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Social Anxiety, Depression, and Emotional Congruence

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SOCIAL ANXIETY, DEPRESSION, AND EMOTIONAL CONGRUENCE

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SOCIAL ANXIETY, DEPRESSION, AND EMOTIONAL CONGRUENCE

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Abstract

Social anxiety and depression are associated with interpretation biases and impairment in social cognitive ability (e.g., understanding the mental states of others), yet there is little known about their associations with emotional congruence (i.e., the extent to which a perceiver shares the emotional experience of a target). The present study examined the association between dimensional levels of social anxiety, depression, and emotional congruence, as well as the moderating role of anhedonia and stimuli valence. Neither social anxiety nor depressive symptoms significantly predicted emotional congruence. Further, no significant associations were found when including the moderators following multiple test correction. Although previous studies have shown that social anxiety and depressive symptoms can impact cognitive empathic processes, the present findings demonstrate that these symptoms may not be related to affective empathy.

Table of Contents

List of Tables…….....v

List of Figures…….……...vi

I. Introduction…….....1

II. Method…….....10

A. Participants…….....10

B. Measures…….....11

C. Statistical Analysis…….....15

III. Results

A. Preliminary Analyses…….……..…….....16

B. Analyses with Social Anxiety Symptoms…….....17

C. Analyses with Depressive Symptoms…….....18

D. Exploratory Analyses…….....19

IV. Discussion…….....20

References……...….....27

List of Tables

Table 1.	Sex Differences for Major Study Variables……....…42
Table 2.	Correlations Between Major Study Variables……..…43
Table 3.	Results from HLM Analysis- Social Anxiety Symptoms Predicting Emotional Congruence for Total Stimuli..…...44
Table 4.	Results from HLM Analysis- Social Anxiety Symptoms Predicting Emotional Congruence for Positive Stimuli....45
Table 5.	Results from HLM Analysis- Depressive Symptoms Predicting Emotional Congruence for Total Stimuli.....46
Table 6.	Results from HLM Analysis: Depressive- Symptoms Predicting Emotional Congruence for Positive Stimuli.....47
Supplemental Table 1.	Results from HLM Analysis- Social Anxiety Symptoms Predicting Emotional Congruence Without Covariates.....49
Supplemental Table 2.	Results from HLM Analysis- Depressive Symptoms Predicting Emotional Congruence Without Covariates.....50
Supplemental Table 3.	Results from HLM Analysis- Social Anxiety Symptoms Predicting Emotional Congruence for Negative Stimuli.....51
Supplemental Table 4.	Results from HLM Analysis- Depressive Symptoms Predicting Emotional Congruence for Negative Stimuli.....52

List of Figures

Figure 1. Social Anxiety Predicting Emotional Congruence Moderated by Anhedonia……..…….....…48

Social Anxiety, Depression, and Emotional Congruence

Social anxiety and depression are distinct, but related, forms of psychopathology characterized by cognitive biases. Social anxiety disorder (SAD) involves a core fear of evaluation, which often results in avoidance of social situations and interactions (American Psychiatric Association, 2013). The cognitive model of social anxiety posits that symptoms (e.g., negative feelings when in social situations) stem from negative beliefs that socially anxious individuals have about themselves (Clark & Wells, 1995). These beliefs are based upon assumptions of others' evaluation, rather than objective information gathered during social situations. Major Depressive Disorder (MDD) is characterized by an extended period of depressed mood that is influenced by negative beliefs about the self, the world, and the future (American Psychiatric Association, 2013; Beck & Bredemeier, 2016). Although SAD and MDD are distinct DSM-defined disorders, they both share an affective profile of high negative and low positive affect (Kashdan, 2002, 2004) and are highly comorbid (Kessler, Chiu, Demler, & Walters, 2005). Further, they overlap in their shared style of negative cognitions, including interpretation and attentional biases.

Individuals with social anxiety have interpretation biases that often result in the misinterpretation of ambiguous situations as negative (Amir, Beard, & Bower, 2005; Musa & Lépine, 2000) and benign behavior as critical or evaluative (Mathews & MacLeod, 1994). Depressed individuals also tend to interpret ambiguous information as negative (LeMoult & Gotlib, 2018; Orchard, Pass, & Reynolds, 2016), and this extends to both social and nonsocial information (Voncken, Bögels, & Peeters, 2007). In addition to interpretation biases, socially anxious and depressed individuals have attentional biases towards negative stimuli (Heinrichs & Hofmann, 2001; Jacobs, Reinecke, Gollan, & Kane, 2008) and away from positive social

information (Taylor, Bomyea, & Amir, 2010). These cognitive biases in interpretation and attention may influence social cognitive ability in socially anxious and/or depressed individuals, yet there is limited research examining potential impairment in social cognition among these clinical populations.

Social cognition has been decomposed into lower-level processes, such as emotion recognition and the perception of social cues (e.g., body language), and higher-level processes, such as inferring the mental states of others (Green, Lee, & Ochsner, 2013). Higher-level processes, such as theory of mind and empathic accuracy, are often measured by paradigms that include contextual information in addition to social cues (Green et al., 2013). Empathy is a multifaceted construct that can be separated into cognitive and affective domains. Cognitive empathy reflects a perceiver's ability to understand another person's mental state whereas affective empathy refers to sharing an emotional experience in response to a target's emotional experience (Davis, 1983; Zaki et al., 2008). Emotional congruence reflects the extent to which affective responses between a perceiver and a target are matched. This construct has also been described using terms such as "affect sharing," "emotional contagion," and "shared self-other representations," but is thought to be distinct from constructs such as prosocial concern in that the latter focuses on motivation to improve others' distress (Zaki & Ochsner, 2012). In a recent study (Morrison et al., 2016), a standard video-based empathic accuracy task was modified to assess emotional congruence while maintaining similar stimuli and response formats. In the original video-based empathic accuracy task (Zaki et al., 2008), instructions ask the perceiver to rate how they think *the target* is feeling. In the modified version that assesses emotional congruence (as utilized in the present study), the perceiver is asked to rate how *they* are feeling while watching the target. The former involves cognitive processes, such as contextual appraisal

(Singer & Lamm, 2009), whereas the latter involves involuntary, pre-reflective processes (Hatfield, Cacioppo, & Rapson, 1992; Singer & Lamm, 2009). Thus, empathic accuracy may be conceptualized as a higher-level social cognitive process and emotional congruence as a lower-level process (Green, Lee, & Ochsner, 2013).

Previous findings examining social cognitive ability in individuals with social anxiety and depression have been mixed. Some studies have found that individuals with higher levels of social anxiety or social anxiety disorder (SAD) have impairments in social cognitive ability. A meta-analysis conducted by O'Toole, Hougaard, and Mennin (2013) found that social anxiety symptoms were negatively associated with interpersonal emotion knowledge (i.e., the ability to understand others' expressed emotions). However, a subset of the studies included in the meta-analysis found increased emotion recognition in socially anxious individuals. Tibi-Elhanany et al. (2011) found that participants with higher levels of social anxiety had impairments in theory of mind compared to those with lower levels of social anxiety when presented with cartoon outlines of faces. Similarly, Buhlmann et al. (2015) and Hezel and McNally (2014) found that individuals with SAD were less accurate at inferring others' states of mind compared to healthy controls. Hezel and McNally (2014) also found a significant interaction between group and valence of stimuli, such that those with SAD were less accurate at assessing theory of mind for negative stimuli compared to healthy controls. In a recent study using an independent sample from the present study, our research group examined the association between dimensional levels of social anxiety and social cognitive ability (i.e., empathic accuracy, but not emotional congruence) and found a negative association between social anxiety symptoms and higher level, but not lower-level, social cognition (Alvi et al., 2020). Furthermore, the most robust finding

across two tasks was that greater social anxiety symptoms were associated with decreased accuracy for positive stimuli.

