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Social Anhedonia, But Not Positive Schizotypy, Is Associated With Poor Affective Control

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Emotion researchers have distinguished between automatic versus controlled processing of affective information. One previous study with a small sample size found that extreme levels of social anhedonia (SocAnh) in college students, which predicts future schizophrenia-spectrum disorders, is associated with problems in controlled affective processing on a primed evaluation task. The current study examined whether in a larger college student sample SocAnh but not elevated perceptual aberration/magical ideation (PerMag) was associated with poor controlled affective processing. On the primed evaluation task, primes and targets could be either affectively congruent or incongruent and participants judged the valence of targets. Previous research on this task has found that participants appear to use controlled processing in an attempt to counteract the influence of the prime in evaluating the target. In this study, compared to the PerMag ($n = 48$) and control groups ($n = 338$), people with extreme levels of social anhedonia ($n = 62$) exhibited increased affective interference as they were slower for incongruent than for congruent trials. In contrast, there were no differences between the PerMag and control groups. Overall, these results suggest that SocAnh, but not PerMag, is associated with poor controlled affective processing.

Keywords: emotion, schizotypy, affective control, social anhedonia, schizophrenia-spectrum disorders

One negative symptom of schizophrenia and schizophrenia-spectrum personality disorders is anhedonia, or diminished experience of positive emotion for social and/or physical stimuli (Horan, Green, Kring, & Nuechterlein, 2006; Wolf, 2006). For example, for schizoid personality disorder, anhedonic-like symptoms arguably account for five of the seven *DSM–IV* criteria (APA, 2000). Anhedonia is also evident in the prodrome of schizophrenia (Hafner & an der Heiden, 2003), and social anhedonia in college students has been found to predict the onset of schizophrenia-spectrum disorders, including schizoid and schizotypal personality disorders (Kwapil, 1998; Gooding, Tallent, & Matts, 2005). For example, Kwapil (1998) reported that of those identified as having high levels of social anhedonia using the same criteria we have used in the current research, at 10 year follow-up, 28% were diagnosed with a schizophrenia-spectrum personality disorder, with 17% diagnosed with schizoid personality, 17% diagnosed with paranoid personality disorder, and 11% diagnosed with schizotypal personality disorder. In addition, anhedonia is not well treated by existing interventions (Horan et al., 2006). Therefore, understanding SocAnh could provide evidence about the susceptibility for developing schizophrenia and schizophrenia-spectrum personality disorders (Lenzenweger, 1999) and could also help in the development of new interventions for a treatment-refractory aspect of these disorders.

Given that anhedonia involves decreased self-reported positive emotion, many psychopathologists have hypothesized that anhedonia might involve an emotional deficit (e.g., Berenbaum, Snowhite, & Oltmanns, 1987; Blanchard, Bellack, & Mueser, 1994; Germans & Kring, 2000; Gooding, Davidson, Putnam, & Tallent, 2002; Blanchard, Aghevli, Wilson, & Sargeant, 2010; Horan, Blanchard, Clark, & Green, 2008; Leung, Couture, Blanchard, Lin, & Llerena, 2010; Martin & Kerns, 2010). However, the

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exact nature of any emotional deficit in anhedonia is still unclear (Horan et al., 2006). Although there are many possible explanations for why questions remain regarding the nature of emotional deficits in anhedonia, one explanation is the reliance on self-report data. As has long been noted, self-report data can be unreliable and prone to biases (Schwarz, 1999). Thus, investigations into emotional deficits may benefit from the use of behavioral measures.

Among different mechanisms involved in emotion, researchers have suggested a possible distinction between more automatic activation of affective information versus more controlled processing of affective information (Ochsner & Gross, 2005; Barrett, Mesquita, Ochsner, & Gross, 2007; Cunningham & Zelazo, 2007; Johnstone, van Reekum, Urry, Kalin, & Davidson, 2007). Automatic affective processing is "rapid, unconscious and robust across situations" (Cunningham & Zelazo, 2007, p. 97). In contrast, controlled (or reflective) affective processes are "slower, conscious and more likely to generate evaluations that vary as a function of current contexts and processing goals" (Cunningham & Zelazo, 2007, p. 97). Thus, automatic affective processing might be involved in the initial affective reaction to a stimulus, but controlled affective processing might be involved in regulating or modifying automatically elicited affect, such as decreasing negative affect (Ochsner et al., 2004) or increasing positive affect (Larsen et al., 1996). Previous research on automatic versus controlled affective processing has found that they appear to involve activity in different brain regions (e.g., amygdala vs. medial prefrontal; Cunningham, Raye, & Johnson, 2004; Johnstone et al., 2007), exhibit different time courses (i.e., early vs. late; Cunningham, Espinet, DeYoung, & Zelazo, 2005), and are involved in different types of affective processing tasks (e.g., unconscious or implicit processing vs. explicit processing, Morris, Ohman, & Dolan, 1998; Cunningham et al., 2004).

