



Published in final edited form as:

*Schizophr Res.* 2010 December ; 124(1-3): 66–73. doi:10.1016/j.schres.2010.06.012.

## Is Social Anhedonia related to Emotional Responsivity and Expressivity? A laboratory study in Women

Winnie W. Leung<sup>a,1</sup>, Shannon M. Couture<sup>a,\*</sup>, Jack J. Blanchard<sup>a</sup>, Stephanie Lin<sup>a</sup>, and Katiah Llerena<sup>a</sup>

<sup>a</sup>University of Maryland, Department of Psychology, 1123 Biology-Psychology Building, College Park, MD 20742, USA

### Abstract

Social anhedonia is an important feature of schizophrenia and it is a promising indicator of schizotypy. Although social anhedonia is defined as an affective construct (less pleasure derived from social encounters), little is known about the emotional responsivity and expressivity of individuals with high levels of social anhedonia. After screening a large sample of female undergraduate students (N = 1 085), a cohort of psychometrically identified individuals with high levels of social anhedonia (n = 34) and normally hedonic controls (n = 45) participated in laboratory assessments involving trait affectivity, self-reported dispositional emotional expressiveness, and the expression and experience of emotion in response to neutral, nonaffiliative (i.e., comedy) and affiliative film clips. Results revealed that individuals with high levels of social anhedonia are characterized by lower positive affect, both as a trait and in response to emotionally evocative stimuli, and are less facially expressive, both by their own self-report and in response to film clips. Attenuated positive affect was observed across film stimuli, indicating a general reduction in affective response rather than a specific decrease in responsivity for affiliative stimuli. Future work should continue to investigate whether there is a unique role for social stimuli in the emotional lives of individuals with high levels of social anhedonia or whether these individuals tend to experience anhedonia more broadly regardless of social context.

### Keywords

social anhedonia; emotion experience; emotion expression; evocative stimuli; females

### 1. Introduction

Disturbances in the experience and expression of emotion have long been considered prominent features of schizophrenia (Bleuler, 1919/1950; Kraepelin, 1919/1971). Reflecting these early observations, contemporary assessments of symptomatology within schizophrenia include reduced hedonic capacity (anhedonia) and blunted affect (Andreasen, 1983; Kay et al., 1987). Moreover, a wide range of studies utilizing self-report instruments have provided evidence that, compared to healthy controls, individuals with schizophrenia report high trait anhedonia

© 2010 Elsevier B.V. All rights reserved.

\*Corresponding author. Tel: 301-405-7190; Fax: 301-314-9566; scouture@psyc.umd.edu.

<sup>1</sup>Present address: Lieber Center for Schizophrenia Research and Treatment, New York State Psychiatric Institute

**Publisher's Disclaimer:** This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

and high trait negative affect as well as low trait positive affect (e.g., Blanchard et al., 1994; Blanchard et al., 2001; for review see Horan et al., 2008). Additionally, experience sampling studies similarly report reduced intensity and less variability of positive affect in the daily lives of individuals with schizophrenia (Myin-Germeys et al., 2000).

Importantly, a very different picture of emotional responding in schizophrenia emerges when laboratory studies using evocative stimuli (e.g., films, slides, social interactions, or food) are considered. In such studies, although individuals with schizophrenia do show diminished facial expression compared to healthy controls (Aghveli et al., 2003; Berenbaum & Oltmanns, 1992; Kring & Earnst, 1999; Kring & Neale, 1996), with some exceptions (e.g., Mathews & Barch, 2010), they report having internal emotional experiences comparable to controls (e.g., Aghveli et al., 2003; Berenbaum & Oltmanns, 1992; Blanchard et al., 1999; Dworkin et al., 1996, 1998; Fitzgibbons & Simons, 1992; Horan & Blanchard, 2003b; Horan et al., 2010; Kring, & Neale, 1996). Thus, in schizophrenia there is a replicable pattern of elevated anhedonia (as measured either in clinical interview or self-report trait measures), and diminished emotional expression (measured either in clinical interviews or with coding of facial affective expression in laboratory studies), with the seemingly paradoxical finding of preserved self-reported emotional responding to evocative stimuli (see review by Kring & Moran, 2008).

What is currently unclear is whether this same disjunction between self-reported traits and expressivity on the one hand, and intact responding to emotional stimuli on the other, is evident in schizophrenia spectrum disorders and in those individuals with elevated traits hypothesized to be associated with risk for schizotypy. Such research would allow for a determination of whether emotional alterations in schizophrenia extend across spectrum conditions, and if they relate to particular facets or traits of schizotypy. Furthermore, research in nonclinical populations with schizotypy traits has the advantage of avoiding the medication confounds present in schizophrenia research (Blanchard & Neale, 1992).

Social anhedonia is a promising trait to explore because it is considered a core feature of schizotypy that is associated with risk for the development of this disorder (e.g., Meehl, 1962) and the defining characteristic of this construct is that of diminished experience of pleasure. Cross sectional findings have confirmed a range of clinical characteristics and cognitive deficits in those individuals who are high in social anhedonia (e.g., Blanchard et al., in press; Gooding et al., 1999, 2006; Kwapil et al., 2002; Mishlove & Chapman, 1985), and longitudinal studies have shown that social anhedonia is predictive of the onset of schizophrenia-spectrum disorders (e.g., Gooding et al., 2005; Kwapil, 1998). Interestingly, despite the obvious affective features of the construct of social anhedonia, there is actually very little research that has examined emotion in those identified as high in social anhedonia.

Several studies have now evaluated self-reported trait affectivity and daily emotional experience in nonclinical individuals high in social anhedonia. Compared to healthy controls, social anhedonia groups are characterized by decreased self-reported trait positive affect and increased trait negative affect (Barenbaum et al., 2006; Gooding et al., 2002; Gooding & Tallent, 2003; Ross et al., 2002). This pattern of reduced trait positive affect and higher trait negative affect in social anhedonia has recently been replicated in a large community study (Blanchard et al., in press). In particular, low levels of trait positive affect appears to be more closely linked to negative schizotypy than high trait negative affect (Horan et al., 2008). Studies of emotional experience in daily life have also found that elevated rates of social anhedonia is associated with decreased experience of positive affect (Brown et al., 2007; Kerns et al., 2008). These data would suggest a pattern of emotional experience in social anhedonia groups that parallels that described above for schizophrenia.