There is also research suggesting that social anxiety is associated with greater social cognitive performance. For example, Tibi-Elhanany et al. (2011) found that socially anxious individuals exhibited greater accuracy in affective empathy compared to those with lower levels of social anxiety. In addition, Hunter, Buckner, and Schmidt (2009) found that socially anxious individuals were more accurate at identifying facial expressions than those with low social anxiety. Further evidence was found by Joormann and Gotlib (2006) who reported that individuals with SAD needed less intensity of emotional expression for identification of certain emotions, such as anger, than healthy controls. Using videos of targets describing situations of social exclusion, Auyeung and Alden (2016) found that individuals with social anxiety had greater accuracy for negative emotions under social threat.

Finally, some studies have found no difference in social cognitive ability between individuals with higher vs. lower levels of social anxiety. Sutterby et al. (2012) found no difference between people with lower and higher levels of social anxiety on theory of mind. Philippot and Douilliez (2005) assessed emotion recognition in people with SAD and healthy controls using a series of emotional facial expressions that varied in type and intensity of emotions and found no significant between-group differences in facial expression accuracy. Similarly, in a study in which social anxiety was assessed dimensionally, Mullins and Duke (2004) did not find an association between social anxiety and errors in facial expression identification.

Thus, there are mixed findings relating social anxiety with social cognition; however, the vast majority of these studies have examined cognitive empathic processes rather than affective

empathy. Indeed, although there is some support for an association between social anxiety and higher levels of self-reported dispositional affective empathy (i.e., feelings of sympathy for others and shared feelings of distress; Davis, 1983; Davis & Oathout, 1992), there is limited research examining the association between social anxiety and emotional congruence.

Recently, Morrison et al. (2016) found that individuals with SAD exhibited less emotional congruence (i.e., affective empathy) than healthy controls, but did not differ in empathic accuracy. The association between group and emotional congruence was moderated by valence, such that the effect was found for positive, but not negative, emotions. The authors also found that this association was mediated by one's own emotion knowledge (i.e., clarity of one's own emotions). After including clarity of emotions as a mediator, the direct effect of diagnostic group was no longer significant, suggesting that emotional knowledge (i.e., less clarity of one's own emotions) accounted for the group effect on emotional congruence. Although the authors considered potential mediators, they did not include important covariates, such as target expressivity. This covariate is important to include based on evidence that empathic accuracy is dependent on the trait expressivity of individuals in the video stimuli (i.e., participants showed greater empathic accuracy for target individuals with higher levels of emotion expressivity; Zaki et al., 2008). The limited number of video stimuli (2 negative and 3 positive clips) utilized by Morrison et al. (2016) may also have influenced their findings. Using multiple items, or stimuli, in a measure allows for aggregation, which results in reduction of random measurement error and greater reliability (Clark & Watson, 1995). Therefore, increasing the number of stimuli in the paradigm may result in greater reliability and validity of the measure.

As in social anxiety, studies examining the relation between depressive symptoms or major depressive disorder (MDD) and social cognitive ability have provided mixed findings.

Using dynamic social stimuli (as opposed to static images), Schneider et al. (2012) found that individuals with MDD were less accurate in identifying target emotion compared to healthy controls. Similarly, Esposito, Scibelli, and Vinciarelli (2016) found that individuals with MDD were less accurate than healthy controls in decoding emotional expressions of sadness, happiness, and surprise. In a systematic review, Schreiter, Pijnenborg, and Aan Het Rot (2013) found a negative association between depression and several forms of social cognitive ability, including theory of mind and empathic accuracy. In contrast to these results demonstrating impairment in social cognitive ability, Harkness, Sabbagh, Jacobson, Chowdrey, and Chen (2005) found a positive association between dysphoria, a broad factor that includes emotional and cognitive symptoms of depression (David Watson et al., 2007), and theory of mind in college undergraduates. Similarly, Wolkenstein, Schönenberg, Schirm, and Hautzinger (2011) found an interaction between group and valence, such that depressed individuals were more accurate in decoding negative mental states of others compared to healthy controls. Finally, others have found no association between depression and theory of mind (e.g., Derntl, Seidel, Schneider, & Habel, 2012; Thoma et al., 2011).

There is also existing research that suggests depression is related to higher levels of dispositional affective empathy (Derntl et al., 2012; Schreiter et al., 2013). In comparison, there is limited research examining depression and emotional congruence, with mixed findings. Schneider et al. (2012) found evidence that participants with MDD were less accurate than healthy controls in matching their own affective responses to targets. Regenbogen et al. (2015), on the other hand, found no group differences between participants with MDD and healthy controls in cognitive and affective responses to dynamic social stimuli.

One explanation for the mixed results of studies examining social anxiety and depression with social cognition may be that the majority of previous research has not included potentially relevant moderators. For example, anhedonia, or the tendency to experience reduced pleasure or joy in activities, is a symptom of MDD based on the *Diagnostic and Statistical Manual of Mental Disorders, Fifth edition* (American Psychiatric Association, 2013). Importantly, anhedonia has also been positively associated with social anxiety disorder (SAD; Watson, Clark, & Carey, 1988; Kashdan, 2007). Kashdan (2007) conducted a meta-analysis on 19 studies and found a negative correlation (r = -.36) between social anxiety and positive affect, which persisted when statistically covarying the presence of other psychiatric symptoms including depression (i.e., the correlation changed to, r = -.21). This association is specific to social anxiety, rather than other dimensions of anxiety, and is thought to involve the absence of resources (i.e., lack of energy from excessive self-focused attention and evaluation) necessary to attend to positive information in the environment (Kashdan, 2004). Socially anxious individuals may experience hedonic deficits due to their increased negative self-focus (i.e., cognitive biases), which may impede the ability to connect with and experience rewarding stimuli (Clark & Wells, 1995; Kashdan, 2002, 2004).

Findings from several studies point to a direct relation between anhedonia and empathic processes. For example, greater daily positive affect has been associated with higher levels of self-reported affective empathy (i.e., lower positive affect, or anhedonia, was associated with lower levels of affective empathy; Nezlek, Feist, Wilson, & Plesko, 2001). Similarly, Light, Moran, Zahn-Waxler, and Davidson (2019) found that greater pleasure capacity (i.e., less anhedonia) predicted greater positive-valence empathy (i.e., the tendency to share positive emotions with others). In addition, previous research has found a negative association between

social cognition and negative symptoms, including anhedonia, within other forms of psychopathology, such as schizophrenia (Penn, Sanna, & Roberts, 2008; Sergi et al., 2007). Thus, previous results showing lower empathy in individuals with higher levels of anhedonia, as well as the reduced attention to positive information that has been found in individuals with higher levels of social anxiety (Kashdan, 2004), suggest that social cognitive impairments associated with individuals with higher levels of social anxiety (or depression), could be exacerbated by higher levels of anhedonia. The potential moderating role of anhedonia on the association between social anxiety or depression and social cognitive ability is also particularly relevant in the context of emotional congruence, as the sharing of affect with another involves the generation of one's own affect in response. Since anhedonia involves the reduced ability to experience joy or pleasure, observing someone who is expressing joy or pleasure would likely result in experiencing less joy or pleasure in response, which would be less congruent.