One task that involves both automatic and controlled affective processing is the affective priming task, which is comprised of noninterference (i.e., congruent) and high interference (i.e., incongruent) trials. On this task (Fazio, Sanbonmatsu, Powell, & Kardes, 1986; Fazio, 2001), participants read a valenced prime word (e.g., "funeral") and then make an affective judgment on a target word (e.g., "headache"). When making affective judgments, valenced prime words are thought to automatically activate a possible response (e.g., "positive" vs. "negative"). This can produce interference (i.e., slower reaction times, [RTs]) if the prime and target have different valences (De Houwer, Hermans, Rothermund, & Wentura, 2002; Klauer & Musch, 2003; Wentura, 2000) or facilitation (i.e., faster RTs) if the prime and target are congruent and have the same valence. In addition to automatic affective processing, the affective priming task also involves controlled affective processing. On this task, the prime (e.g., "funeral") can interfere and can conflict with the response to the target ("kitten"). Critically, people appear able to engage in relatively controlled affective processing in order to counteract interference from the prime by, for example, activating the response that is opposite from the one indicated by the prime (Klauer, Rossnagel, & Musch, 1997; Klauer, Teige-Mocigemba, & Spruyt, 2009). There is evidence that the influence of controlled evaluative processing can occur even at a relatively brief stimulus onset asynchrony (SOA), or the time between the presentation of the prime and presentation of the target. For example, the response facilitation effect on this task is only clearly evident with a short SOA of 100 ms but not at a slightly longer SOA of 200 ms (Klauer et al., 1997). At even longer SOAs, counteracting the prime results in reverse processing effects, as participants are actually slower when the prime and target are congruent and have the same valence (Klauer et al., 1997; Wentura, 2000; Kerns, 2005). Hence, as in some interference tasks (Machado et al., 2007), on the primed evaluation task with more time between the prime and the target, participants appear to engage in controlled processing to counteract the influence of the prime, with controlled processes becoming evident at SOAs longer than 100 ms.

Previous research has found that SocAnh is associated with a controlled affective processing deficit on the affective priming task (Martin & Kerns, 2010). Using an extreme group design, we found that individuals elevated on SocAnh ($n = 27$) exhibited a significantly larger affective interference effect than a control group ($n = 47$). This suggests that people with SocAnh were less able to rapidly counteract the influence of the emotional prime, consistent with poor controlled affective processing. In contrast, the SocAnh and control groups did not differ in performance on a semantic priming task, or on the Stroop task, a measure of cognitive control (Martin & Kerns, 2010). Thus, it appears that a deficit in controlled affective processing associated with SocAnh cannot be explained by differences in cognitive control.

Although one previous study has found an affective control deficit in SocAnh compared to control participants (Martin & Kerns, 2010), the sample size in that study was limited (SocAnh $n = 27$). In addition, the previous study's ability to interpret increased affective interference in the SocAnh group was somewhat limited by the fact that the control group did not exhibit a significant within-group affective interference effect (i.e., they were not significantly slower for incongruent vs. congruent trials). Thus, in the current study, new, larger extreme and control groups were recruited to provide a stronger test of an affective control deficit in SocAnh. In addition, it is not known whether this affective control deficit is unique to SocAnh or is associated with other measures indicative of an increased risk of future schizophrenia-spectrum disorders (Chapman, Chapman, Kwapil, Eckblad, & Zinser, 1994). Previous research has consistently found that SocAnh and elevated perceptual aberration and/or magical ideation (PerMag) load on different schizophrenia-spectrum factors (Cicero & Kerns, 2010; Kwapil et al., 2008), and results from self-report studies suggest differences between SocAnh and PerMag in emotion processing. For example, SocAnh, but not PerMag, differ significantly from control participants in reports of how much they focus on positive emotion (Martin, Becker, Cicero, Docherty, & Kerns, 2011). In addition, SocAnh is associated with a significantly stronger desire to ignore negative emotion compared to PerMag (Martin et al., 2011). Also, there is some evidence suggesting that, in contrast to SocAnh, PerMag might actually exhibit decreased affective interference (Kerns, 2005). However, the size of the PerMag group in that study was also limited ($n = 34$), and there was also some evidence of a speed–accuracy trade-off in the PerMag group. Thus, the current study included a larger PerMag group for direct comparison to a SocAnh group.