Importantly, there have been few laboratory studies utilizing evocative stimuli to examine emotional responding in social anhedonia groups (Gooding et al., 2002; Kerns et al., 2008; Mathews & Barch, 2006). Gooding and colleagues (2002) found no differences in participants' startle eyeblink modulation in response to positive affect eliciting pictures from the IAPS. However, this study did not examine either self-reported affective responding to the stimuli nor were assessments of expressivity conducted. Mathews and Barch (2006) found that higher social anhedonia was related to less positive valence ratings of positive words and less negative valence of negative words. Finally, Kerns et al. (2008) report on two studies examining the relationship between social anhedonia and emotional responding. In both studies, social anhedonia was related to decreased positive (but not negative) affect intensity in response to affective pictures (Kerns et al., 2008). Thus, the latter two studies suggest a different pattern of findings from clinical samples; specifically, that emotions elicited in response to stimuli may be less intense in individuals with high levels of social anhedonia compared to controls.

In summary, our understanding of how social anhedonia is related to emotion is currently limited, and there are a number of methodological issues that constrain the interpretability of studies to date. First, of the three studies assessing emotional stimuli in social anhedonia only one directly assessed self-reported emotional responding (Kerns et al., 2008). In the other studies either stimuli (words) were rated and not the participants' own emotional reactions (Mathews & Barch, 2006), or self-report responses were not collected (Gooding et al., 2002). Second, given that social anhedonia does not reflect a pan deficit in emotion but rather a specific deficit in pleasure to social interactions, it is notable that much of the stimulus material that has been used is of a non-social nature (e.g., words, pictures of animals, nature scenes), and when people are used in pictures such stimuli are not directly affiliative (e.g., sky divers, man on cliff; Blanchard, 1998). Although a few studies have incorporated stimuli containing erotic material, erotic images only capture one aspect of affiliative behavior, and do not directly involve other aspects of social affiliation (e.g., friendships, family relationships, support, emotional sharing, etc.) that may be more directly associated with conceptualizations of social anhedonia. Third, to our knowledge, no laboratory studies have examined facial displays of affect in social anhedonia – an important consideration given that blunted affect is a core feature of schizophrenia and evident in emotion elicitation studies of patient samples. There are some suggestive findings indicating that altered emotional expression might be associated with social anhedonia. Self-reported social anhedonia has been found to correlate with self-reported expressivity such that greater anhedonia is related to less emotional expression (Kring et al., 1994). In a study coding behavioral displays within a clinical interview, compared to controls, individuals with high levels of social anhedonia were found to have greater schizoidia ratings including diminished facial displays of affect (Collins et al., 2005).

The current study sought to examine emotional responding in individuals high in social anhedonia compared to a normally-hedonic control group. We measured emotion using multiple methods including trait self-report measures of affect and emotional expression as well as self-reported responses to affect-eliciting film clips. With regard to emotional responses, we provided both a broad assessment of positive affect as well as a more focused assessment of warmth-affiliation. These two domains, though clearly related, may have distinct neural correlates, be differentially influenced by evocative stimuli, and these affective responses may also have differential associations with individual differences in affiliation (Depue & Morrone-Strupinsky, 2005; Morrone-Strupinsky & Depue, 2004). In addition to self-reports of emotional responding, we utilized behavioral coding of facial expressions in response to the film stimuli. Given the importance of including stimuli which may specifically tap responses to interpersonal and affiliative contexts, we used previously developed film material depicting a close mate relationship, which has been demonstrated to induce affiliation in females (Morrone-Strupinsky & Depue, 2004). This study examined the following hypotheses:

1. At the trait dispositional level, individuals high on social anhedonia would report lower trait PA and less self-reported emotional expressivity compared to controls.
2. In response to evocative film clips, we examined the hypothesis that in individuals with high levels of social anhedonia, there would be a specific deficit in emotional responding, such that attenuated positive affect and warm and affection ratings would be most pronounced for the affiliative film clip (as would be indicated by a significant group x film type interaction).
3. Compared to the control group, the social anhedonia group would be characterized by less facial expressions in response to both the affiliative and comedy film stimuli.

## 2. Methods

### 2.1 Participants

Because the affiliative clip selected for the current study has only been demonstrated to induce affiliative responses in females, only women high on social anhedonia were included in the current study. All female freshman students living on campus at a mid-Atlantic university (N=3 850) were contacted via mail with a recruitment letter inviting them to participate in an online survey. A total of 1 082 participants completed the screening questionnaires (Revised Social Anhedonia Scale (RSAS; Eckblad et al., 1982), and its Infrequency Scale (IS; Chapman & Chapman 1976) described below). Subsequent group selection was based on individual responses to the RSAS (z-scored separately by race to account for potential discrepant responses among racial groups). Participants with scores on the RSAS that were at least 1.96 standard deviations above the mean were assigned to the social anhedonia group, whereas participants with RSAS scores of no more than .5 standard deviation above the mean were assigned to the control group, consistent with previous studies (Chapman et al, 1994; Kwapil, 1998). Nineteen participants (1.75%) were excluded after endorsing 3 or more items in the unexpected direction on the Infrequency Scale and 51 (4.7%) scored above the cut-off for social anhedonia, rates consistent with previous studies (Chapman et al., 1976; Horan et al., 2004). Control participants were selected to match social anhedonia participants on race. All participants provided informed consent. The final sample included 34 individuals with high levels of social anhedonia and 45 controls. See Table 1 for demographic characteristics.

### 2.2 Measures

**2.2.1 Social Anhedonia**—The Revised Social Anhedonia Scale (RSAS; Eckblad et al., 1982) is a 40 true/false item inventory to assess social anhedonia, and was used as the screening questionnaire for the current study. The RSAS has demonstrated adequate validity, internal consistency (Mishlove & Chapman, 1985), and high test-retest reliability over a 90-day and 1 year period (Blanchard et al., 1998, 2001). The Infrequency Scale (Chapman & Chapman, 1976) was designed as an invalidity index for the RSAS. Three or more endorsed items suggests invalid responding.

**2.2.2 Trait Affectivity**—Trait positive affect (PA; 27 items) and trait negative affect (NA; 28 items) were measured with the General Temperament Survey (GTS; Clark & Watson, 1990). These scales have high internal consistency reliabilities and good convergent and discriminant validity across a number of samples (Carver & White, 1994; Watson & Clark, 1992), including schizophrenia (e.g., Horan & Blanchard, 2003a).