Based on the common high negative and low positive affective profiles of social anxiety and depression (Kashdan, 2002), it is important to include depression as a covariate to assess whether the effect of social anxiety on emotional congruence exits above and beyond symptoms of depression (and vice versa). Indeed, after excluding SAD participants with comorbid depression, Morrison et al. (2016) no longer found a significant main effect of social anxiety on emotional congruence, highlighting the importance of including depressive symptoms as a covariate. Another relevant covariate to consider when examining the association between social anxiety or depression and social cognition is alexithymia, or the difficulty of identifying and describing one's own emotions. Alexithymia has been associated with deficits in processing emotional facial expressions (Grynberg et al., 2012), and emotion knowledge is inversely related to social anxiety (O'Toole et al., 2013) and depression (Bamonti et al., 2010; Honkalampi,

Hintikka, Laukkanen, & Viinamäki, 2001). The gender of perceivers has also been associated with differences in social cognitive ability and empathy (Christov-Moore et al., 2014) with females showing greater accuracy than males in recognition of emotional facial expressions (Babchuk, Hames, & Thompson, 1985; Thayer & Johnsen, 2000) and emotional body language (Johansson, 1973). Further, there is growing evidence that emotional contagion is more likely to occur among females (Doherty, Orimoto, Singelis, Hatfield, & Hebb, 1995; Magen & Konasewich, 2011), suggesting the relevance of gender in emotional congruence.

In the present study, our aims were to examine the association between: a) social anxiety symptoms and emotional congruence, b) the moderating role of valence on the association between social anxiety symptoms and emotional congruence, c) the moderating role of anhedonia on the association between social anxiety symptoms and emotional congruence for positive stimuli, d) depressive symptoms and emotional congruence, e) the moderating role of valence on the association between depressive symptoms and emotional congruence, and f) the moderating role of anhedonia on the association between depressive symptoms and emotional congruence for positive stimuli. Based on the shared cognitive biases (e.g., negative interpretation bias and negative self-focus) and affective profiles (i.e., high negative affect and low positive affect) among socially anxious and depressed individuals, as well as our recent findings showing a negative association between social anxiety and social cognitive ability (Alvi et al., 2020), we hypothesized that higher levels of social anxiety or depressive symptoms would be associated with decreased emotional congruence across all stimuli. Further, based on the findings of Morrison et al. (2016) we predicted that valence would moderate this association, such that higher levels of social anxiety or depression would have a greater negative association with positive stimuli compared to negative stimuli.

We also predicted that anhedonia would moderate the association between social anxiety or depression symptoms and emotional congruence for positive stimuli. Specifically, we predicted that higher levels of social anxiety or depression and higher levels of anhedonia would be associated with lower emotional congruence for positive stimuli. We also predicted that lower levels of social anxiety or depression and lower levels of anhedonia (i.e., the healthiest profile) would be associated with higher emotional congruence for positive stimuli. Finally, we hypothesized that higher levels of social anxiety or depression and lower levels of anhedonia (or lower levels of social anxiety or depression and higher levels of anhedonia) would be associated with lower emotional congruence (i.e., a weaker association than those with high levels of both social anxiety or depression and anhedonia). We expected significant moderation for positive stimuli due to anhedonia's specific impact on the experience of positive emotion and the need to generate positive affect in relation to positive video stimuli in our task to achieve higher levels of emotional congruence. Nonetheless, on an exploratory basis, separate post-hoc analyses were conducted for negative stimuli, in which we did not expect to find significant moderation based on the absence of evidence that anhedonia is associated with the interpretation and experience of negative emotions. Based on previous work demonstrating that the presence of anhedonia in social anxiety is not better explained by depressive symptoms (Kashdan, 2004), we hypothesized that these interactions would be significant when statistically controlling for depressive (or social anxiety) symptoms.

Methods

Participants

Six attention check items were included throughout the battery for validity checks. As in Alvi et al. (2020), participants were removed ($n = 4$) if they completed the online assessment too

quickly (i.e., less than 20 minutes). In addition, 3 participants were removed based on the validity check items. Participants with incomplete data (n = 7) were also removed. This resulted in the inclusion of 202 participants (68.2% female, age range = 18-29, M age = 19.77, SD = 1.75) from Southern Methodist University (SMU) in Dallas, Texas. Participants identified as White (76.6%), Asian (16.9%), Black or African American (2.5%), 'Other' (3.5%), and Native American or Alaska Native (0.5%). Outliers were removed from all variables prior to analyses such that scores below the 25th percentile – 1.5*(Interquartile range; IQR) and scores above the 75th percentile + 1.5*(IQR) were eliminated from analyses (Tukey, 1977). Following outlier identification, 10 data points were removed from the MASQ Anhedonic Depression variable, two data points from the MASQ General Depression variable, and 9-29 data points from the emotional congruence video task. Self-report measures were completed online, and the emotional congruence video task was completed in a laboratory session. Participants also completed a task in which they were asked to listen to music clips and rate their emotional experiences, but this is unrelated to the present study. Participants who completed some or all aspects of the study were awarded course credit. The study was approved by the SMU Institutional Review Board and informed consent was obtained from all participants.

Measures

Social anxiety. Participants completed the Social Phobia Scale (SPS; Mattick & Clarke, 1998), Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998), and Leibowitz Social Anxiety Scale (LSAS; Liebowitz, 1987). The SPS is a 20-item self-report measure that assesses fear of evaluation during routine activities. Example items include "I become anxious if I have to write in front of other people" and "When in an elevator, I am tense if people look at me." Participants were asked to rate the degree to which the statements are characteristic of them.

Items were rated on a 5-point Likert scale (1 = *not at all* and 5 = *extremely*). SPS scores were summed to create the total SPS score, with higher scores reflecting greater levels of social anxiety. The SPS has good concurrent validity and internal consistency (α = .95 in the current sample) (Osman, Gutierrez, Barrios, Kopper, & Chiros, 1998). The SIAS is a 20-item self-report measure that assesses fear of general social interactions. Example items include "I get nervous if I have to speak to someone in authority" and "I have difficulty talking with other people." Participants were asked to rate the degree to which statements are characteristic of them. Items were rated on a 5-point Likert scale (1 = *not at all* and 5 = *extremely*). SIAS scores were summed to create the total SIAS score, with higher scores reflecting greater levels of social anxiety. The SIAS also has good concurrent validity and internal consistency (α = .94 in the current sample) (Osman et al., 1998). The LSAS is a 24-item self-report measure of fear and avoidance of social situations. Example items include "Meeting strangers" and "Giving a party." Participants were asked to rate their fear in each situation on a 4-point Likert scale (0 = *none* and 3 = *severe*). They were also asked to rate their avoidance of each situation on a 4-point Likert scale with 0 being *never* and 3 being *usually.* LSAS scores were summed to create the total LSAS scores, with higher scores reflecting greater levels of social anxiety. The LSAS has good convergent validity and internal consistency (α = .96 in the current sample) (Baker, Heinrichs, Kim, & Hofmann, 2002). The SPS, SIAS, and LSAS demonstrated good convergent validity (i.e., the three measures are measuring the same construct) with correlations between .74 - .76. Based on these correlations and the different aspects of social anxiety assessed, the three scales were standardized and averaged, as in Craske et al. (2014), to create a social anxiety composite *(composite reliability* = .98; Nunnally & Bernstein, 1994).