Method

Participants

We used an extreme-groups approach (Preacher, Rucker, MacCallum, & Nicewander, 2005) that compared people with elevated SocAnh and people with elevated levels of PerMag to a control group. Participants were undergraduates from a large Midwestern university. They were recruited from a larger group of students ($n = 2134$) who completed a subset of items from psychosis-proneness scales as part of a departmental mass testing—15 items from the Revised Social Anhedonia Scale (Eckblad, Chapman, Chapman, & Mishlove, 1982), seven items from the Perceptual Aberration Scale (Chapman, Chapman, Raulin, & Edell, 1978), and eight items from the Magical Ideation Scale (Eckblad & Chapman, 1983). Individuals who scored 1.96 standard deviations above or 0.5 standard deviations below the same-sex gender mean were recruited to the laboratory. In the laboratory, participants completed the full version of the psychosis-proneness scales and inclusion in the current study was based on their scores on the full version using cut-offs scores obtained from a previous large-sample study (Kerns & Berenbaum, 2000). The mean length of time between completing the screening questions and participating in the lab was approximately three weeks (range two to six weeks).

There were 62 people in the SocAnh group (68% women, mean age = 18.65, $SD = 1.32$, 79% Caucasian) who scored above 1.96 standard deviations above the same-sex mean on the Revised Social Anhedonia Scale. There were 48 people in the PerMag group (53% women, mean age = 18.33, $SD = 0.62$, 81% Caucasian) who scored above 1.96 standard deviations above the same-sex mean on the Perceptual Aberration or Magical Ideation scales or had a summed, standardized score from the Perceptual Aberration and Magical Ideation scales above 3.0. People who qualified for both the SocAnh and PerMag group were excluded ($n = 14$). There were 338 people in the control group (63% women, mean age = 18.45, $SD = 0.84$, 85% Caucasian) who scored less than 0.5 standard deviations below the mean on the Revised Social Anhedonia Scale, Perceptual Aberration Scale, and Magical Ideation Scale. There were no significant between group differences on any demographic variable (e.g., sex, age, ethnicity). People who didn't meet criteria for the SocAnh, PerMag, or control group were excluded from all analyses ($n = 228$).

Materials

Psychosis-proneness scales. Participants completed the Revised Social Anhedonia Scale (RSAS; Eckblad et al., 1982), which is designed to measure lack of relationships and lack of pleasure from relationships (e.g., "Having close friends is not as important as many people say."). They also completed the Perceptual Aberration Scale (PerAb; Chapman et al., 1978) and the Magical Ideation Scale (MagicId; Eckblad & Chapman, 1983), which are designed to measure psychotic-like distortions and unusual beliefs respectively. In addition, participants completed the Chapman Infrequency Scale (Chapman & Chapman, 1983) to screen for careless or invalid responses. Based on previous research (Chapman et al., 1994), those who endorsed three or more items on this 13-item, true-false scale were eliminated from analyses. The 118-items from these four scales were presented to participants in random order. Individuals who score high on RSAS are at an increased risk of developing a schizophrenia-spectrum disorder (Gooding et al., 2005; Kwapil, 1998), and those who score high on the PerAb and MagicId have an increased risk for developing psychosis (Chapman et al., 1994).

Affective control: Primed evaluation task. This task consisted of positively or negatively valenced prime and target words that appeared in succession on a computer screen (Martin & Kerns, 2010). Each prime and target word appeared only once (Klauer et al., 1997). Prime and target words (e.g., positive words: kitten, angel, clothes; negative words: headache, funeral, lice) were selected from previous published norms of affectively valenced words (Anderson, 1968; Bargh, Chaiken, Govender, & Pratto, 1992; Bellazza, Greenwald, & Banaji, 1986; Bradley & Lang, 1999; Brown & Ure, 1969; John, 1988; Rubin, 1980; Silverstein, & Dienstbier, 1968). Words in congruent word pairs (i.e., prime and target with the same valence) were matched to words in incongruent word pairs (i.e., prime and target with different valences) on length and frequency, as well as arousal levels. The proportion of prime and target pairs that had the same valence was .50. Participants were told to read the first word silently to themselves and then to rate the second word for whether it was a "good" (or "positive") word or a "bad" (or "negative") word. Participants responded with a keyboard press, '1′ for good and '2′ for bad. After completing eight practice trials, participants completed four blocks of 32 trials. Each trial began with a fixation cross for 500 ms, followed by a prime word for 150 ms. Then the target word appeared until a participant made a response. Then the screen was blank for 2000 ms until the next trial. Participants were instructed to respond as quickly and accurately as possible. To insure that participants did not evaluate words in an idiosyncratic manner, participants were given visual feedback when they responded incorrectly. Since very fast or very slow responses are likely spurious (Ratcliff, 1993), trials with reaction times less than 200 or greater than 3,500 ms were eliminated. Because we used the standard version of the primed evaluation task, which includes only positively and negatively valenced words but does not include neutral prime words (e.g., Bargh et al., 1992; Fazio et al., 1986; Klauer et al., 1997), we could not discriminate between interference versus facilitation effects. Following previous research (Kerns, 2005; Klauer et al., 1997), the *affective interference effect* was measured as the difference in reaction times between congruent trials (i.e., where prime and target have same valence) versus incongruent trials (i.e., where prime and target have different valences). We also examined error rates on this task to examine whether increased affective interference could be accounted for by a speed–accuracy trade-off.

