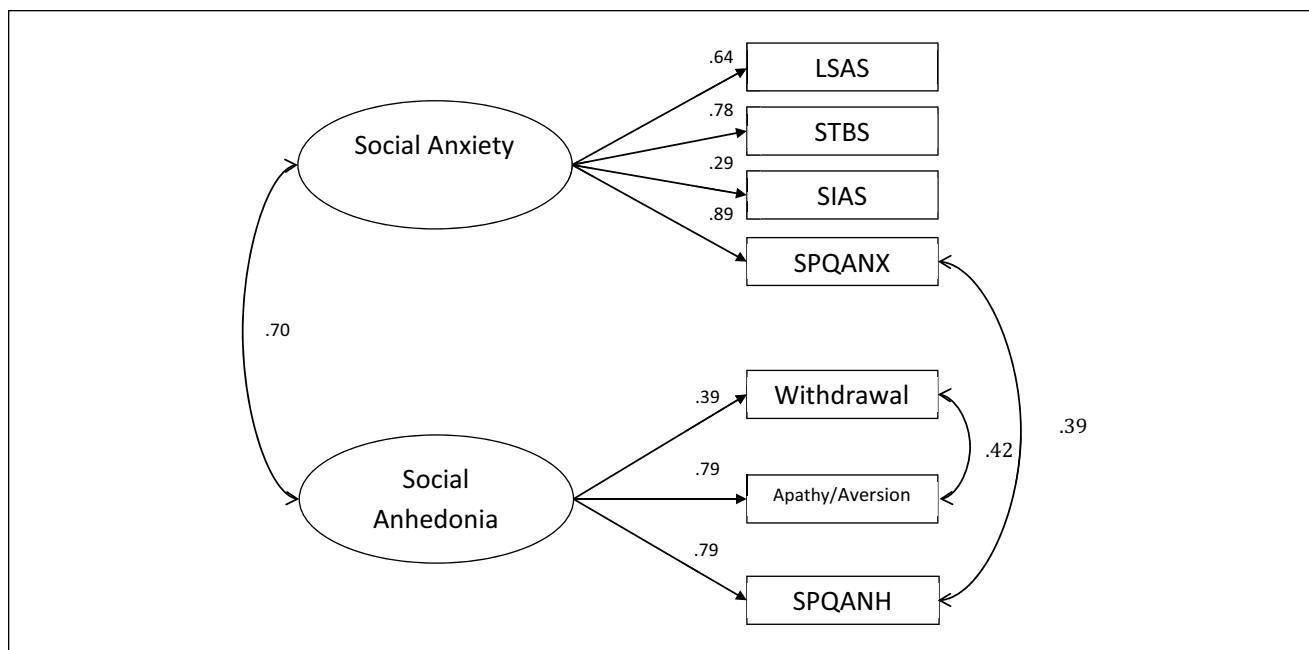
Model Fitting. The second goal of Study 3 was to test whether social anhedonia and social anxiety could be discriminated from each other using a CFA. Thus, we tested the first of four different models. In Model 1, all seven social anhedonia and social anxiety scale scores loaded on a single factor (see Table 3 for a list of all models). In Model 2, the three social anhedonia scales loaded on Factor 1 and the four social anxiety scale scores loaded on Factor 2. In Model 3, the social apathy/withdrawal factor loaded along with social anxiety, and in Model 4, the social withdrawal factor loaded along with social anxiety. In all of the models, the errors of the manifest variables from subscales originating from the same scale were allowed to correlate with each other (i.e., the errors of the SPQ–Social Anxiety and the

SPQ–Social Anhedonia scales were allowed to correlate, and the errors of the social apathy/aversion and social withdrawal subscales were allowed to correlate) to account for method variance. As can be seen in Table 3, Model 2 (the three social anhedonia scales the four social anxiety scales loading on separate factors) provided the best fit to the data based on all six fit statistics. A Satorra–Bentler χ^2 difference test showed that Model 2 fit statistically significantly better than Model 1, $\chi^2(3) = 92.21, p < .001$. Since Models 2, 3, and 4 have the same degrees of freedom, they could not be compared with a χ^2 difference test. To test the magnitude of the difference in fit between Model 2 and Models 3 and 4, we computed a Bayes factor as recommended by Raftery (1995) and Nagin and Tremblay (2001) and utilized by Krueger et al. (2011) by calculating $e^{\text{BIC}_{\text{Model3}} - \text{BIC}_{\text{Model2}}}$ and $e^{\text{BIC}_{\text{Model4}} - \text{BIC}_{\text{Model2}}}$. The Bayes factor was 4.08×10^{24} for the difference in fit between Model 2 and Model 3 and 4.29×10^{13} for the difference in fit between Model 2 and Model 4. The Bayes factor represents the posterior odds of the better fitting model being the appropriate model for the data, and values greater than 150 are considered “very strong” evidence. Thus, our analyses provide very strong evidence that Model 2 is the best fitting model to our data. This suggests that social anhedonia and social anxiety can be discriminated from each other using CFA. As can be seen in Figure 1,

Table 3. Model Fit Comparison.