Depressive and anhedonic symptoms. Participants completed the General Distress: Depressive Symptoms and Anhedonic Depression subscales of the Mood and Anxiety Symptom Questionnaire (MASQ; Watson & Clark, 1991) to assess depressive and anhedonic symptoms. The MASQ General Distress: Depressive Symptoms subscale consists of 12 items that assess depressed mood. Participants were asked to rate the extent to which they have experienced different items on a 5-point Likert scale (1 = *not at all* and 5 = *extremely*). Example items include "felt hopeless" and "felt sluggish or tired." The MASQ Anhedonic Depression subscale consists of 21 items that assess loss of interest and low positive affect. Participants used the same rating scale described above. Example items include "Felt like nothing was very enjoyable" and "Felt like there wasn't anything interesting for fun to do." MASQ items were averaged, for each respective scale, to create the total MASQ subscale scores, with higher scores reflecting greater levels of depression and anhedonia. The MASQ has good convergent and discriminant validity, as well as good internal consistency (α = .92- 94 in the current sample) (Watson & Clark, 1991). The two subscales are moderately correlated (r = .53) indicating that the constructs are related, but distinct.

Alexithymia. Participants completed the Toronto Alexithymia Scale (TAS-20; Bagby, Parker, & Taylor, 1994) to assess levels of alexithymia. Alexithymia was included as a statistical covariate to account for individuals' difficulty identifying and describing emotions based on the inverse relation between emotion knowledge and social anxiety (O'Toole et al., 2013), as well as the positive association between alexithymia and depression (Bamonti et al., 2010; Honkalampi et al., 2001). The TAS-20 is a 20-item self-report measure that assesses levels of alexithymia. Example items include "I am often confused about what emotion I am feeling" and "I have feelings that I can't quite identify." Participants were asked to rate the extent to which they agree

or disagree with each statement on a 5-point Likert scale (1 = *strongly disagree* and 5 = *strongly agree*). TAS-20 items were summed to create a total TAS-20 score, with higher scores reflecting greater levels of alexithymia. The TAS-20 has good convergent and criterion validity, as well as good internal consistency ($\alpha = .87$ in the current sample) (Bagby et al., 1994; G. J. Taylor, Bagby, & Parker, 1992).

Emotional congruence. Emotional congruence was assessed through a modified version of an Empathic Accuracy Video Task developed by Kern et al. (2013), which consisted of 8 video clips (4 positive and 4 negative; 2-2.5 minutes each). In each clip, an individual (the "target") was taped while he or she discussed a positive or negative autobiographical event. After the videos were filmed, the targets provided a continuous rating of their own emotions while watching their videos and completed the Berkeley Expressivity Questionnaire (BEQ; Gross, 2000). The BEQ is a 10-item self-report questionnaire that assesses individuals' general level of emotion expressivity. This measure was included based on previous research associating greater target expressivity with increased accuracy among perceivers (Zaki et al., 2008). In the current study, participants watched the videos in random order and were asked to continuously rate how they were feeling on a moment to moment basis (as in Morrison et al., 2016) on a 9-point scale (1= *extremely negative*; 9= *extremely positive*) using the left and right arrow keys on the keyboard using MediaLab (Version 2008.1.13; Empirisoft Corporation; New York, NY). The selected number on the 9-point scale remained highlighted so participants could monitor their ratings. Correlations between target's and participant's ratings were captured in 2-second epochs throughout the clip. Accuracy scores were then calculated as the mean correlation per video (for additional details see Kern et al., 2013).

Statistical Analysis

Multilevel modeling was used to account for repeated assessments within participants and differences in target expressivity across videos. The level-1 (within-person) model estimated within-person emotional congruence scores, controlling for video order, valence, and target expressivity. The level-2 (between-person) model provided the average emotional congruence score, with added predictors to assess differences between participants. First, social anxiety symptoms were added as a predictor at level 2, along with covariates of depressive symptoms and alexithymia to assess the extent to which social anxiety symptoms predicted emotional congruence and the extent to which this association was moderated by valence. In a separate analysis, social anxiety symptoms were added as a predictor at level 2, along with covariates including depressive symptoms, alexithymia, anhedonia, as well as the interaction between social anxiety symptoms and anhedonia, in the prediction of emotional congruence for positive stimuli only. This allowed us to examine the extent to which social anxiety symptoms predicted emotional congruence for positive stimuli and if this association was moderated by anhedonia.

Similarly, depressive symptoms were added as a predictor at level 2, along with social anxiety symptoms and alexithymia as covariates to assess the extent to which it predicts emotional congruence and if the association is moderated by valence. In a separate analysis, depressive symptoms were added as a predictor at level 2, along with covariates social anxiety symptoms, alexithymia, anhedonia, as well as the interaction between depressive symptoms and anhedonia, along with the outcome variable of the emotional congruence score for positive stimuli only. Sex was considered as a covariate in preliminary analyses but was removed after no sex differences were shown. Posthoc exploratory analyses were run to examine the interaction between social anxiety (or depressive) symptoms and anhedonia for negative stimuli.

Based on prior research showing a medium effect size (d = .55), we conducted a post-hoc power analysis using the MLM power analysis program PinT 2.12 (Power in Two-Level Models; Snijders & Bosker, 1993), which indicated that we had greater than .80 power to detect the same sized effect for the main effect of individual characteristics (i.e., social anxiety and depressive symptoms) on emotional congruence. Power to detect small effect sizes for cross-level interactions (i.e., social anxiety symptoms x valence or depressive symptoms x valence) and level-2 interactions (i.e., social anxiety symptoms x anhedonia or depressive symptoms x anhedonia) were also greater than .80. Effect sizes were calculated using the *t*-to-*d* transformation to yield an approximate Cohen's *d* effect size for all *t* statistics. FDR correction for three tests (i.e., the main effect of social anxiety on emotional congruence, the interaction effect of social anxiety and valence on emotional congruence, and the interaction effect of social anxiety and anhedonia on emotional congruence for positive stimuli; the same correction was applied to tests with depression, rather than social anxiety, as the primary predictor) was implemented to account for multiple testing (Benjamini & Hochberg, 1995).

