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# Emotional word usage in groups at risk for schizophrenia-spectrum disorders: An objective investigation of attention to emotion

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A B S T R A C T

Both extreme levels of social anhedonia (SocAnh) and extreme levels of perceptual aberration/magical ideation (PerMag) indicate increased risk for schizophrenia-spectrum disorders and are associated with emotional deficits. For SocAnh, there is evidence of self-reported decreased trait positive affect and abnormalities in emotional attention. For PerMag, there is evidence of increased trait negative affect and increased attention to negative emotion. Yet, the nature of more objective emotional abnormalities in these groups is unclear. The goal of this study was to assess attention to emotions more objectively in a SocAnh, PerMag, and control group by using a positive (vs. neutral) mood induction procedure followed by a free writing period. Linguistic analyses revealed that the SocAnh group used fewer positive emotion words than the control group, with the PerMag group falling in between the others. In addition, both at-risk groups used more negative emotion words than the control group. Also, for the control group only, those in the positive mood induction used more positive emotion words, suggesting their emotions influenced their linguistic expression. Overall, SocAnh is associated with decreased positive emotional expression and at-risk groups are associated with increased negative emotional expression and a decreased influence of emotions on linguistic expression.

## 1. Introduction

People at risk for developing schizophrenia-spectrum disorders, such as individuals with elevated levels of social anhedonia (SocAnh) or perceptual aberrations and magical ideation (PerMag), are characterized with abnormalities in emotion traits (e.g., Martin et al., 2011a; Kerns, 2005). Importantly, previous research suggests that SocAnh and PerMag have both shared and unique emotion abnormalities. For example, both SocAnh and PerMag are associated with increased trait negative affect but only SocAnh is associated with decreased trait positive affect (e.g., Gooding and Pflum, 2014; Gooding and Tallent, 2003; Martin et al., 2011a). In addition, both SocAnh and PerMag are associated with increased neural reactivity to negative stimuli (Martin et al., 2016; Karcher and Shean, 2012) but only SocAnh is associated with decreased neural reactivity to positive stimuli (Hooker et al., 2014; Martin et al., 2016). Relatedly, both SocAnh and PerMag are associated with increased self-reported attention to negative emotion but only SocAnh is associated with decreased self-reported attention to positive emotions (Martin et al., 2011a). At the same time, both SocAnh and PerMag individuals reporting increased perceptual aberrations measured by the Schizotypal Personality Questionnaire (Raine, 1991) have been associated with aspects of alexithymia, such as increased difficulty identifying emotions (Van't Wout et al., 2004). However, only SocAnh has been associated with increased difficulty describing emotions, another facet of alexithymia (Gooding and Tallent, 2003; Martin et al., 2015). Overall, these results provide evidence that SocAnh and PerMag exhibit shared (e.g., increased attention to negative information, increased reactivity to negative stimuli) but also unique emotion abnormalities (e.g., decreased attention to positive information in SocAnh only). Because both SocAnh and PerMag are associated with the development of schizophrenia-spectrum disorders (e.g. Horan et al., 2008; Kwapil, 1998, Gooding et al., 2005), and they are both associated with emotion abnormalities (e.g., Gooding and Tallent, 2003; Martin et al., 2011a, 2011b), understanding these abnormalities could have important implications for future prevention and intervention in schizophrenia-spectrum disorders.

### 1.1. Measures of emotion abnormalities

Although emotion abnormalities are considered core deficits of these at-risk groups, previous studies have largely approached measur-

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ing these abnormalities only by directly asking individuals about their emotional experiences and trait tendencies. Thus, it is unclear the extent to which these abnormalities are reflected in more objective measures of attention to emotion. It is important to consider whether such abnormalities are reflected in objective measures because currently it is not clear whether they are consistent under different circumstances. Although some studies have used experience sampling methodology to investigate daily, real-time emotional experiences and expression in at-risk individuals (e.g. Barrantes-Vidal et al., 2013; Kwapil et al., 2012), participants were still directly asked about their emotions. Directly asking participants questions related to the construct of interest might activate participants' pre-existing beliefs and attitudes (Feldman and Lynch, 1988), or they may even form those beliefs or attitudes only after being asked the researcher's question (Fazio et al., 1984). Thus, rather than tapping into strongly endorsed or long-held beliefs which guide behavior, self-report questionnaires may lead participants to form judgments they otherwise would not form, resulting in responses that do not truly reflect the intended construct of interests. Although there is also some support of emotion abnormalities in SocAnh from non-self-report behavioral priming tasks (Martin and Kerns, 2010; Martin et al., 2011b), emotion delayed match-to-sample memory tasks (Gooding and Tallent, 2003), and in at-risk groups from neural measures (Martin et al., 2016; Karcher and Shean, 2012), it is still unclear whether the results could be reflected in a more objective, naturalistic measure. That is, it is unclear the extent to which these groups attend to emotional information naturally without being explicitly instructed to do so. One way to assess this is using a free writing paradigm, in which participants write naturally without any restrictions or instructions. This measure can give a more objective assessment of how one attends to emotions, which may be beneficial in clarifying part of the nature in emotion abnormalities in groups at risk for the development of schizophrenia-spectrum disorders. Thus, the current research examined whether differences in attention to emotions between two at-risk groups, SocAnh and PerMag, and a control group are reflected in a free writing paradigm, in which participants are given no prompt and can write freely about anything they want.