Procedure

Participants completed the psychosis-proneness scales followed by the primed evaluation task. The data presented here were part of a larger study in which additional, but unrelated tasks, were completed.

Results

First, we conducted a Group (SocAnh vs. PerMag vs. control) by Prime valence (positive vs. negative) by Target valence (positive vs.

negative) ANOVA for reaction times. Results revealed a significant three-way interaction, $F(2, 445) = 3.63$, $p < .027$. We followed up this analysis with a series of t tests.

Reaction Time Affective Interference Effect

We examined whether participants from each group exhibited a significant within-group affective interference effect. We expected that participants would be significantly slower to respond to incongruent trials than they would be to respond to congruent trials. For SocAnh, $t(61) = 4.34$, $p < .001$, and control groups, $t(337) = 3.61$, $p < .001$, paired t test revealed that reaction times were significantly slower for incongruent trials versus congruent trials. Thus, as can be seen in Table 1, the SocAnh and control groups exhibited the expected affective interference effect as they were slower to respond to incongruent trials than congruent trials. In contrast, the PerMag did not show the expected effect, $t(47) = 0.65$, $p = .517$. There was no significant difference in reaction times between the congruent and incongruent trials.

Next, we examined whether there were significant differences between the groups for the reaction time affective interference effect. As can be seen in Table 1 and Figure 1, the SocAnh group exhibited a larger affective interference effect than comparison participants, $t(398) = 2.65$, $p < .01$, effect size $r = .15$. In addition, the SocAnh group exhibited a larger affective interference effect than the PerMag group, $t(108) = 2.0$, $p < .05$, $r = .19$. This suggests that people with elevated SocAnh exhibit poor emotional control as they were less likely to counteract the influence of the prime than both the control and PerMag groups. In contrast, there were no significant differences between the PerMag and control group, $t(384) = 0.47$, $p = .64$, $r = .02$.

Error Rates on the Primed Evaluation Task

Next, we examined whether the increased affective interference effect for reaction time in SocAnh could be accounted for by a speed–accuracy trade-off. If there was a speed–accuracy trade-off, then it would be expected that people with SocAnh would exhibit a smaller affective interference effect for errors (i.e., more congruent errors than incongruent errors) compared to other groups. However, as can be seen in Table 1, results revealed that the SocAnh group did not significantly differ in error rate affective interference effect from the control, $t(398) = 0.84$, $p = .4$, $r = .04$, or the PerMag groups, $t(108) = 0.37$, $p = .7$, $r = .04$. Hence, as can be seen in Table 1, there was no evidence of a speed–accuracy trade-off in SocAnh. In addition, there were no significant differences between the PerMag and control groups in error rate affective interference effect, $t(384) = 1.35$, $p = .18$, $r = .07$.

Discussion

Previous research reported that SocAnh was associated with a deficit in controlled affective

Table 1
Means (SD) of Reaction Times and Error Rates by Trial Type

	SocAnh (n = 62)	PerMag (n = 48)	Controls (n = 338)
Reaction times			
Positive-Positive	925.66 (186.21)	912.63 (222.09)	951.25 (219.28)
Positive-Negative	972.51 (210.03)	945.92 (206.65)	997.20 (215.62)
Negative-Positive	962.67 (192.12)	942.29 (260.60)	962.48 (214.68)
Negative-Negative	816.43 (255.78)	933.85 (330.27)	941.12 (260.17)
Error rates			
Positive-Positive	0.067 (.054)	0.049 (.08)	0.051 (.051)
Positive-Negative	0.065 (.071)	0.076 (.096)	0.048 (.052)
Negative-Positive	0.064 (.068)	0.075 (.12)	0.048 (.062)
Negative-Negative	0.049 (.06)	0.081 (.083)	0.044 (.048)

Note. Trial types are denoted by "prime, target." For example, Positive-Negative means a positive prime and a negative target.