Results

Preliminary Analyses

As shown in Table 1, there were no sex differences in major study variables. Thus, sex was not included in analyses. Using cutoff scores recommended by Mennin et al. (2002) for the LSAS, 21% of the sample fell into the clinical range for social anxiety. This represents a higher point-prevalence rate than the 13% found in other college samples (Spokas & Heimberg, 2008). In the current sample, 10.9% of participants reported clinical levels of anhedonia, using cut-off scores proposed by Buckby, Yung, Cosgrave, and Killackey (2007) that allow for the discrimination of mood disorders. In addition, 17.3% reported high levels of alexithymia, using

cut-off scores suggested by Parker, Taylor, and Bagby (1993), which is greater than the reported prevalence rates of 10% in general populations (Mattila, Salminen, Nummi, & Joukamaa, 2006; Salminen, Saarijärvi, Äärelä, Toikka, & Kauhanen, 1999).

Although there was not a significant correlation between depressive symptoms and emotional congruence (r = .04, p = .08), a significant, negative correlation between social anxiety symptoms and emotional congruence (r = -.15, p < .01) confirms the negative association we predicted. Moderate correlations between social anxiety and anhedonia (r = .44, p < .01) and between depression and anhedonia (r = .53, p < .01), shown in Table 2, confirm previous work demonstrating these positive associations (Kashdan, 2007; Watson & Clark, 1991). Similarly, correlations between social anxiety and alexithymia (r = .49, p < .01) and between depression and alexithymia (r = .37, p < .01) confirm the positive relation between constructs (Bamonti et al., 2010; Honkalampi, Hintikka, Laukkanen, & Viinamäki, 2001; O'Toole et al., 2013). Further, the small negative correlation between alexithymia and emotional congruence (r = -.12, p < .01) supports similar findings demonstrating negative associations between alexithymia and social cognition (Grynberg et al., 2012). Across all stimuli, participants scored an average of .70 on the emotional congruence task (i.e., people had a 70% congruence rate of matching their affective responses with the targets in the videos), which falls within the range reported by Morrison et al. (2016).

Analyses with Social Anxiety Symptoms

As shown in Table 3, there was no main effect of social anxiety symptoms on emotional congruence across all stimuli, b = -.010, SE = .006, p = .113, d = .228, when including participants' depressive symptoms and alexithymia, as well as target expressivity and the order of videos as covariates. In addition, no main effects were found for depressive symptoms, b =

.001, *SE* = .006, *p* = .854, *d* = .026 or alexithymia, *b* = .001, *SE* = .005, *p* = .876, *d* = .022 in this model. The interaction between social anxiety symptoms and emotional valence of videos, *b* = .001, *SE* = .004, *p* = .817, *d* = .033, was also not significant.

When examining the association between social anxiety, anhedonia, and emotional congruence for positive stimuli, no main effects were found for anhedonia, *b* = -.014, *SE* = .011, *p* = .228, *d* = .180, depressive symptoms, *b* = .012, *SE* = .010, *p* = .221, *d* = .182, or alexithymia, *b* = .009, *SE* = .008, *p* = .295, *d* = .156 (see Table 4). The interaction between social anxiety symptoms and anhedonia was significant in predicting emotional congruence for positive stimuli when including the covariates, *b* = .065, *SE* = .033, *p* = .047, *d* = .297. Therefore, we investigated the interaction effect of social anxiety symptoms and anhedonia on emotional congruence for positive stimuli through an analysis of simple slopes. Counter to hypotheses, a significant negative association was found between social anxiety and emotional congruence for individuals with lower levels of anhedonia (i.e., -1 SD below the mean level of anhedonia), *b* = -.142, SE = 0.070, *p* = .041, but not for those with higher levels of anhedonia (+1 SD above the mean level of anhedonia), *b* = -0.013, *SE* = 0.011, *p* = .223, as shown in Figure 1. However, following multiple test correction (i.e., using the FDR corrected significance level of .017), the interaction effect of social anxiety symptoms and anhedonia did not maintain significance.

Analyses with Depressive Symptoms

As shown in Table 5, no main effect of depressive symptoms on emotional congruence, across all stimuli, was found, *b* = .002, *SE* = .006, *p* =.795, *d* = .037, when including participants' social anxiety symptoms, alexithymia, target expressivity, and the order of videos as covariates. There were also no main effects of social anxiety symptoms, *b* = -.010, *SE* = .006, *p* = .086, d = .247, or alexithymia, *b* = -.001, *SE* = .005, *p* = .879, *d* = .022 in this model. The interaction

between depressive symptoms and emotional valence of videos was also not significant, b = .002, SE = .004, p = .703, d = .054.

As shown in Table 6, no main effects were found for anhedonia b = -.030, SE = .022, p = .184, d = .198, social anxiety symptoms, b = -.012, SE = .011, p = .294, d = .157, or alexithymia, b = .009, SE = .009, p = .304, d = .156 when examining positive stimuli only. The interaction between depressive symptoms and anhedonia was also not significant in predicting emotional congruence for positive stimuli when including the covariates, b = .032, SE = .050, p = .525, d = .095.

Exploratory Analyses

Exploratory analyses were performed to determine whether social anxiety and depressive symptoms significantly predicted emotional congruence across all stimuli without the inclusion of covariates. There was a marginal main effect of social anxiety symptoms on emotional congruence, b = -.009, SE = .005, p = .061, d = .267 (as shown in Supplemental Table 1), but no main effect of depressive symptoms on emotional congruence, b = -.005, SE = .006, p = .334, d = .069 (as shown in Supplemental Table 2).

Additional exploratory analyses were also performed to determine whether the interaction between social anxiety symptoms and levels of anhedonia predicted emotional congruence for negative stimuli. As expected, the interaction was not significant, b = .002, SE = .007 p = .806, d = .036 (as shown in Supplemental Table 3). Similarly, the interaction between depressive symptoms and levels of anhedonia did not predict emotional congruence of negative stimuli, b = .001, SE = .007, p = .902, d = .018 (as shown in Supplemental Table 4).

Discussion

The present study sought to build on previous findings demonstrating an association between social anxiety, depression, and emotional congruence using a dimensional assessment of symptoms. Results showed that our hypotheses were not confirmed: Although there was a weak correlation between social anxiety symptoms and emotional congruence, this association did not hold after controlling for other variables. There was also no significant association between depressive symptoms and emotional congruence. Further, neither emotional valence of stimuli nor levels of anhedonia significantly moderated the associations following multiple test correction.

These results appear to be in contrast to the findings of Morrison et al. (2016) in which individuals with SAD exhibited less emotional congruence for positive stimuli than healthy controls. There are several methodological differences that may help to explain these contrasting findings. First, Morrison et al. (2016) did not include target expressivity and depressive symptoms as covariates in their analyses, and after excluding SAD participants with comorbid MDD, the authors found the main effect of group and the group x valence interaction was no longer significant. This latter finding aligns more closely with our results. Also, Morrison et al. (2016) included fewer stimuli (5 videos vs. 8 videos in the present study) and a smaller sample size (64 participants vs. 203 participants in the present study), which may have increased variability in participant responses.

To try and explain why individuals with SAD showed reduced emotional congruence for positive stimuli compared to healthy controls, Morrison et al. (2016) conducted mediation analyses and included negative and positive affect, clarity of emotions (i.e., the ability to identify one's own emotions), attention to emotions, and interpersonal perceptions as potential mediators.