**2.2.3 Self-reported Emotional Expressivity**—The Emotional Expressivity Scale (EES; Kring et al., 1994) is a 17-item self-report questionnaire that is a general index for outward expressivity, regardless of emotional valence (e.g., positive or negative) or channel (facial,

vocal, or gestural) of expression. The EES has shown to be highly reliable, with excellent internal consistency and 4-week test-retest correlation reliability (Kring et al., 1994).

The Berkeley Expressivity Questionnaire (BEQ; Gross & John, 1995) is a 16-item self-report questionnaire that assesses both the general strength of emotion-response tendencies and the degree to which such tendencies are typically expressed as manifest behavior. The BEQ is comprised of three subscales: Positive Expressivity, Negative Expressivity, Impulse Strength, and also has high internal consistency (Gross & John, 1997).

**2.2.4 Self-reported Experience of Emotion**—A scale based on the circumplex model of emotion (Larsen & Diener, 1992) was administered to assess emotional experience (i.e., mood) at baseline and in response to the film stimuli. Participants were asked to rate the extent to which they were experiencing each of the 36 affective terms “right now, that is, at the present moment.” The 18-item positive mood scale consists of items tapping activated pleasant affect, pleasant affect, and unactivated pleasant affect. The 18-item negative mood scale consists of items reflecting activated unpleasant affect, unpleasant affect, and unactivated unpleasant affect. Participants rated each of the 36 mood adjectives on a 5-point scale (very slightly or not at all, a little, moderately, quite a bit, or extremely). These scales have been shown to have good internal consistency reliabilities for both patients with schizophrenia and for non-patient samples (e.g., Horan & Blanchard, 2003b; Kring & Earnst, 1999).

The Warm and Affectionate scale (WA; Morrone-Strupinsky & Depue, 2004) was designed to measure the emotional state accompanying affiliation. The WA requires a single rating for feelings of warmth and affection on a 7-point Likert scale.

**2.2.5 Behavioral Coding of Facial Expression**—Facial expressions in response to the film stimuli were rated by using the Facial Expression Coding System (FACES; Kring & Sloan, 1991). The FACES coding system involves making separate frequency counts for positively and negatively valenced facial expressions. Each individual facial expression is rated on duration (in seconds) and intensity (from 1 = low to 4 = high), and mean scores represent the duration and intensity per expression. Given variability in film length across emotion conditions, the frequency variable was adjusted to reflect the frequency of expressions per minute. As duration and intensity are already expressed as averages per facial expression, no adjustment was necessary to account for varying film length. Emotion studies using FACES to measure facial expressions have examined congruent expressions to the emotional eliciting stimuli (e.g., Aghevli et al., 2003; Earnst & Kring, 1999; Kring & Neale, 1996; Kring et al., 1993); thus, analyses in this study focused only on positive expressions on all films (neutral, comedy, affiliative).

**Coder Training:** A graduate student and an advanced undergraduate student, trained by the first author (WL) performed the FACES ratings. Raters were blind to group status, and agreement between the two coders was established during a training period, using pilot videotaped expressed facial emotions of participants not included in the study. Coders then independently rated tapes for all participants, and periodic random checks of their agreement were conducted to prevent coder drift. Inter-rater agreement (ICC) ranged from .96 to 1.00, indicating excellent agreement between raters.

**2.2.6 Film Clips**—Three different film clips were used in the current study to induce emotional states. These film stimuli included an affiliative (9 minutes, 35 seconds), comedic (5 minutes, 33 seconds), and neutral film clip (2 minutes, 58 seconds). The affiliative film clip (Morrone-Strupinsky & Depue, 2004) used a female main character given findings that vicarious identification is increased when the participant is of the same gender as the actor (Morrone et al., 2000). The affiliative film clip portrays the development of a close mate



relationship of a couple who has their first child (Morrone-Strupinsky & Depue, 2004). This film clip is effective in inducing an emotional state of warmth and affection as indexed by the Warm and Affectionate scale in healthy females (Morrone-Strupinsky & Depue, 2004).

A comedic, non-social film clip that has been widely used in similar studies (e.g., Earnst & Kring, 1999; Kring & Neale, 1996; Kring et al, 1993) was included to compare affiliative and affective differences between social and non-social film clips. The clip consists of excerpts taken from a slapstick comedy movie depicting a man and a woman encountering a number of things that go wrong with their new house with minimal interaction between characters. Previous studies have demonstrated that this film clip is effective in inducing state positive affect in controls and individuals with schizophrenia, as compared to both negative (sad, fear) and neutral films (e.g., Kring & Neale, 1996). A neutral film clip consisting of a narrated segment of tropical rain forest scenes served as a control.

## 2.4 Procedures

Following group assignment, individuals with high levels of social anhedonia and control participants completed measures of trait affectivity (NA and PA) and self-report measures of emotional expressiveness prior to arriving for their appointments for the laboratory task. Self-report measures of baseline affective states (including state PA, state NA, and warmth-affection) were administered approximately 5 minutes after each participant arrived to the laboratory. In order to minimize order effects of the film clips, each participant was randomly assigned to view one of six tapes, with each tape presenting the 3 film clips in different orders. Film clips were presented on a 27" color television monitor, with a 5-minute resting interval between each film clip to complete questionnaires and to dissipate emotion induced by the prior film. During each viewing, participants' facial responses were videotaped by a concealed digital camera for later coding.

## 2.5. Statistical Analyses

T-tests were used to examine the group differences in trait affectivity and state affect prior to viewing the film clips. Second, a Multivariate Analysis of Variance (MANOVA) was conducted on the self-reported emotional expressivity measures, and followed-up by post hoc one-way ANOVAs. Third, repeated measures ANOVA was performed to examine whether there were group differences in emotional responsivity to the film stimuli. Fourth, repeated measures ANOVA was performed to examine whether there are any group differences in laboratory ratings of facial expressions across the different film stimuli.

## 3 Results

### 3.1 Trait and Baseline State Affect

Individuals with high levels of social anhedonia reported lower trait PA ( $t [77] = -4.66, p < .05$ ), lower baseline state PA ( $t [77] = -2.33, p < .05$ ), and lower baseline warmth and affection ( $t [77] = -2.36, p < .05$ ) compared to controls. In contrast, there were no group differences in levels of trait or state NA ( $t [77] = 1.45, p > .05$ ;  $t [77] = .91, p > .05$ , respectively). These results indicated that the social anhedonia group reported lower levels of PA, both dispositionally and on a specific occasion, whereas they reported similar levels of NA compared to controls (see Table 2).