Model fit comparison	RMSEA	CFI	SRMR	AIC	BIC	χ^2	df
Model 1: one factor	.138	.886	.072	18681.02	18775.12	113.652	12
Model 2: two factors	.097	.949	.045	18617.03	18715.22	56.464	11
Model 3: two factors (apathy/aversion)	.139	.895	.063	18673.70	18771.89	104.781	11
Model 4: two factors (withdrawal)	.124	.917	.061	18648.42	18746.61	85.24	11

Note. RMSEA = root mean square error of approximation; CFI = comparative fit index; SRMR = standardized root mean square residual; AIC = Akaike information criterion; BIC = Bayesian information criterion; *df* = degree of freedom. Model 1: one-factor model with all scales loading on a single factor; Model 2: two-factor model with the three social anhedonia scales loading on one factor and the four social anxiety scales loading on the second factor; Model 3: two-factor model with social withdrawal and SPQ–Social Anhedonia loading on one factor and social apathy/aversion loading with the social anxiety scales on the second factor; Model 4: two-factor model with social apathy/aversion and SPQ–Social Anhedonia loading on one factor and social withdrawal loading with the social anxiety scales on the second factor.

**Figure 1.** Confirmatory factor analysis of social anhedonia and social anxiety variables in Study 3.

Note. LSAS = Liebowitz Social Anxiety Scale; STBS = Social Thoughts and Beliefs Scale; SIAS = Social Interaction and Anxiety Scale; SPQANX = Schizotypal Personality Questionnaire–Social Anxiety; SPQANH = Schizotypal Personality Questionnaire–Social Anhedonia.

the manifest variables loaded highly on the social anhedonia and social anxiety factors, and the factors were highly correlated with each other ($r = .70$).

Relations With Negative Schizotypy. We used Model 2 to examine the relations among social anhedonia, social anxiety, and other variables within a structural equation modeling (SEM) framework. We regressed each of the variables on social anhedonia and social anxiety simultaneously. These results can be interpreted like a simultaneous multiple regression in which variance shared between the latent factors is removed. As can be seen in Table 4, social anhedonia was strongly associated with physical anhedonia and restricted emotional expression, whereas social anxiety was weakly associated with restricted emotional expression.

Emotion Processing. As also hypothesized, social anhedonia was associated with decreased attention to emotions, whereas social anxiety was associated with increased attention to, but decreased clarity of emotions. Social anhedonia was associated with decreased cognitive reappraisal of emotions and increased emotional suppression, whereas social anxiety was not significantly associated with either cognitive reappraisal or emotional suppression.

General Discussion

The main finding of the current research is that the RSAS has discriminant validity from measures of social anxiety. First, the CFA in Study 3 found that the model in which the four social anhedonia and four social anxiety scales loaded

Table 4. Personality, Mood, and Emotion Variables Regressed on Social Anhedonia and Social Anxiety Factors in Study 3 (Standardized Coefficients).

	Social Anhedonia	Social Anxiety
Negative Schizotypy		
Physical Anhedonia	.46***	-.13
DAPP BQ–Restricted Expression	.42***	.31***
Emotion Processing		
TMMSA	-.54***	.25**
TMMSC	.09	-.38***
ERQ–Reappraisal	-.32***	.03
ERQ–Suppression	.47***	.03

Note. DAPP-BQ = Dimensional Assessment of Personality Pathology–Brief Questionnaire; TMMSA = Trait Meta-Mood Scale Attention to Emotions Subscale; TMMSC = Trait Meta-Mood Scale Clarity of Emotions Subscale; ERQ = Emotion Regulation Questionnaire.
* $p < .05$. ** $p < .01$. *** $p < .001$.

on separate factors fit better than models in which any social anhedonia scales loaded on the social anxiety factor. This suggests that social anhedonia, as measured with the RSAS, and social anxiety are distinct constructs. The second major finding of the current research is that the RSAS may represent a multidimensional construct. Third, social anhedonia and social anxiety displayed differential associations with negative schizotypy and emotion processing. This suggests that in addition to statistically significant differences in the CFA models, there are meaningful differences in the nomological networks of social anhedonia and social anxiety. However, although Study 1 and Study 2 found that the RSAS may be composed of two highly correlated factors, the results of Study 3 suggest that both factors are part of a more unified social anhedonia construct. Taken together, these findings suggest that the RSAS measures multiple different motivations for social withdrawal, but does not have significant conceptual overlap with measures of social anxiety.