Of these, the authors found clarity of emotions (i.e., alexithymia) and negative interpersonal perceptions (i.e., perceived similarity to and likeability of the target and perceived importance of target's story) to be significant mediators of the effect of group on emotional congruence. Because mediation requires time-ordering of variables, and trait-level variables conceptually precede predictors and outcomes (Tate, 2015), the variables that were measured as states (e.g., real-time affective states) in Morrison et al. (2016) may have been better suited as potential moderators (as anhedonia was in the present study) or covariates (as alexithymia was in the present study).

Although the interaction effect of social anxiety symptoms and anhedonia on emotional congruence for positive stimuli did not maintain significance following multiple-test correction, the pattern of the interaction showed that social anxiety symptoms were negatively related to emotional congruence for positive social information among individuals with lower levels, but not higher levels, of anhedonia. This pattern of nominal results contradicted our hypothesis that the negative association between social anxiety and emotional congruence would be strengthened by higher, rather than lower, levels of anhedonia. Further examination of this interaction showed that among individuals with lower levels of social anxiety, greater emotional congruence was found when anhedonia was lower compared to higher. In contrast, no significant difference in emotional congruence was found among individuals with higher levels of social anxiety who had lower vs. higher levels of anhedonia. This suggests that there was no difference in emotional congruence among individuals with higher levels of social anxiety (i.e., at 1 SD above the mean level of social anxiety) compared to those with lower levels of social anxiety (i.e., at 1 SD below the mean level of social anxiety). Nonetheless, future research is needed to determine if this pattern of results remains consistent in alternative samples.

In interpreting the present findings related to anhedonia, it is important to note that Morrison et al. (2016) and others (e.g., Craske et al., 2019) often use measures of positive affect (i.e., PANAS) to assess this construct. In the present study, there was a moderate correlation between the MASQ anhedonic depression subscale and positive affect (r = -.30) as measured by the Positive and Negative Affect Schedule (PANAS-X; Watson & Clark, 1994), suggesting that these are related but not identical constructs based on guidelines requiring correlations of .70 - .80 to establish convergent validity (Watson, 2012). As mentioned, anhedonia refers to the tendency to experience reduced pleasure in activities (American Psychiatric Association, 2013). Measures of positive affect assess an individual's current affective state, but may not reflect the reduction of pleasure in activities that were once pleasurable to an individual. It is possible that an anhedonic individual may not look forward to things with enjoyment (i.e., an item asked on the MASQ; Watson & Clark, 1991), but still feel alert and attentive (i.e., items on the PANAS; Watson & Clark, 1994). This discrepancy may explain the moderate correlation between the measures in the current study and highlight the potential benefit of using the MASQ as a measure of anhedonia.

The present findings suggest that the negative association between social anxiety and empathic accuracy that we found in our previous study (Alvi et al., 2020) does not extend to emotional congruence. Affective empathic processes, such as emotional contagion, are thought to be primitive and involuntary (Hatfield et al., 1992; Singer & Lamm, 2009). Cognitive processes, on the other hand, require self-awareness and self/other distinction (de Vignemont & Singer, 2006; Singer & Lamm, 2009), which is reflected in the empathic accuracy task (i.e., the task requires participants to determine the affective state of a target individual, rather than reporting participants own responses). Thus, although the former process may be automatic and

reflexive, the latter involves complex cognitive processes, such as contextual appraisal. The distinction between these two processes is also reflected at the neural level. Affective empathy (i.e., emotional congruence) involves the mirror neuron system, a system in the inferior frontal gyrus that is automatically activated in response to others' actions and emotions (Can, Iacoboni, Dubeau, Mazziotta, & Lenzi, 2003; Shamay-Tsoory, Aharon-Peretz, & Perry, 2009). Cognitive empathic systems, however, have been associated with ventromeidal prefrontal cortices (Shamay-Tsoory et al., 2009). Therefore, based on the cognitive models of social anxiety and depression (Beck, 2011; Clark & Wells, 1995), individuls with these disorders may have impairment in social cognitive ability that requires these complex cognitive processes (e.g., empathic accuracy), rather than primitive and involuntary processes (e.g., emotional congruence).

The differences between the association of social anxiety on empathic accuracy and emotional congruence may also be explained by the temporal course of cognitive and affective processes in empathic responding. In an event-related potential (ERP) study, Fan and Han (2008) found the affective process involved in empathy for pain preceded the cognitive process in which contexual information is processed. Similarly, others have found earlier ERPs correlated with affect sharing (Cheng, Chen, & Decety, 2014; Decety, Yang, & Cheng, 2010) and later ERPs were associated with mentalizing (i.e., cognitive empathy; Sessa, Meconi, & Han, 2014). These findings may help explain the differences in cognitive and affective responding in indviduals with higher levels of social anxiety and depression. Although SAD and MDD are characterized by cognitive biases in interpretation and attention (LeMoult & Gotlib, 2018; Andrew Mathews & MacLeod, 2005; Musa & Lépine, 2000), individuals with these disorders may not differ in their

initial affective responses since these cognitive biases are engaged during the latter process of cognitive appraisal (Fan & Han, 2008; Sessa, Meconi, & Han, 2014).

Distinctions between cognitive and affective empathic processes may be useful for clinicians to consider in treatment of individuals with SAD or MDD. Based on the lack of association between emotional congruence (i.e., affective empathy) and social anxiety or depressive symptoms, results from the present study in combination with our previous report (Alvi et al., 2020) underscore the benefit of focusing on cognitive processes (e.g., cognitive appraisal) in treatment. This approach is reflected in the cognitive model of mental illness, which posits that individuals' emotions and behaviors are influenced by their thoughts and perceptions (Beck, 2011). With this understanding, clinical intervention at a cognitive level may alleviate impairment in both cognitive and affective empathic processes.

Together, these findings highlight the distinction between cognitive and affective processes in behavioral assessments of empathy for individuals with symptoms of social anxiety or depression. Although social anxiety symptoms are negatively associated with performance on higher-level social cognitive tasks (e.g., theory of mind) that focus on inferring other's mental states and feelings (Alvi et al., 2020; Hezel & McNally, 2014), they may be less relevant for measures of lower-level social cognition (i.e., affective empathy). Strengths of the current study include the large sample size and power to detect medium-sized effects (as well as greater confidence in interpreting a null effect), and dimensional assessment of social anxiety and depression. An additional strength of the current study is the inclusion of relevant covariates including alexithymia, target expressivity, and depression (or social anxiety when examining depression). These variables are related to performance on measures of social cognitive ability and emotional congruence, and previous findings may have been driven by the unaccounted

effects of these variables. Although previous work has examined the association between levels of social anxiety and/or depression and trait-level affective empathy, few studies have utilized behavioral measures of emotional congruence. Given the lack of correlation between dispositional and behavioral measures of empathy (e.g., Lee, Zaki, Harvey, Ochsner, & Green, 2011), future research should continue to utilize real-time assessment of empathic processes.

In addition to several strengths, the present study also has several important limitations. Although dimensional assessment of social anxiety and depression allows for variance in symptoms, these results may not generalize to clinical samples. Future studies should assess emotional congruence in samples with clinical diagnoses of SAD and MDD, or higher levels of anhedonia, to determine whether results are replicated. It may also be beneficial to conduct longitudinal studies with clinical samples to determine whether social cognitive processes, particularly affective processes, such as emotional congruence, are associated with changes in symptom severity. Longitudinal studies may help clarify whether these affective processes are stable or state-like.