### 3.2 Self-reported Emotional Expressivity

A MANOVA conducted to compare the self-reported emotional expressivity of the social anhedonia and control groups revealed a significant main effect of group ( $F [4, 71] = 17.77, p < .01$ ). Post-hoc ANOVAs indicated that individuals with high levels of social anhedonia

reported lower EES scores, lower BEQ Positive Expressivity, lower BEQ Negative Expressivity, and lower BEQ Impulse Strength relative to controls (Table 2).

### 3.3 Intercorrelations Among Expressivity and Self-Reported Affect

Baseline state NA and trait NA were significantly associated in both groups, and baseline state NA was also correlated with trait PA in the social anhedonia group (Table 3). Baseline state PA was significantly related to trait PA in the social anhedonia group, and this correlation approached significance in the control group. The two measures of self-reported expressivity, the EES and BEQ, were highly intercorrelated with each other in both groups with  $r$ 's ranging from .327 to .779. In general, there were few significant correlations between self-reported expressivity and baseline state or trait affect, with the exception of trait PA evidencing significant associations with self-reported expressivity in the control group (See Table 3 for all correlations).

### 3.4 Self-reported Evoked Emotion

A 2 (group: social anhedonia vs. controls)  $\times$  3 (film condition: neutral-comedy-affiliative) repeated measures ANOVA was conducted separately for PA, NA, and warmth and affection. Self-reported emotional responses to the film clips are presented in Figure 1, and means and effect sizes are presented in Table 4.

**3.4.1 Positive Affect**—For PA in response to film clips, the repeated measures ANOVA showed a significant main effect for group ( $F [1, 77] = 6.01, p < .05$ ) and a significant main effect for film condition ( $F [2, 76] = 16.68, p < .01$ ), but no significant group by film condition interaction ( $F [2, 76] = 1.83, p > .05$ ). Post-hoc pairwise comparisons suggested the films induced PA as intended, with the highest levels of PA reported in response to the affiliative and comedy film clips relative to the neutral film, and higher levels of PA reported in response to the affiliative film compared to the comedy film in both groups (all  $p$ 's  $< .05$ ). Post-hoc pairwise comparisons also showed that, compared to controls, individuals with high social anhedonia reported significantly lower levels of PA across all three films ( $p$ 's  $< .05$ ). Thus, although the social anhedonia group reported lower levels of PA regardless of film type, all participants experienced the affiliative film as eliciting the highest levels of PA.

**3.4.2 Negative Affect**—For NA, there was a significant main effect for film condition ( $F [2, 76] = 10.96, p < .01$ ), but the main effect for group ( $F [1, 77] = .29, p > .05$ ) and the group by film condition interaction ( $F [2, 76] = 3.66, p > .05$ ) were not significant. Post-hoc pairwise comparisons demonstrated that all participants reported lower levels of NA during the comedy and affiliative films compared to the neutral film (all  $p$ 's  $< .01$ ), but reported no differences between the comedy and affiliative films.

**3.4.3 Warm and Affection**—For warm and affectionate ratings in response to the films, there was a significant main effect for film condition ( $F [2, 76] = 40.59, p < .01$ ), but no significant main effect for group ( $F [1, 77] = 2.50, p > .05$ ) or the group by film condition interaction ( $F [2, 76] = 2.17, p > .05$ ). Similar to the results for PA, all participants reported the highest levels of warmth and affection for the affiliative and comedy films relative to the neutral film, with the highest level of warmth and affection reported for the affiliative film as compared to the comedy film (all  $p$ 's  $< .01$ ). However, the social anhedonia and control groups reported similar levels of warmth-affiliation.

### 3.5 Elicited Emotional Expressivity in Response to Film Conditions

Equipment errors with the digital recording resulted in missing data for 4 individuals with high social anhedonia and 3 control participants. Intercorrelations among the FACES variables were

significant for members of both groups viewing the neutral and affiliative film clips, ranging from .46 to .82 for the social anhedonia group and .32 to .82 for the control group. However, for individuals with high levels of social anhedonia, correlations among FACES variables was relatively low for the comedy film (-.04 to .38). Subsequently, a 2 (group: social anhedonia vs. controls)  $\times$  3 (film condition: neutral-comedy-affiliative) repeated measures ANOVA was conducted separately for frequency, mean duration, and mean intensity. See Table 5 for descriptive statistics and effect sizes.

**3.5.1 Frequency**—For the number of positive expressions displayed (i.e., frequency count) per minute, results showed a significant main effect for group ( $F [1, 70] = 4.90, p < .05$ ) and a significant main effect for film condition ( $F [2, 69] = 73.93, p < .01$ ), but no group by film condition interaction ( $F [2, 69] = 2.58, p > .05$ ). All participants displayed the greatest number of positive facial expressions during the comedy film and affiliative film compared to the neutral film, and displayed more positive facial expressions per minute during the comedy film relative to the affiliative film (all  $p$ 's  $< .01$ ). The significant group effect indicated that individuals with high social anhedonia expressed fewer numbers of positive facial expressions per minute as compared to the control group ( $p < .05$ ).

**3.5.2 Duration and Intensity**—For the mean duration of positive expressions displayed (i.e., average duration per expression) and the mean intensity of positive expressions displayed (i.e., average intensity per expression), there was a significant main effect for film condition ( $p$ 's  $< .01$ ), but the main effect for group and the group by film condition interaction were not significant. As with frequency, participants displayed the longest duration and intensity for the comedy film, followed by the affiliative film (all  $p$ 's  $< .05$ ).

## 4 Discussion

This study investigated emotional responsivity and expressivity in individuals high in the schizotypy trait of social anhedonia. Emotional experience and expression were assessed across multiple methods including self-report measures of trait affect and dispositional emotional expression as well as emotional responding to evocative stimuli (measured with self-report and behavioral coding of facial expression). The current study design extends prior laboratory research with the use of a novel social affiliative film stimulus to examine affective reactions associated with social anhedonia. Additionally, it is the first study to examine facial expressivity in response to affect-eliciting stimuli in social anhedonia.

It was hypothesized that, compared to controls, individuals with high social anhedonia would report lower levels of trait affectivity and lower levels of self-reported emotional expressivity. Consistent with previous studies investigating trait affectivity in social anhedonia (e.g., Blanchard et al., in press; Gooding et al., 2002), the social anhedonia group reported less trait positive affect than the healthy control group. In addition, consistent with prior research (Kring et al., 1994), the social anhedonia group endorsed significantly lower levels of self-reported expressivity. There were no group differences in trait NA, a finding inconsistent with prior studies (e.g., Blanchard et al., in press; Horan & Blanchard, 2003a). These findings indicate that at the trait level, individuals high in social anhedonia endorse self-descriptions of reduced positive affect and reduced emotional expression.