### 1.2. Significance of free writing and linguistic analysis

Extensive research has investigated the relationship between expressive writing and health outcomes in healthy participants (for a review, see Frattaroli, 2006). This body of work suggests that writing about positive experiences is associated with enhanced positive mood and better physical and psychological outcomes compared to control conditions (i.e., writing about emotionally neutral topics; Burton and King, 2008; Pennebaker et al., 1988; Smyth, 1998). At the same time, previous research suggests that writing about experienced traumatic events, as a possible way to find meaning in those events, is also associated with positive outcomes (e.g., Pennebaker, 1985). Together, these studies provide evidence that writing about emotional (compared to neutral topics) is more beneficial to one's mental and physical health. However, participants in those studies all received prompts to guide their writing. The presence of any prompt could influence one's natural word use since participants could spontaneously engage in attitude formation when they are prompted to express an opinion on questions in relation to the construct of interest (Fazio et al., 1984). Importantly, natural word use is crucial in revealing aspects of our social and psychological states (Pennebaker et al., 2003) and may only be reflected in unprompted, open-ended responses. Thus, in order to objectively measure naturalistic linguistic expression, the current study adopted a free-writing paradigm in which participants were asked to write freely about anything they wished. The free-writing task is therefore an objective, alternative measure that operationalizes affective tendencies by measuring natural emotion word use.

In previous studies, this same objective measure of word use has also been utilized to measure affective tendencies in writing and speech samples of individuals with schizophrenia (Junghaenel et al., 2008; Minor et al., 2015) and with schizotypy (Najolia et al., 2011), which refers to a personality organization that reflects liability for schizophrenia (Meehl, 1962). These studies suggest differences exist in emotional word use between people at risk for a schizophrenia-spectrum disorder, those already diagnosed, and healthy individuals. Considering linguistic analysis of word use has provided evidence of emotional differences between these groups, word analysis could be an alternative measure over self-report questionnaires to understand emotion deficits more objectively. At the same time, previous research suggests schizotypy is dimensional (Kwapil et al., 2008) and that there are differential relationships within facets of schizotypy to cognitive control, emotion processing, and emotional experience (Kerns, 2006; Martin et al., 2011a). The current research extends knowledge about schizotypy by characterizing the relationship between schizotypy facets (i.e., SocAnh vs. PerMag) and specific emotional attention traits.

### 1.3. Using affect as information to guide behaviors

Our current affective state is related to multiple outcomes, such as thinking, judgments and behaviors. The "affect-as-information" theory suggests that people often use their own feelings as diagnostic information to make judgments, as if asking, "How do I feel?" before making a decision or conclusion (Schwarz and Clore, 2003). For example, previous research has found that healthy individuals who experienced a negative mood induction tended to have higher risk estimates than those in the positive mood condition (Gasper and Clore, 2000). In line with this research, Martin et al. (2011a) investigated the link between negative mood and judgment of risk in SocAnh, PerMag and control groups. They found this relationship was only present in the PerMag and control groups (both $rs < 0.42$, both $ps < 0.05$) but not in the SocAnh group [$r(54)=0.00$, $p=0.99$]. That is, there was a relationship between negative mood and judgments in both the PerMag and control groups but not in the SocAnh group. This finding suggests only the PerMag and control groups, but not the SocAnh group, use their negative mood as information when making judgments. This effect has been found not only for negative moods, but also for current positive mood and judgments (e.g., decreased stereotypic judgments; Bodenhausen et al., 1994) in healthy individuals. Though the relationship between current negative mood and judgment has been examined in SocAnh and PerMag, it is unknown whether a relationship exists between current positive mood and actual behaviors, such as the content of naturalistic writing samples. Thus, the current research examined if similar relationships between positive mood and writing would be found for these groups.

Because SocAnh is associated with lower baseline positive affect compared to the other groups (Gooding and Tallent, 2003), the relationship between positive mood and free writing in SocAnh could be attenuated compared to the relationship found for the PerMag and control groups. Thus, in the current study, half of each group's participants underwent a pleasant mood induction in order to increase their positive moods. Past research has found that both affiliative and comedic videos produced a significant increase in positive affect for individuals with SocAnh and healthy participants (Leung et al., 2010). Therefore, including a positive induction to raise levels of positive affect allows for an investigation of a more definite relationship between current positive mood and word usage in a free writing paradigm.

### 1.4. The current study

Overall, the current study aimed to examine whether there are differences in emotional word use between the at-risk and control groups through a free writing task. Because people with SocAnh report decreased positive affect and decreased attention to positive emotion, we expected that there would be fewer positive emotion words used