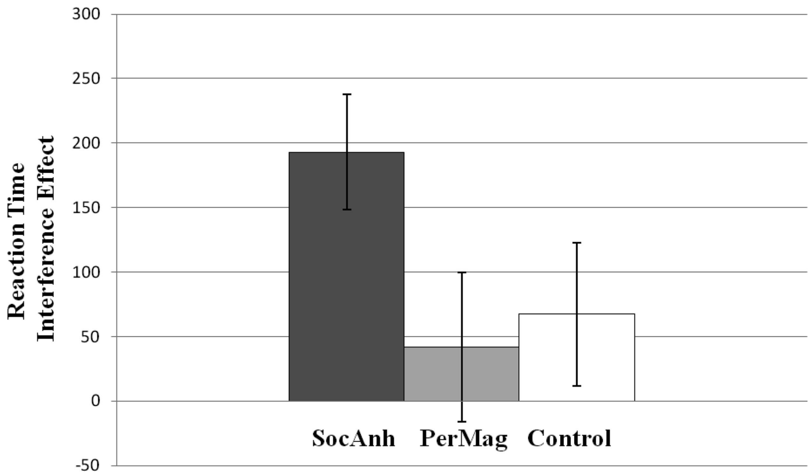

Figure 1. Reaction time interference effects with e*rror bars represent plus or minus one standard error of the mean* for the SocAnh, PerMag, and Control groups.

processing and that this deficit could not be explained by a general difficulty with cognitive control (Martin & Kerns, 2010). The current study examined whether in a much larger sample that this deficit in affective control was unique to SocAnh or whether it was found in a PerMag group also at increased risk for schizophrenia-spectrum disorders. The current study found that only the SocAnh group but not the PerMag group exhibited poor controlled affective processing. Compared to the PerMag and control groups, the SocAnh group exhibited increased affective interference as they were slower for incongruent than for congruent trials. In contrast, there were no differences between the PerMag and control groups. Overall, these results suggest that SocAnh is uniquely associated with poor controlled affective processing.

Another interpretation of the current results is that the increased affective interference in SocAnh reflects an increased automatic affective response to the affective primes. Although counterintuitive in a group appearing to exhibit affective deficits, this would predict that SocAnh is associated with increased affective interference at even shorter SOAs (e.g., Klauer et al., 1997). In contrast, a controlled affective processing deficit predicts increased affective interference only at relatively longer SOAs. We are currently examining these predictions.

Another interpretation of the current results is that SocAnh is associated with an increased response to negative primes. Hence, this could account for why the SocAnh group is much faster for Negative-Negative trials than the other two groups. However, there is at least one problem with this explanation. In the current study, the SocAnh group participants were nonsignificantly faster for Negative-Positive than for Positive-Negative trials, whereas if SocAnh was associated with increased response to negative primes we would expect the reverse. Hence, overall, we think the most likely interpretation of the current results is that SocAnh is associated with an affective control deficit. However, future research should examine whether SocAnh is associated with an increased sensitivity to negative information even in contexts where affective control is not thought to be involved.

A specific deficit in affective control in SocAnh could have implications for how people with SocAnh process emotional information in their daily lives. For example, it is possible that this deficit could result in diminished positive affect. For example, it has been found that people with increased affect intensity are more likely to focus on and amplify their feelings (Larsen, Billings, & Cutler, 1996). Thus, decreased affective control might result in decreased attention to and diminished experience of positive affect in people with anhedonia. Consistent with this, in other research, we have found that SocAnh is associated with decreased attention to and diminished experience of positive affect (Martin et al., 2011). At the same time, given evidence that controlled affective processing is involved in processing emotionally ambivalent stimuli (Cunningham, Van Bavel, & Johnsen, 2008), a deficit in affective control could help account for the association between anhedonia and ambivalence (Kerns, 2006), which has long been considered a fundamental feature of schizophrenia-spectrum disorders (Bleuler, 1911/1950; Raulin & Brenner, 1993).

The current research found an association between SocAnh and a controlled affective processing deficit in a group of extreme-scoring college students at risk for schizophrenia-spectrum disorders. Currently, it is not known whether this affective control deficit has a direct impact in the lives of these individuals. Future research is needed to investigate whether this deficit relates to any social or functional impairment. In addition, it is not known whether there is a similar association in individuals with schizophrenia and schizophrenia-spectrum personality disorders. Schizophrenia is associated with lower intelligence and lower socioeconomic status. Thus, it is possible that results found in college students may not completely generalize to a general population sample. Also, the prevalence of an affective control deficit in any Axis I or II disorder, as well as any associated social or functional impairment, is currently unknown. Future investigations are needed in order to answer such questions. If a deficit in affective control is found in those with a spectrum disorder, specific training in emotion regulation, such as is found in Dialectical Behavior Therapy (Linehan, 1993), could be used to enhance one's focus on positive feelings and to modify negative feelings.