The second study aim sought to examine emotional responding to evocative stimuli. With regard to the manipulation of emotion, it is clear from the results that the affiliative and comedy films both produced significant changes in the participants' mood as planned, with higher positive affect (PA), lower negative affect (NA), and higher warmth-affection, as compared to the neutral film. Compared to the comedy film, the affiliative film produced higher PA and higher warmth-affection, suggesting that it induced an affiliative state as intended. Group



comparisons revealed that compared to controls, individuals with high social anhedonia reported attenuated state PA in response to all films including the affiliative and the comedy film. There were no group differences in negative affect or warmth-affection ratings in response to any of the films. This pattern of findings is consistent with a generalized diminution of positive affect in social anhedonia and does not support a deficit specific to affiliative stimuli.

With regard to behavioral displays of emotion, results indicated that compared to controls, individuals high in social anhedonia had significantly fewer facial expressions in response to the viewing the evocative films. However, there were no group differences in the average intensity or duration of facial expressions. This pattern of findings suggest that although individuals high in social anhedonia may make fewer expressions, that when they do have a facial display it is not necessarily an attenuated expression (as indicated by intensity or expression). These current findings of diminished emotional expression in social anhedonia are consistent with prior reports of diminished expression in a clinical interview (Collins et al., 2005), and extend these results to show that reduced expression in social anhedonia is evident when employing standardized laboratory stimuli and using detailed behavioral coding of facial displays.

Thus, the above results are suggestive of a pattern of emotional disturbance in social anhedonia which includes lower trait PA, reduced emotional responsivity, and diminished emotional expressivity. The emotional responsivity findings replicate and extend recent research in non-clinical samples demonstrating that social anhedonia is related to reduced self-reports of emotional experience in response to evocative stimuli (Mathews & Barch, 2006; Kerns et al., 2008) Whereas a disjunction of experience and expression of emotion has been reported for individuals with schizophrenia (e.g., Aghevli et al., 2003; Earnst & Kring 1999; Kring et al., 1996; Kring & Neale, 1993), a convergence between these response domains was found within this nonclinical sample with high levels of social anhedonia. This suggests that the current findings should be replicated across the schizophrenia-spectrum to ascertain whether results are broadly applicable. For example, results may suggest that the dissociation between expression and experience of emotion may not yet be prevalent in this non-clinical group, thereby necessitating study of emotional functioning across the phases of psychosis. Alternately, this pattern of findings may suggest the importance of considering individual difference variables in studying emotional constructs, especially within schizophrenia (given the phenotypic heterogeneity within this disorder). Specifically, reduced emotional responding may not characterize all individuals with schizophrenia but instead relate more specifically to those who report high levels of social anhedonia. Consistent with this notion, Horan et al. (2010) found a medium effect size for the relationship between social anhedonia and reduced emotional responding within schizophrenia.

#### 4.1 Limitations

There are several methodological limitations that should be considered. First, this study only utilized female participants because validity for the film-induced affiliation paradigm has only been documented in women thus far (Morrone-Strupinsky & Depue, 2004). Given gender differences in emotion (e.g., Gross & John, 1995; Kring & Gordon 1998; Lang et al., 1993) it will be important to replicate the current findings in males. Another limitation of the present study is that clinical assessments of personality disorders were not conducted. It would be informative to employ structured diagnostic interviews in future studies to better determine if clinical levels of schizotypy and other disorders are present in participants or family members. Given the potential contribution of depression to anhedonia (e.g., Blanchard et al., 2001), it can be argued that depression, rather than schizotypy, may contribute to the differences between the social anhedonia and healthy control groups. Although we did not directly evaluate depressive symptoms, Watson & Clark's (1991) tripartite model suggests that depression is

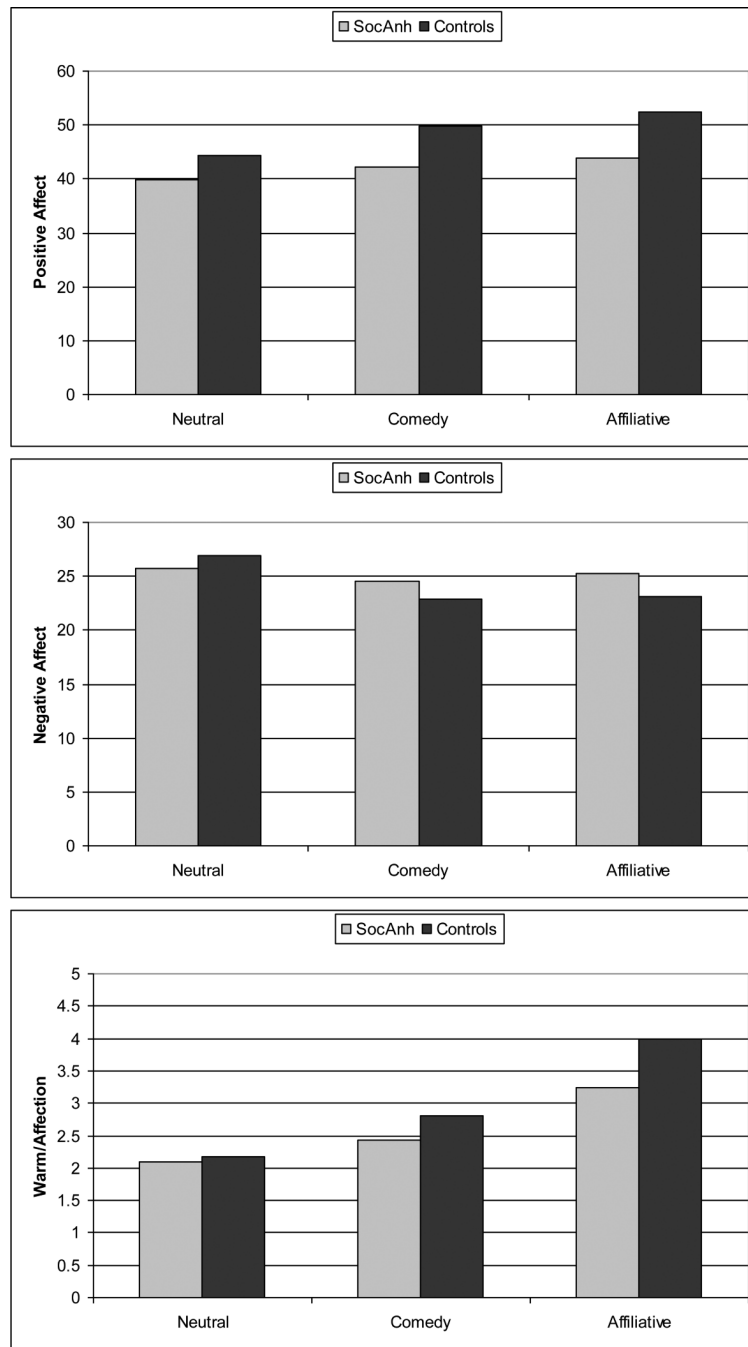
characterized by high levels of negative affect in conjunction with low levels of positive affect. Given that both trait and state negative affect were not elevated in our social anhedonia group, it is unlikely that depression contributed to the present findings. Finally, our measurement of warmth-affiliation was based on a single item and this may have resulted in a less sensitive or less reliable assessment of this domain (compared to the 18-item PA and NA scales). These measurement issues may have contributed to diminished ability to detect group differences in warmth-affection and a more extensive measurement approach to affiliative feelings should be considered in future studies.