An additional limitation of the present study is that results from student samples cannot be generalized to the general public due to variability of student attitudes and traits across settings (Hanel & Vione, 2016). These variables, particularly personality differences, also have significant variability between college sites (Corker, Donnellan, Kim, Schwartz, & Zamboanga, 2017), suggesting that these findings may not extend to general college populations either. Although psychological research largely includes samples similar to the present sample (e.g., White, primarily female, college students), this particular population is often an outlier in comparison to populations globally, thus unrepresentative of the general human experience

(Henrich, Heine, & Norenzayan, 2010). Cultural aspects of stimuli are also important to consider in their potential impact on results.

Various forms of emotion recognition processes, including those relevant for emotional congruence tasks, are impacted by target and perceiver cultural identities (Elfenbein & Ambady, 2002; Weathers, Frank, & Spell, 2002). In a meta-analysis, Elfenbein and Ambady (2002) found emotion recognition accuracy to be greater when target and perceivers were of the same national, ethnic, or regional group. Weathers et al. (2002) also found facial expression recognition to be greater for individuals when presented with stimuli from the same ethnic group, suggesting an in-group cultural advantage. In a study examining the role of culture in emotional empathy (i.e., emotional congruence), Soto and Levenson (2009) found greater physiological linkage (i.e., similarity between raters' and target's physiological responses) for Chinese Americans when rating targets of the same ethnicity. Together, these findings suggest that culture and diversity of both samples and stimuli are relevant in research of emotional congruence. Future research should include diverse, clinical samples to address these limits of generalizability. Finally, prospective studies should also explore potential mediators (e.g., real-time affective states) and additional moderators that may affect the association between symptoms of depression and/or social anxiety, levels of anhedonia, and emotional congruence.

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Table 1

Sex Differences for Major Study Variables

	Male	**Female**	**Comparing Males vs. Females**
	M (SD)	**M (SD)**	***t*-statistic**
Social Anxiety	.03 (.91)	-.01 (1.01)	.25
SIAS	29.92 (15.69)	28.45 (16.95)	.59
LSAS	37.48 (25.13)	37.25 (26.80)	.06
SPS	21.53 (15.45)	20.65 (16.60)	.36
Depression	2.10 (.84)	2.17 (.93)	-.48
Anhedonia	2.64 (.66)	2.55 (.63)	.87
Alexithymia	48.14 (10.56)	46.02 (12.63)	1.16
Positive Affect	2.88 (.79)	2.65 (.80)	5.32**
Negative Affect	1.35 (.37)	1.33 (.46)	.86

Note. **$p < .01$. Social Anxiety = Social anxiety composite scor

Table 2

Correlations Between Major Study Variables

Variables	*M*	*SD*	1	2	3	4	5	6	7	8	9
1. LSAS	37.18	26.17	-								
2. SPS	20.90	16.13	.760**	-							
3. SIAS	28.80	16.52	.738**	.757**	-						
4. Social Anxiety	-.002	.98	.911**	.916**	.914**	-					
5. Depression	2.14	.90	.529**	.553**	.543**	.598**	-				
6. Anhedonia	2.57	.64	.346**	.379**	.464**	.443**	.526**	-			
7. Alexithymia	46.59	12.07	.367**	.453**	.479**	.486**	.372**	.466**	-		
8. EC (pos)	.73	.15	-.139**	-.099**	-.069**	-.098**	-.012	-.046	-.103**	-	
9. EC (neg)	.67	.08	-.177**	-.126**	-.128**	-.145**	-.047	-.118**	-.024	.072**	-
10. EC (total)	.70	.08	-.208**	-.135**	-.129**	-.153**	-.044	-.108**	-.122**	.858**	.523**

Note. *$p < .05$. **$p < .01$. Social Anxiety = Social anxiety composite score. EC = Emotional congruence.

Table 3

Results from HLM Analysis: Social Anxiety Symptoms Predicting Emotional Congruence

Fixed Effects	***b***	***SE***	***p*-value**
Level 1			
Intercept	.700	.006	.000
Order	.029	.004	.000
Valence	.133	.005	.000
Expressivity	.153	.009	.000
Level 2			
Social Anxiety	-.010	.006	.113
Social Anxiety x Valence	.001	.004	.817
Depression	.001	.006	.854
Alexithymia	-.001	.005	.876
Random Effect	**Variance Component**	***SD***	***p*-value**
Level 2			
Intercept	.003	.058	.000
Order	.000	.004	>.500
Valence	.000	.006	>.500
Expressivity	.077	.088	.000

Note. Parameter estimates were based on the fixed effects model with robust standard errors. Original p-values (i.e., before FDR correction) are reported.

Table 4

Results from HLM Analysis: Social Anxiety Symptoms Predicting Emotional Congruence for Positive Stimuli

Fixed Effects	***b***	***SE***	***p*-value**
Level 1			
Intercept	.735	.010	.000
Order	-.002	.009	.817
Expressivity	.092	.009	.000
Level 2			
Social Anxiety	-.078	.038	.041
Anhedonia	-.014	.011	.228
Anhedonia x Social Anxiety	.065	.033	.047
Depression	.012	.010	.221
Alexithymia	.009	.008	.295
Random Effect	**Variance Component**	***SD***	***p*-value**
Level 2			
Intercept	.013	.113	.000
Order	.003	.057	.328
Expressivity	.007	.083	.155

Note. Parameter estimates were based on the fixed effects model with robust standard errors. Original p-values (i.e., before FDR correction) are reported.

Table 5

Results from HLM Analysis: Depressive Symptoms Predicting Emotional Congruence

Fixed Effects	***b***	***SE***	***p*-value**
Level 1			
Intercept	.701	.006	.000
Order	.029	.004	.000
Valence	.133	.005	.000
Expressivity	.153	.009	.000
Level 2			
Social Anxiety	-.010	.006	.086
Depression	.002	.006	.795
Depression x Valence	.002	.004	.703
Alexithymia	-.001	.005	.879
Random Effect	**Variance Component**	***SD***	***p*-value**
Level 2			
Intercept	.003	.059	.000
Order	.000	.004	>.500
Valence	.000	.007	>.500
Expressivity	.077	.088	.000

Note. Parameter estimates were based on the fixed effects model with robust standard errors. Original p-values (i.e., before FDR correction) are reported.