To further understand the controlled affective processing deficit in SocAnh, future research could utilize physiological measures. Recent research reported that people with schizophrenia exhibited similar early electrophysiological potentials compared to control participants in response to emotional stimuli but that they exhibit abnormal late potentials (Horan, Wynn, Kring, Simons, & Green, 2010). Although this group did not report an association with anhedonia, it is possible that their findings could be related to a deficit in affective control in those with elevated levels of anhedonia. In addition, brain imaging techniques could help elucidate the nature of the affective control deficit. For example, poor affective control might be associated with decreased activity in medial frontal and rostral anterior cingulate regions previously associated with controlled evaluative processing (Cunningham et al., 2004; Cunningham et al., 2008; Johnstone et al., 2007).

The current research did not find a significant within-group affective interference effect, in the PerMag group, however the results were in the expected direction (slower for incongruent trials than for congruent trials), and there was no trend for a decreased affective interference effect in the PerMag group compared to controls. One previous study with a small sample found that PerMag was associated with decreased reaction time affective interference (Kerns, 2005). However, in that study there was also evidence of a speed–accuracy trade-off, which could potentially explain the association with reaction time affective interference. Overall, based on the current results with a larger sample size, it does not appear that PerMag is associated with decreased affective interference, at least at an SOA of 150 ms. Future research could examine whether PerMag might be associated with decreased affective interference at even shorter SOAs when affective interference effects are thought to be most robust in controls (i.e., before the influence of affective control). At the same time, other research suggests that PerMag might be associated with other types of emotion processing mechanisms (Berenbaum et al., 2006). For example, PerMag is associated with wanting to ignore negative emotions significantly less than SocAnh or control participants (Martin et al., 2011). Hence, future research could continue to examine whether psychotic-like beliefs and experiences are associated with emotion (Berenbaum et al., 2010). At the same time, other research suggests that PerMag might be associated with other types of emotion processing mechanisms (Berenbaum et al., 2006). For example, PerMag is associated with wanting to ignore negative emotions significantly less than SocAnh or control participants (Martin et al., 2011). Hence, future research could continue to examine whether psychotic-like beliefs and experiences are associated with emotion (Berenbaum et al., 2006).

References

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text revision). Washington, DC: American Psychiatric Association.

Anderson, N. H. (1968). Likeableness ratings of 555 personality-trait words. *Journal of Personality and Social Psychology, 9,* 272–279.

Bargh, J. A., Chaiken, S., Govender, R., & Pratto, F. (1992). The generality of the automatic attitude activation effect. *Journal of Personality and Social Psychology, 62,* 893–912.

Barrett, L. F., Mesquita, B., Ochsner, K. N., & Gross, J. J. (2007). The experience of emotion. *Annual Review of Psychology,* 58, 373–403.

Bellazza, F. S., Greenwald, A. G., & Banaji, M. R. (1986). Words high and low in pleasantness as rated by male and female college students. *Behavior Research Methods, Instruments, & Computers, 18,* 299–303.

Berenbaum, H., Boden, M. T., Baker, J. P., Dizen, M., Thompson, R. J., & Abramowitz, A. (2006). Emotional correlates of the different dimensions of schizotypal personality disorder. *Journal of Abnormal Psychology, 115,* 359–368.

Berenbaum, H., Snowhite, R., & Oltmanns, T. F. (1987). Anhedonia and emotional responses to affect evoking stimuli. *Psychological Medicine, 17,* 677–684.

Blanchard, J. J., Aghevli, M., Wilson, A., & Sargeant, M. (2010). Developmental instability in social anhedonia: An examination of minor physical anomalies and clinical characteristics. *Schizophrenia Research, 118,* 162–167.

Blanchard, J. J., Bellack, A. S., & Mueser, K. T. (1994). Affective and social-behavioral correlates of physical and social anhedonia in schizophrenia. *Journal of Abnormal Psychology, 103,* 719–728.

Bleuler, E., (1911/1950). *Dementia praecox* (J. Zinkin, Trans.). New York: International Universities Press.

Bradley, M. M., & Lang, P. J. (1999). Affective norms for English words (ANEW): Instruction manual and affective ratings. In U. Florida (Ed.), Tech. Rep. No. C-1, The Center for Research in Psychophysiology.

Brown, W. P., & Ure, D. M. (1969). Five rated characteristics of 650 word association stimuli. *British Journal of Psychology, 60,* 233–249.

Chapman, J. P., & Chapman, L. J. (1983). Reliability and the discrimination of normal and pathological groups. *The Journal of Nervous and Mental Disease, 171,* 658–661.