## References

- Aghevli MA, Blanchard JJ, Horan WP. The expression and experience of emotion in schizophrenia: a study of social interactions. *Psychiatry Res* 2003;119:261–270. [PubMed: 12914897]
- Andreasen, NC. *The Scale for the Assessment of Negative Symptoms (SANS)*. The University of Iowa; Iowa City, Iowa: 1983.
- Berebaum H, Oltmanns TF. Emotional experience and expression in schizophrenia. *J. Abnorm. Psychol* 1992;101(1):37–44. [PubMed: 1537971]
- Berenbaum H, Boden MT, Baker JP, Dizen M, Thompson RJ, Abramowitz A. Emotional correlates of the different dimensions of schizotypal personality disorder. *J Abnorm Psychol* 2006;115:359–368. [PubMed: 16737400]
- Blanchard, JJ. Hedonic capacity. In: Flack, WF.; Laird, JD., editors. *Emotions in psychopathology: Theory and Research*. Oxford University Press; New York: 1998. p. 336–352.
- Blanchard JJ, Bellack AS, Mueser KT. Affective and social behavioral correlates of physical and social anhedonia in schizophrenia. *J. Abnorm. Psychol* 1994;103(4):719–728. [PubMed: 7822573]
- Blanchard JJ, Horan WP, Brown SA. Diagnostic difference in the temporal stability of social anhedonia: a longitudinal study of schizophrenia and major depressive disorder. *J. Abnorm. Psychol* 2001;110:363–317. [PubMed: 11502079]
- Blanchard JJ, Collins LM, Aghevli M, Leung WW, Cohen AS. Social anhedonia in a community sample: The Maryland Longitudinal Study of Schizotypy. *Schizophr. Bull.* in press. doi:10.1093/schbul/sbp107.
- Blanchard JJ, Mueser KT, Bellack AS. Anhedonia, positive and negative affect, and social functioning in schizophrenia. *Schizophr. Bull* 1998;24:413–424. [PubMed: 9718633]
- Blanchard JJ, Neale JM. Medication effects: Conceptual and methodological issues in schizophrenia research. *Clin. Psychol. Rev* 1992;12:345–362.
- Bleuler, E.; Zinkin, J. *Dementia process or the group of schizophrenia*. International University Press; New York: 1950. (Original work published in 1911)
- Brown LH, Silvia PJ, Myin-Germeys I, Kwapil TR. When the need to belong goes wrong: the expression of social anhedonia and social anxiety in daily life. *Psychological Sci* 2007;18(9):778–82.
- Carver CS, White TL. Behavioral inhibition, behavioral activation, and affective responses in impending reward and punishment: the BIS/BAS scales. *J. Pers. Soc. Psychol* 1994;67:319–333.
- Chapman, LJ.; Chapman, JP. *The Infrequency Scale*. 1976. Unpublished test
- Chapman, LJ.; Chapman, JP. *Revised Physical Anhedonia Scale*. 1978. Unpublished test
- Chapman LJ, Chapman JP, Kwapil TR, Eckblad M, Zinser MC. Putatively psychosis-prone subjects 10 years later. *J. Abnorm. Psychol* 1994;103(2):171–183. [PubMed: 8040487]
- Chapman LJ, Chapman JP, Raulin ML. Scales for physical and social anhedonia. *J. Abnorm. Psychol* 1976;85:374–382. [PubMed: 956504]
- Clark, D.; Watson, LA. *The General Temperament Survey*. Southern Methodist University; Dallas: 1990. Unpublished manuscript
- Clark L, Watson D. Tripartite model of anxiety and depression: Psychometric evidence and taxonomic implications. *J. Abnorm. Psychol* 1991;100:316–336. [PubMed: 1918611]
- Collins LM, Blanchard JJ, Biondo K. Behavioral signs of schizoidia and schizotypy in social anhedonics. *Schizophr. Res* 2005;78(2):309–322. [PubMed: 15950438]