As mentioned, the current research provides mixed evidence for the multidimensionality of the RSAS. The results of Study 1 and Study 2 suggest that it is possible to extract multiple factors from the RSAS, which is consistent with some previous research (e.g., Blanchard et al., 2000). However, the pattern of correlations of the factors extracted in Study 3 suggests that the factors are very similar. Nevertheless, the finding of multiple factors is consistent with previous work on both social anhedonia and childhood “preference for solitude,” a similar construct to social anhedonia. For example, some research suggests that the RSAS may be measuring asociality rather than a hedonic deficit associated with social interactions (Linscott, 2007). This may be similar to our social withdrawal factor. Moreover, Meehl (1990) suggested that the social withdrawal seen in schizotypy is a result of interpersonal aversiveness, which

may be similar to our social aversion factor. Finally, Raulin and Wee (1984) described a facet of schizotypy of social fear, which is more similar to social anxiety. Likewise, the childhood literature on preference for solitude contrasts “unsociability/social disinterest” (similar to our “apathy” factor) and “social avoidance” (similar to our “aversion” factor) with “shyness” (similar to social anxiety), and considers these to be a related but separate motivational process (Asendorpf, 1990; see Coplan & Armer, 2007, for a recent review). Other research has found that these aspects of social anhedonia display different relations with other variables such as emotion regulation and social functioning (Bowker, Markovic, Cogswell, & Raja, 2012; Wang, Rubin, Laursen, Booth-Laforce, & Rose-Krasnor, 2013). Taken together, these results provide equivocal evidence for the existence of multiple facets of the broader more unified social anhedonia construct that has implications both in childhood and adulthood.

In addition to item-level analyses in Study 1 and Study 2, the CFA results in Study 3 are consistent with previous studies finding that social anhedonia and social anxiety loaded on distinct factors in a CFA (Brown et al., 2008). However, the current research extends these results in two important ways. First, the use of an EFA to create facets for the CFA, as opposed to creating parcels of random items, allowed us to test whether there are specific aspects of social anhedonia (i.e., social apathy, social withdrawal, or social aversion) overlap with social anxiety. The current research suggests that these aspects of social anhedonia, as measured with the RSAS, do not significantly overlap with social anxiety. Second, the current research included an additional measure of social anhedonia, the SPQ, which increased the precision of our measurement of social anhedonia. Third, to our knowledge, the current study is the first study to examine differential relations among social anxiety, social anhedonia, emotional processing, and negative schizotypy within a SEM framework. As mentioned, these results provided further evidence for the discriminability of social anhedonia and social anxiety by showing that they are differentially related with other constructs in their respective nomological networks.

In addition to the finding that social anhedonia and social anxiety are distinct, the current research has implications for our understanding of both social anhedonia and social anxiety. We found that social anhedonia was strongly related to other measures of negative schizotypy. These findings are consistent with previous work finding that social anhedonia is more strongly associated with negative schizotypy than is social anxiety (Brown et al., 2008). Consistent with previous research, the current work found that social anhedonia was associated with a decrease in attention to emotions (Kerns, 2006). Social anhedonia was also associated with increased emotional suppression and decreased cognitive reappraisal. In contrast, social anxiety

was associated with increased attention to emotion and decreased emotional clarity. This is somewhat consistent with previous research, which has found that social anxiety is associated with both decreased attention to emotions and emotional clarity (Turk et al., 2005). Contrary to our hypothesis, social anxiety was not significantly associated with either emotional suppression or emotional reappraisal in the SEM analyses. Previous work has found the anxiety is associated with increased emotional suppression and decreased emotional reappraisal (Kashdan & Steger, 2006; Werner, Goldin, Ball, Heimberg, & Gross, 2011). The current results are inconsistent with these findings. However, the SEM results reflect the relation between social anxiety and emotional processing after removing shared variance with social anhedonia. The social anxiety variables are associated with emotional suppression and reappraisal in the predicted pattern according to the zero-order correlations in Table 2. Thus, these inconsistent results may be due to removing shared variance with social anhedonia. Although the current research included comparison measures of emotion processing and negative schizotypy that could be used to show that social anhedonia and social anxiety could be discriminated from each other, one limitation of the current research is that it did not include a behavioral measure that could be used for the same purpose. Future research could examine whether the distinction between social anhedonia and anxiety has clinical significance by showing that people with social anhedonia behave different than people with social anxiety. At the same time, social anhedonia and social anxiety made be inseparable on a behavioral level, since the ultimate behavior of social withdrawal is the same. Future research could extend the current research by examining other methods of discriminating the two constructs to determine in what ways they can be discriminated and in what ways they cannot.