Chapman, L. J., Chapman, J. P., Kwapil, T. R., Eckblad, M., & Zinser, M. C. (1994). Putatively psychosis-prone subjects 10 years later. *Journal of Abnormal Psychology, 103,* 171–183.

Chapman, L. J., Chapman, J. P., Raulin, M. L., & Edell, W. S. (1978). *Schizotypy and thought disorder as a high risk approach to schizophrenia.* New York: Brunner/Mazel.

Cicero, D. C., & Kerns, J. G. (2010). Multidimensional factor structure of positive schizotypy. *Journal of Personality Disorders, 24,* 327–343.

Cunningham, W. A., Espinet, S. D., DeYoung, C. G., & Zelazo, P. D. (2005). Attitudes to the right- and left: Frontal ERP asymmetries associated with stimulus valence and processing goals. *Neuroimage, 28,* 827–834.

Cunningham, W. A., Raye, C. L., & Johnson, M. K. (2004). Implicit and explicit evaluation: FMRI correlates of valence, emotional intensity, and control in the processing of attitudes. *Journal of Cognitive Neuroscience, 16,* 1717–1729.

Cunningham, W. A., Van Bavel, J. J., & Johnsen, I. R. (2008). Affective flexibility: Evaluative processing goals shape amygdala activity. *Psychological Science, 19,* 152–160.

Cunningham, W. A., & Zelazo, P. D. (2007). Attitudes and evaluations: A social cognitive neuroscience perspective. *Trends in Cognitive Science, 11,* 97–104.

De Houwer, J., Hermans, D., Rothermund, K., & Wentura, D. (2002). Affective priming of semantic categorization responses. *Cognition and Emotion, 16,* 643–666.

Eckblad, M., & Chapman, L. J. (1983). Magical ideation as an indicator of schizotypy. *Journal of Consulting and Clinical Psychology, 51,* 215–225.

Eckblad, M., Chapman, L. J., Chapman, J. P., & Mishlove, M. (1982). *The revised social anhedonia scale.* Unpublished manuscript.

Fazio, R. H. (2001). On the automatic activation of associated evaluations: An overview. *Cognition and Emotion, 15,* 115–141.

Fazio, R. H., Sanbonmatsu, D. M., Powell, M. C., & Kardes, F. R. (1986). On the automatic activation of attitudes. *Journal of Personality and Social Psychology, 50,* 229–238.

Germans, M. K., & Kring, A. M. (2000). Hedonic deficit in anhedonia: Support for the role of approach motivation. *Personality and Individual Differences, 28,* 659–672.

Gooding, D. C., Davidson, R. J., Putnam, K. M., & Tallent, K. A. (2002). Normative emotion-modulated startle response in individuals at risk for schizophrenia-spectrum disorders. *Schizophrenia Research, 57,* 109–120.

Gooding, D. C., Tallent, K. A., & Matts, C. W. (2005). Clinical status of at-risk individuals 5 years later: Further validation of the psychometric high-risk strategy. *Journal of Abnormal Psychology, 114,* 170–175.

Hafner, H., & an der Heiden, W. (2003). Course and outcome of schizophrenia. In S. R. Hirsch & D. R.

Weinberger (Eds.), *Schizophrenia* (2nd ed., pp. 101–141). Malden, MA: Blackwell.

Horan, W. P., Blanchard, J. J., Clark, L. A., & Green, M. F., (2008). Affective traits in schizophrenia and schizotypy. *Schizophrenia Bulletin, 34,* 856–874.

Horan, W. P., Green, M. F., Kring, A. M., & Nuechterlein, K. H. (2006). Does anhedonia in schizophrenia reflect faulty memory for subjectively experienced emotions? *Journal of Abnormal Psychology, 115,* 496–508.

Horan, W. P., Wynn, J. K., Kring, A. M., Simons, R. F., & Green, M. F. (2010). Electrophysiological correlates of emotional responding in schizophrenia. *Journal of Abnormal Psychology, 119,* 18–30.

John, C. H. (1988). Emotionality ratings and free-association norms of 240 emotional and non-emotional words. *Cognition and Emotion, 2,* 49–70.

Johnstone, T., van Reekum, C. M., Urry, H. L., Kalin, N. H., & Davidson, R. J. (2007). Failure to regulate: Counterproductive recruitment of top-down prefrontal-subcortical circuitry in major depression. *The Journal of Neuroscience, 27,* 8877–8884.

Kerns, J. G. (2005). Positive schizotypy and emotion processing. *Journal of Abnormal Psychology, 114,* 392–401.

Kerns, J. G. (2006). Schizotypy facets, cognitive control, and emotion. *Journal of Abnormal Psychology, 115,* 418–427.