- Depue R, Morrone-Strupinsky J. A neurobehavioral model of affiliative bonding: Implications for conceptualizing a human trait of affiliation. *Beh Brain Sciences* 2005;28(3):313–395.
- Dworkin RH, Clark SC, Amador XF, Gorman JM. Does affective blunting in schizophrenia effect affective deficit or neuromotor dysfunction? *Schizophr. Res* 1996;20(3):301–306. [PubMed: 8827857]
- Dworkin, RH.; Oster, H.; Clark, SC.; White, SR. Affective expression and affective experience in schizophrenia.. In: Lenzenweger, MF.; Dworkin, RH., editors. *Origins and Development of Schizophrenia: Advances in Experimental Psychopathology*. American Psychological Association; Washington DC: 1998. p. 385-424.
- Earnst KS, Kring AM. Emotional responding in deficit and non-deficit schizophrenia. *Psychiatry Res* 1999;88:191–207. [PubMed: 10622340]
- Eckblad, ML.; Chapman, LJ.; Chapman, JP.; Mishlove, M. The Revised Social Anhedonia Scale. University of Wisconsin; Madison, WI: 1982. Unpublished test
- Fitzgibbons L, Simons RF. Affective response to color-slide stimuli in subjects with physical anhedonia: a three-system analysis. *Psychophysiology* 1994;29(6):613–620. [PubMed: 1461952]
- Gooding DC, Davidson RJ, Putman KM, Tallent KA. Normative emotion-modulated startle response in individuals at risk for schizophrenia-spectrum disorders. *Schizophr. Res* 2002;57:109–120. [PubMed: 12165381]
- Gooding DC, Kwapil TR, Tallent KA. Wisconsin Card Sorting Test deficits in schizotypic individuals. *Schizophr. Res* 1999;40(3):201–209. [PubMed: 10638858]
- Gooding DC, Matts CW, Rollmann EA. Sustained attention deficits in relation to psychometrically identified schizotypy: Evaluating a potential endophenotypic marker. *Schizophr. Res* 2006;82(1): 27–37. [PubMed: 16442266]
- Gooding DC, Tallent KA. Spatial, object, and affective working memory in social anhedonic: an exploratory study. *Schizophr. Res* 2003;63(3):247–260. [PubMed: 12957704]
- Gooding DC, Tallent KA, Matts CW. Clinical status of at-risk individuals 5 years later: Further validation of the psychometric high-risk strategy. *J. Abnorm. Psychol* 2005;114(1):170–175. [PubMed: 15709824]
- Gross JJ, John OP. Facets of emotional expressivity: Three self-report factors and their correlates. *Pers. Individual Differences* 1995;19:555–568.
- Gross JJ, John OP. Revealing feelings: Facets of emotional expressivity in self-reports, peer ratings, and behavior. *J. Pers. Soc. Psychol* 1997;72:435–448. [PubMed: 9107009]
- Horan WP, Blanchard JJ. Neurocognitive, social, and emotional dysfunction in deficit syndrome schizophrenia. *Schizophr. Res* 2003a;65:125–137. [PubMed: 14630305]
- Horan WP, Blanchard JJ. Emotional responses to psychosocial stress in schizophrenia: the role of individual differences in affective traits and coping. *Schizophr. Res* 2003b;60:271–283. [PubMed: 12591589]
- Horan WP, Blanchard JJ, Gangestad SW, Kwapil TR. The psychometric detection of schizotypy: Do putative schizotypy indicators identify the same latent class? *J. Abnorm. Psychol* 2004;113(3):339–357. [PubMed: 15311982]
- Horan WP, Blanchard JJ, Green MF, Clark LA. Affective traits in schizophrenia and schizotypy. *Schizophr. Bull* 2008;34(5):856–74. [PubMed: 18667393]
- Horan WP, Wynn JK, Kring AM, Simons RF, Green MF. Electrophysiological correlates of emotional responding in schizophrenia. *J Abnorm. Psychol* 2010;119(1):18–30. [PubMed: 20141239]
- Kay SR, Fiszbein A, Opler LA. The Positive and Negative Syndrome Scale for schizophrenia. *Schizophr. Bull* 1987;13:261–276. [PubMed: 3616518]
- Kerns JG, Docherty AR, Martin EA. Social and physical anhedonia and valence and arousal aspects of emotional experience. *J. Abnorm. Psychol* 2008;117(4):735–746. [PubMed: 19025222]
- Krapelin, E.; Barclay, RM. *Dementia process and paraphrenia*. Krieger; Huntington, NY: 1971. (Original work published in 1919)
- Kring AM, Earnst KS. Stability of emotional responding in schizophrenia. *Behav. Therapy* 1999;30:373–388.

- Kring AM, Gordon AH. Sex differences in emotion: Expression, experience, and physiology. *J. Pers. Soc. Psychol* 1998;74:686–703. [PubMed: 9523412]
- Kring AM, Kerr SL, Smith DA, Neale JM. Flat affect in schizophrenia does not reflect diminished subjective experience of emotion. *J. Abnorm. Psychol* 1993;102(4):507–517. [PubMed: 8282918]
- Kring AM, Moran EK. Emotional response deficits in schizophrenia: Insights from affective science. *Schizophr. Bull* 2008;34:819–828. [PubMed: 18579556]
- Kring AM, Neale JM. Do schizophrenic patients show a disjunctive relationship among expressive, experiential, and psychophysiological components of emotion? *J. Abnorm. Psychol* 1996;105(2):249–257. [PubMed: 8723006]
- Kring, AM.; Sloan, D. The Facial Expression Coding System (FACES): A Users Guide. Vanderbilt University; Nashville, TN: 1991. Unpublished manuscript
- Kring AM, Smith DA, Neale JM. Individual differences in dispositional expressiveness: Development and validation of the Emotional Expressivity Scale. *J. Pers. Soc. Psychol* 1994;66(5):934–349. [PubMed: 8014836]
- Kwapil TR. Social anhedonia as a predictor of the development of schizophrenia-spectrum disorders. *J. Abnorm. Psychol* 1998;107(4):558–565. [PubMed: 9830243]
- Kwapil TR, Crump RA, Pickup DR. Assessment of psychosis proneness in African-American college students. *J. Clin. Psychol* 2002;58(12):601–1614.
- Lang PJ, Greenwald MK, Bradley MM, Hamm AO. Looking at pictures: Affective, facial, visceral, and behavioral reactions. *Psychophysiology* 1993;30(3):261–273. [PubMed: 8497555]
- Larsen R, Diener E. Promises and problems with the circumplex model of emotion. *Rev. Pers. Soc. Psychol* 1992;13:25–59.
- Mathews JR, Barch DM. Episodic memory for emotional and non-emotional words in individuals with anhedonia. *Psychiatry Res* 2006;143:121–33. [PubMed: 16806490]
- Mathews JR, Barch DM. Emotion responsivity, social cognition, and functional outcome in schizophrenia. *J. Abnorm. Psychol* 2010;119(1):50–59. [PubMed: 20141242]
- Meehl PE. Schizotaxia, schizotypy, schizophrenia. *The American Psychologist* 1962;17(12):827–838.
- Mishlove M, Chapman LJ. Social anhedonia in the prediction of psychosis proneness. *J. Abnorm. Psychol* 1985;94:384–396. [PubMed: 4031235]
- Morrone JV, Depue RA, Scherer AJ, White TL. Film-induced incentive motivation and positive activation in relation to agentic and affiliative components of extraversion. *Pers. Individual Differences* 2000;29(2):199–216.
- Morrone-Strupinsky JV, Depue RA. Differential relation of two distinct, film-induced positive emotional states to affiliative and agentic extraversion. *Pers. Individual Differences* 2004;36(5):1109–1126.
- Myin-Germeys I, Delespaul PAEG, deVries MW. Schizophrenia patients are more emotionally active than is assumed based on their behavior. *Schizophr. Bull* 2000;26(4):847–854. [PubMed: 11087017]
- Ross SR, Lutz CJ, Bailey SE. Positive and negative symptoms of schizotypy and the five-factor model: a domain and facet level analysis. *J Pers Assess* 2002;79:53–72. [PubMed: 12227668]
- Watson D, Clark LA. On trait and temperament: General and specific factors of emotional experience and their relation to the five-factor model. *J. Pers* 1992;60:441–476. [PubMed: 1635050]



**Figure 1.** Self-reported Positive Affect, Negative Affect, and Warm/Affection across Film Stimuli in Individuals with Social Anhedonia and Controls.