Table 6

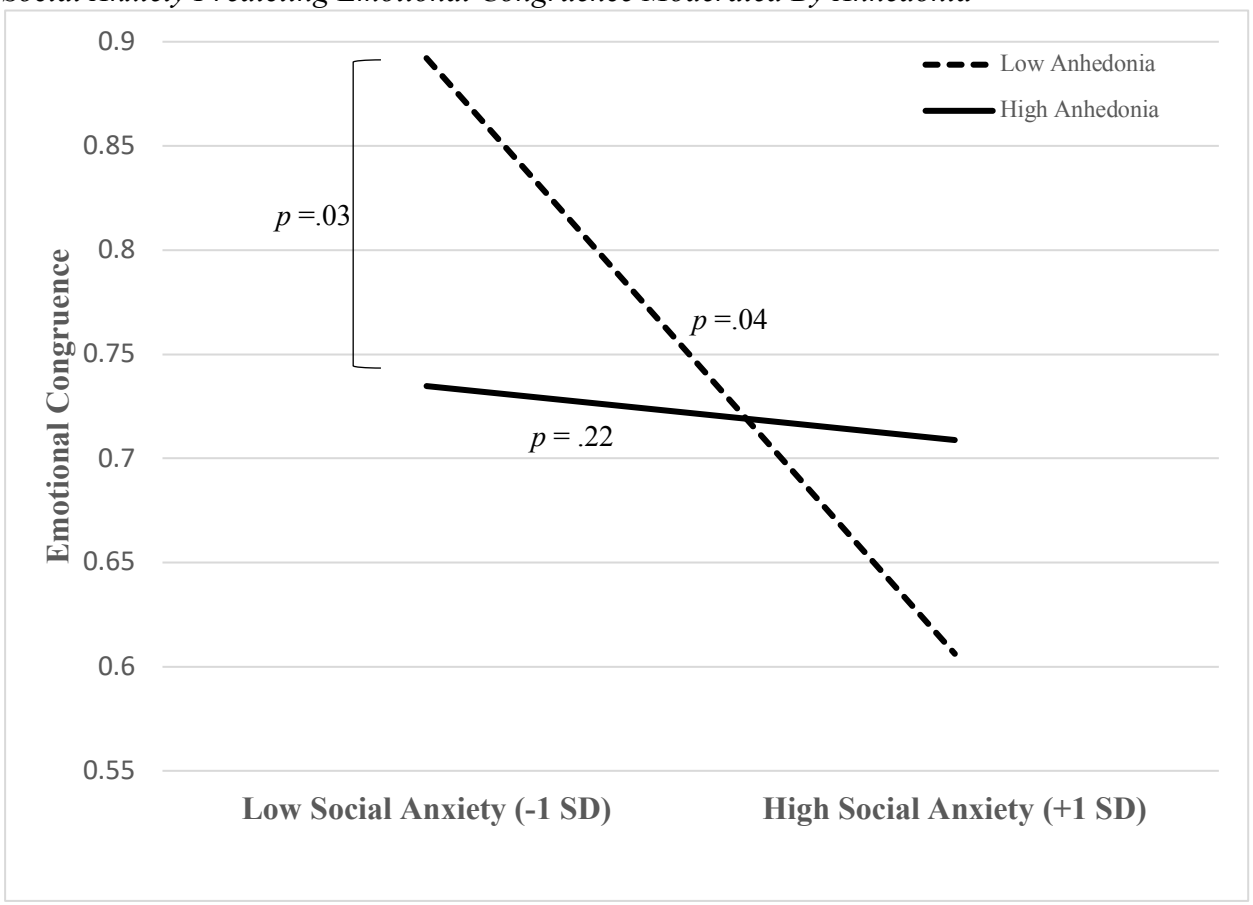
Results from HLM Analysis: Depressive Symptoms Predicting Emotional Congruence for Positive Stimuli

Fixed Effects	***b***	***SE***	***p*-value**
Level 1			
Intercept	.736	.010	.000
Order	-.002	.009	.782
Expressivity	.092	.009	.000
Level 2			
Depression	-.010	.036	.767
Anhedonia	-.030	.022	.184
Anhedonia x Depression	.032	.050	.525
Social Anxiety	-.012	.011	.294
Alexithymia	.009	.009	.304
Random Effect	**Variance Component**	***SD***	***p*-value**
Level 2			
Intercept	.013	.114	.000
Order	.003	.056	.336
Expressivity	.007	.083	.161

Note. Parameter estimates were based on the fixed effects model with robust standard errors. Original p-values (i.e., before FDR correction) are reported.

Figure 1

Social Anxiety Predicting Emotional Congruence Moderated By Anhedonia



Note. This figure depicts the interaction between social anxiety and anhedonia in predicting emotional congruence for positive stimuli.

Supplemental Table 1

Results from HLM Analysis: Social Anxiety Symptoms Predicting Emotional Congruence Without Covariates

Fixed Effects	***b***	***SE***	***p*-value**
Level 1			
Intercept	.701	.006	.000
Order	.012	.002	.000
Valence	.266	.009	.000
Expressivity	.256	.014	.000
Level 2			
Social Anxiety	-.009	.005	.061
Social Anxiety x Valence	.002	.008	.812
Random Effect	**Variance Component**	***SD***	***p*-value**
Level 2			
Intercept	.003	.058	.000
Order	.000	.002	>.500
Valence	.000	.013	>.500
Expressivity	.021	.145	.000

Note. Parameter estimates were based on the fixed effects model with robust standard errors. Original p-values (i.e., before FDR correction) are reported.

Supplemental Table 2

Results from HLM Analysis: Depressive Symptoms Predicting Emotional Congruence Without Covariates

Fixed Effects	***b***	***SE***	***p*-value**
Level 1			
Intercept	.701	.006	.000
Order	.013	.002	.000
Valence	.266	.009	.000
Expressivity	.255	.014	.000
Level 2			
Depression	-.005	.006	.334
Depression x Valence	.003	.009	.727
Random Effect	**Variance Component**	***SD***	***p*-value**
Level 2			
Intercept	.004	.059	.000
Order	.000	.002	>.500
Valence	.000	.013	>.500
Expressivity	.021	.146	.000

Note. Parameter estimates were based on the fixed effects model with robust standard errors. Original p-values (i.e., before FDR correction) are reported.

Supplemental Table 3

Results from HLM Analysis: Social Anxiety Symptoms Predicting Emotional Congruence for Negative

Fixed Effects	***b***	***SE***	***p*-value**
Level 1			
Intercept	.672	.005	.000
Order	.037	.004	.000
Expressivity	.222	.008	.000
Level 2			
Social Anxiety	-.011	.007	.138
Anhedonia	-.006	.007	.375
Anhedonia x Social Anxiety	.002	.007	.806
Depression	.003	.007	.690
Alexithymia	.004	.006	.521
Random Effect	**Variance Component**	***SD***	***p*-value**
Level 2			
Intercept	.000	.002	.261
Order	.000	.001	>.500
Expressivity	.000	.002	>.500

Stimuli

Note. Parameter estimates were based on the fixed effects model with robust standard errors. Original p-values (i.e., before FDR correction) are reported.

Supplemental Table 4

Results from HLM Analysis: Depressive Symptoms Predicting Emotional Congruence for Negative Stimuli

Fixed Effects	***b***	***SE***	***p*-value**
Level 1			
Intercept	.672	.005	.000
Order	.037	.004	.000
Expressivity	.222	.008	.000
Level 2			
Depression	.003	.008	.707
Anhedonia	-.007	.007	.365
Anhedonia x Depression	.001	.007	.902
Social Anxiety	-.011	.007	.130
Alexithymia	.004	.006	.527
Random Effect	**Variance Component**	***SD***	***p*-value**
Level 2			
Intercept	.000	.002	.264
Order	.000	.001	>.500
Expressivity	.000	.002	>.500

Note. Parameter estimates were based on the fixed effects model with robust standard errors. Original p-values (i.e., before FDR correction) are reported.