Disruptions to processing of self referential emotional material are associated with positive symptoms of schizotypy

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Abstract

The current experiment examined emotional processing difficulties related to self referential material in high schizotypal individuals employing the mnemic neglect paradigm. Participants read about behaviors, in reference to themselves, that were either central or peripheral, and positive or negative, before recalling those behaviors. Levels of self reported unusual experiences and cognitive disorganization were associated with reduced recall of central positive behaviors, and increased recall of central negative behaviors. These findings are discussed in terms of emotional processing of stimuli in schizotypy, and suggest that high schizotypal individuals are insensitive to emotional self referential material.

Key words: schizotypy; mnemic neglect; threat

1. *Introduction*

Numerous emotional impairments have been noted for individuals with schizophrenia (Aleman & Kahn, 2005), as well as for those who score highly on the related personality trait of schizotypy (Claridge, 1997; Hoshi et al., , 2011; Reed, Wakefield et al., 2008). These disruptions to processing of emotions include inappropriate affect, anhedonia, affective flattening, depression and anxiety, as well as impaired emotional perception, reduced emotional expression, and reduced self-reported positive experiences (Kring, 1999). Emotional impairments may be more of a central feature of both disorders than previously claimed (Aleman & Kahn, 2005), and affect many aspects of emotional functioning (Cedro et al., 2001). Individuals with schizophrenia also show difficulty in coping with emotional stress (van den Bosch et al., 1992), which worsen psychotic symptoms (Horan & Blanchard, 2003; Myin-Germeys et al., 2001).

The study of schizotypy has been used to help illuminate the characteristics of schizotypy itself, but also as individuals with high levels of schizotypy display characteristics similar to those individuals with diagnosed schizophrenia (Chapman et al., 1978; Reed, Wakefield et al., 2008). In fact, one advantage of examining individuals with high levels of schizotypy, rather than individuals with schizophrenia, is that schizotypal individuals are medication free, and so the impact of traits can be examined without the contaminating effects of neuroleptic intervention. In fact, emotional processing difficulties have also been found in individuals with high levels of schizotypy (Hoshi et al., 2011), positive symptoms of schizotypy being associated with greater attention to emotions, but less clarity of emotions, as well as an increased likelihood of being emotionally overwhelmed (Kerns, 2005). Emotional processing difficulties have also been recently detected affecting memory, participants scoring high on unusual experiences on the *Oxford Liverpool Inventory of Feelings and Experiences* (OLIFE; e.g., Mason et al., 2005)

scale show no enhancement for emotional elements of a story in recall memory, unlike low scoring individuals, but an effect is apparent in recognition memory.

If schizotypal individuals demonstrate emotional processing difficulties then these difficulties may also be noted in memory performance using the '*mnemic neglect*' paradigm, which focuses on processing and memory for self-threatening emotional stimuli, which has not previously been studied in relation to schizotypy (see Sedikides et al., in press, for review). In a mnemic neglect experiment, participants are presented with a number of behavioral traits consisting of central positive behaviors, central negative behaviors, peripheral positive behaviors, and peripheral negative behaviors. Central behaviors are traits that are relatively high in personal descriptiveness and importance to the self (e.g., trustworthy vs. untrustworthy), whilePeripheral traits are only moderately personally descriptive and of less importance to the self (e.g., modest vs. immodest; e.g., Sedikides & Green, 2000).

Participants encode this information either in relation to themselves, or they are asked to consider the information in relation to another individual. Typically, in this task, participants report recall of more central behaviors than peripheral behaviors. Central negative behaviors, encoded in relation to the self, tend to be remembered more poorly than central positive behaviors. Fewer central negative behaviors encoded in relation to the self tend to be reported in comparison to behaviors encoded in relation to another individual. Fewer central negative behaviors reported in the self condition (compared to central positive behaviors), and fewer central negative behaviors reported in the self condition (compared to the other condition), represent the mnemic neglect effect.