**Table 1**

Descriptive Statistics for Demographic Characteristics for Social Anhedonia (n=34) and Control (n=45) Groups.

	<b>Social Anhedonia Mean (SD)</b>	<b>Control Mean (SD)</b>
Age	18.24 (.61)	18.11 (.32)
Ethnicity	<b>N (%)</b>	<b>N (%)</b>
Caucasian	23 (67.6%)	34 (75.6%)
African-American	2 (5.9%)	4 (8.9%)
Hispanic/Latino	0 (0.0%)	1 (2.2%)
Asian American	8 (23.5%)	4 (8.9%)
Other	1 (2.9%)	2 (4.4%)

Note. SD=Standard deviation.

**Table 2**

Descriptive Statistics for Study Measures for Social Anhedonia (n=34) and Control (n=45) Groups.

	Social Anhedonia Mean (SD)	Control Mean (SD)	<i>t</i>	Cohen's <i>d</i>
Trait PA	13.27 (7.17)	20.22 (5.70)	-4.66*	1.07
Trait NA	15.21 (8.29)	12.78 (6.66)	1.45	.32
Baseline State PA	42.06 (11.69)	48.20 (11.58)	-2.33*	.53
Baseline State NA	28.91 (10.39)	27.27 (5.53)	.91	.19
Baseline Warm/Affection	1.97 (1.07)	2.60 (1.23)	-2.36*	.55
			<i>F</i>	
EES	48.85 (14.39)	69.91 (10.63)	53.89**	1.66
BEQ Total	4.14 (.92)	5.14 (.66)	31.17**	1.25
Positive Expressivity	4.61 (1.03)	5.98 (.54)	55.37**	1.67
Negative Expressivity	3.17 (1.17)	4.30 (.99)	20.73**	1.04
Impulse Strength	4.62 (1.24)	5.16 (.95)	4.49*	.49

Note. SD=Standard Deviation; PA=Positive Affect; NA=Negative Affect; EES=Emotional Expressivity Scale; BEQ=Berkeley Expressivity Scale

\*  
p<.05

\*\*  
p<.01.

**Table 3**

Intercorrelations Among Baseline and Trait Measures for Social Anhedonia (below diagonal) and Control (above diagonal) Groups.

	Baseline PA	Baseline NA	Baseline WA	Trait PA	Trait NA	EES	BEQ total	BEQ positive	BEQ negative	BEQ impulse
<b>Baseline PA</b>	--	-.210	.673**	.290	-.114	.061	.226	.302*	.073	.217
<b>Baseline NA</b>	-.225	--	-.184	-.115	.368*	-.281	-.065	-.170	-.043	.009
<b>Baseline WA</b>	.528**	-.035	--	.110	.033	.138	.292	.154	.184	.322*
<b>Trait PA</b>	.425*	-.379*	.138	--	-.214	.389*	.335*	.417**	.351*	.080
<b>Trait NA</b>	-.135	.437*	.105	-.350*	--	.072	.255	.020	.130	.381*
<b>EES</b>	.268	-.106	.209	-.202	.117	--	.707**	.593**	.728**	.365*
<b>BEQ total</b>	.315	.149	.215	-.201	.473**	.704**	--	.650**	.867**	.780**
<b>BEQ positive</b>	.520**	.022	.294	.085	.247	.604**	.834**	--	.497**	.239
<b>BEQ negative</b>	.127	-.083	.122	-.321	.337	.779**	.750**	.493**	--	.453**
<b>BEQ impulse</b>	.136	.388*	.110	-.201	.505**	.327	.775**	.522**	.271	--

Note. PA=Positive Affect; NA=Negative Affect; WA=Warmth/Affection; EES=Emotional Expressivity Scale; BEQ=Berkeley Expressivity Scale

\* p<.05

\*\* p<.01.

**Table 4**

Descriptive Statistics for Group Differences in Self-Reported Affect Across Films.

	Social Anhedonia Mean (SD)	Controls Mean (SD)	Cohen's <i>d</i>
Neutral Film			
Positive Affect	39.76 (10.32)	44.42 (14.24)	.37
Negative Affect	25.76 (8.93)	26.93 (7.78)	.14
Warm-Affection	2.09 (1.24)	2.18 (1.44)	.07
Comedy Film			
Positive Affect	42.26 (10.04)	49.71 (14.56)	.56
Negative Affect	24.50 (9.16)	22.89 (4.49)	.22
Warm-Affection	2.44 (1.44)	2.80 (1.34)	.26
Affiliative Film			
Positive Affect	43.94 (14.27)	52.36 (14.25)	.59
Negative Affect	25.24 (8.70)	23.18 (5.56)	.28
Warm-Affection	3.24 (1.42)	4.00 (1.19)	.58

Note. SD=Standard Deviation.

**Table 5**

Descriptive statistics for Behavioral Codings of Facial Expressivity Across Films for Social Anhedonia and Control Groups.

	<b>Social Anhedonia Mean (SD)</b>	<b>Controls Mean (SD)</b>	<b>Cohen's <i>d</i></b>
Neutral			
Frequency	.045 (.146)	.064 (.271)	.08
Intensity	.133 (.434)	.095 (.297)	.10
Duration <sup><i>l</i></sup>	1.54 (7.23)	.541 (2.05)	.19
Comedy			
Frequency	1.08 (.830)	1.57 (.894)	.57
Intensity	1.13 (.672)	1.26 (.578)	.20
Duration	12.77 (18.10)	8.48 (8.66)	.30
Affiliative			
Frequency	.292 (.459)	.475 (.606)	.34
Intensity	.490 (.544)	.728 (.548)	.44
Duration	4.17 (5.90)	6.49 (9.61)	.29

Note. SD=Standard Deviation

<sup>*l*</sup>Duration presented in seconds.