Along with measurement of social anhedonia, the current research may have implications for the measurement of social anxiety. In the factor model in Study 3, the SIAS loaded weakly on the social anxiety factor and was less strongly correlated with the other social anxiety variables. This suggests that the SIAS may not be as good of an indicator of social anxiety as the other three social anxiety variables included in the study, which all loaded highly on the social anxiety factor and were highly correlated with each other.

Although the current research examined schizotypy as a psychometric construct, it may have implications for our understanding of the structure of STPD symptoms. Schizotypy is a neurodevelopmental personality organization that confers a latent risk for the development of schizophrenia (Lenzenweger, 2006; Meehl, 1962). STPD, on the other hand, is a *DSM-5* personality disorder that is a constellation of observable symptoms that tend to aggregate (American Psychiatric Association, 2013). Theorists have

argued that schizotypy is a broader concept than STPD, and people with schizotypy may or may not outwardly display STPD symptoms (Lenzenweger, 2010). As mentioned, the most common structural models of STPD symptoms include social anhedonia and social anxiety on the same factor (e.g., Raine et al., 1994; Stefanis et al., 2004). The current results, and results from other item-level analyses, suggest that this is not appropriate (Callaway et al., 2014; Chmielewski & Watson, 2008; Cohen et al., 2010). These results suggest that social anhedonia and social anxiety would form separate factors if there are enough indicators of each construct included in the model.

In addition to the structure of STPD, the current research may have implications for our understanding of other personality disorders. Social anhedonia and social anxiety are important for the conceptualization of several personality disorders. Both social anhedonia and excessive social anxiety are symptoms of STPD (American Psychiatric Association, 2013), and social anxiety, but not social anhedonia, is a symptom of APD. Additionally, social anhedonia, but not social anxiety, is a symptom of schizoid personality disorder (SPD). Thus, an individual with STPD may find social situations to be uninteresting and anxiety-provoking, whereas someone with SPD finds them uninteresting, and someone with APD may be genuinely interested in relationships, but find them too anxiety-provoking to make it worthwhile. The ultimate behavior resulting in social isolation could be identical in all three cases. Critically, differential diagnosis of STPD, SPD, and APD is dependent on clinicians' ability to discriminate the motivation behind these behaviors. The current research suggests that self-report measures may be sufficient in discriminating between social anhedonia and social anxiety with self-report methods, which may allow for accurate differential diagnosis. At the same time, the finding that social anhedonia can be discriminated from social anxiety may not provide much information about individual symptoms that people with personality disorders experience. For example, an individual with APD may experience social apathy/aversion and social withdrawal in addition to social anxiety. Previous research has found high tetrachoric correlations between STPD, SPD, and APD symptoms (Lenzenweger, Lane, Loranger, & Kessler, 2007), which suggests that even if they are distinct symptoms, they often co-occur.

One area for future research could be to examine whether social anhedonia associated with schizotypal presentations could be discriminated from social anhedonia related to depression. One of the core symptoms of depression is a lack of interest in things the individual used to enjoy, which often includes social activities (Pizzagalli, 2014). Some previous cross-sectional research has found that the RSAS cannot discriminate patients with depression from patients with schizophrenia (e.g., Berenbaum & Oltmanns, 1992; Katsanis, Iacono, Beiser, & Lacey, 1992). Moreover, studies have

found that people with social anhedonia have high levels of both depression and anxiety in college students (Lewandowski et al., 2006; Rey, Jouvent, & Dubal, 2009). Longitudinal studies have found that one difference between anhedonia in schizophrenia and anhedonia in depression is that it is stable in schizophrenia but only present during acute episodes in depression (Blanchard, Horan, & Brown, 2001). Since depression and anxiety are often comorbid, future research could examine whether patients with schizotypal presentations could be discriminated from patients with social anxiety using the RSAS.

There are several notable limitations in the current research that should be considered. First, the use of undergraduates may limit the generalizability of the results to other populations such as community or clinical samples. Undergraduates may be higher functioning, have higher socioeconomic status, and more education than community samples. At the same time, researchers have suggested that the use of undergraduates to model psychopathology can have both empirical and clinical value (Gotlib, 1984), and recent work suggests that undergraduates have high levels of mental disorders (Hunt & Eisenberg, 2010), including personality disorders (Blanco et al., 2008). Moreover, research suggests that the majority of college students in the high range on the RSAS report clinically meaningful social anhedonia on a clinical interview (Cicero, Martin, Becker, Docherty, & Kerns, 2014). In addition to relying on undergraduate students, one limitation of the current research is that the sample was mostly White. Previous research suggests that White participants tend to have lower scores than minority participants on the RSAS (Chmielewski, Fernandes, Yee, & Miller, 1995) and some RSAS items have differential item functioning between African American and White participants (Winterstein et al., 2011). Future research could examine these same questions with more diverse samples from clinical or community populations.

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