Kerns, J. G., & Berenbaum, H. (2000). Aberrant semantic and affective processing in people at risk for psychosis. *Journal of Abnormal Psychology, 109,* 728–732.

Klauer, K. C., & Musch, J. (2003). Affective priming: Findings and theories. In J. Musch & K. C. Klauer (Eds.), *The Psychology of Evaluation: Affective Processes in Cognition and Emotion* (pp. 9–50). Erlbaum: Mahwah, NJ.

Klauer, K. C., Rossnagel, C., & Musch, J. (1997). List-context effects in evaluative priming. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 23,* 246–255.

Klauer, K. C., Teige-Mocigemba, S., & Spruyt, A. (2009). Contrast effects in spontaneous evaluations: A psychophysical account. *Journal of Personality and Social Psychology, 96,* 265–287.

Kwapil, T. R. (1998). Social anhedonia as a predictor of the development of schizophrenia-spectrum disorders. *Journal of Abnormal Psychology, 107,* 558–565.

Kwapil, T. R., Barrantes-Vidal, N., & Silvia, P. J. (2008). The dimensional structure of the Wisconsin Schizotypy Scales: Factor identification and construct validity. *Schizophrenia Bulletin, 34,* 444–457.

Larsen, R. J., Billings, D. W., & Cutler, S. E. (1996). Affect intensity and individual differences in informational style. *Journal of Personality, 64,* 185–207.

Lenzenweger, M. F. (1999). Schizophrenia: Refining the phenotype, resolving endophenotypes. *Behaviour Research and Therapy, 37,* 281–295.

Leung, W. W., Couture, S. M., Blanchard, J. J., Lin, S., & Llerena, K. (2010). Is social anhedonia related to emotional responsivity and expressivity? A laboratory study in women. *Schizophrenia Research, 124,* 66–73.

Linehan, M. M. (1993). *Cognitive-Behavioral Treatment of Borderline Personality Disorder.* New York: The Guilford Press.

Machado, L., Wyatt, N., Devine, A., & Knight, B. (2007). Action planning in the presence of distracting stimuli: An investigation into the time course of distractor effects. *Journal of Experimental Psychology: Human Perception and Performance, 33,* 1045–1061.

Martin, E. A., Becker, T. M., Cicero, D. C., Docherty, A. R., & Kerns, J. G. (2011). Differential associations between schizotypy facets and emotion traits. *Psychiatry Research, 187,* 94–99.

Martin, E. A., & Kerns, J. G. (2010). Social anhedonia associated with poor evaluative processing but not with poor cognitive control. *Psychiatry Research, 178,* 416–424.

Morris, J. S., Ohman, A., & Dolan, R. J. (1998). Conscious and unconscious emotional learning in the human amygdala. *Nature, 393,* 467–470.

Ochsner, K. N., & Gross, J. J. (2005). The cognitive control of emotion. *Trends in Cognitive Sciences, 9,* 242–249.

Ochsner, K. N., Ray, R. D., Cooper, J. C., Robertson, E. R., Chopra, S., Gabrieli, J. D., & Gross, J. J. (2004). For better or for worse: Neural systems supporting the cognitive down- and up-regulation of negative emotion. *Neuroimage, 23,* 483–499.

Preacher, K. J., Rucker, D. D., MacCallum, R. C., & Nicewander, W. A. (2005). Use of the extreme groups approach: A critical reexamination and new recommendations. *Psychological Methods, 10,* 178–192.

Ratcliff, R. (1993). Methods for dealing with reaction time outliers. *Psychology Bulletin, 14,* 510–532.

Raulin, M. L., & Brenner, V. (1993). Ambivalence. In C. G. Costello (Ed.), *Symptoms of schizophrenia* (pp. 201–226). New York: Wiley.

Rubin, D. C. (1980). 51 properties of 125 words: A unit analysis of verbal behavior. *Journal of Verbal Learning and Verbal Behavior, 19,* 736–755.

Schwarz, N. (1999). Self-reports: How the questions shape the answers. *American Psychologist, 54,* 93–105.

Silverstein, A., & Dienstbier, R. A. (1968). Rated pleasantness and association value of 101 English nouns. *Journal of Verbal Learning and Verbal Behavior, 7,* 81–86.

Wentura, D. (2000). Dissociative affective and associative priming effects in the lexical decision task: Yes versus no responses to word targets reveal evaluative judgment tendencies. *Journal of Experimental Psychology Learning, Memory, and Cognition, 26,* 456–469.

Wolf, D. H. (2006). Anhedonia in schizophrenia. *Current Psychiatry Reports, 8,* 322–328.

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