The mnemic neglect paradigm offers advantages over previously used paradigms, as the material tested is both self-referential and self-threatening, and emotional processing difficulties

may be strongly observed relative to the recall of '*self threatening information*'. Self threatening information refers to negative information concerning an important personal trait (also known as 'central negative information'). Individuals tend to selectively forget or inhibit central negative information, resulting in mnemic neglect (Green et al.,2007; Sedikides & Gregg, 2003) relative to central positive information. Application of this technique to a schizotypal sample would be a novel extension of previous work, as it is the first to examine the effect of schizotypy on self referential information and information that is threatening to the self. If schizotypal individuals demonstrate emotional processing difficulties, as noted above (see Hoshi et al., 2011; Kearns, 2005; Kring, 1999), then there may be differences in memory performance using the mnemic neglect paradigm in those with lower or higher scores on schizotypy traits. Given these possibilities, the current study examined whether these effects would be disrupted in those with high schizotypy scores, especially in relation to the positive symptoms of the trait.

2. *Method*

2.1 Participants

Eighty participants (32 males, 48 females; M age = 21.50 years) recruited from a student population by advertisement volunteered to participate in exchange for course credit. No participant reported a history of psychosis or depression.

2.2 Questionnaires

The Oxford Liverpool Inventory of Feelings and Experiences - Brief Version (OLIFE-B; Mason et al., 2005) is a 43 item scale consisting of four subscales: unusual experiences (UE), cognitive disorganization (CD), introverted anhedonia (IA) and impulsive nonconformity (INC).

The scale has an internal reliability (Cronbach α) of between .62 and .80, and a concurrent validity of between .90 and .94 (UE α = .80, validity = .94; CD, α = .77, validity = .93; IA, α = .62, validity = .91; INC, α = .63, validity = 0.90; Mason et al., 2005)

Beck Depression Inventory (BDI; Beck et al., 1961) assesses the clinical symptoms of depression. The score is a sum of the positive answers, ranging from 0 to 63. The internal reliability (Cronbach α) of the scale is between 0.73 and 0.92, and a concurrent validity of between 0.55 and 0.73 for non psychiatric subjects (Beck et al., 1988).

Spielberger Trait Anxiety Inventory-Trait (STAI-T; Spielberger, 1989) rates the affective, cognitive, and physiological manifestations of anxiety in terms of long-standing patterns (i.e., trait anxiety). Scores for each question range from 1 = never, to 4 = almost always, and the total score can range from 20 to 80. The internal reliability (Cronbach α) of the scale is 0.93, with concurrent validity = 0.52 to 0.80 (Spielberger et al, 1983).

2.3 Experimental materials

Participants were presented with 32 behaviors organized across four traits (i.e., central behaviurs: *trustworthy-untrustworthy* and *kind-unkind*; peripheral: *modest-immodest* and *uncomplaining-complaining*; see Appendix). In each of the four traits, four behaviors were presented as positive examples in that dimension, and four behaviors were presented as negative examples. In total, there were eight behaviors presented as examples of each of the four trait dimensions (i.e., 8 each of central positive, central negative, peripheral positive and peripheral negative). Validation studies have determined that trustworthy and kind behaviors are perceived of as central behaviors (i.e., refer to underlying traits), while modest and uncomplaining behaviors are perceived as peripheral behaviors (i.e., do not refer to underlying traits), and

determined that the behaviors are either highly positive or negative, highly diagnostic of underlying traits (i.e., central) or not (i.e., peripheral), and highly important to perform (i.e., central) or not to perform (i.e., peripheral; see Saunders, 2011, 2012, for UK populations; Sedikides, 1993, 1995; Sedikides & Green, 2000 for US populations).

2.4 Procedure

Participants first completed the questionnaires, and were then presented with the 32 behaviors, and asked to consider each behavior in relation to themselves to induce self referential processing:

"*Consider the following description of YOURSELF. Think of the description as being based on actual knowledge of people who know you well. Think of the description as real*."

The order of presentation of behaviors to participants was randomized, and participants worked through the booklet of behaviors in their own time. Following a 5 min distracter (anagrams), participants were asked to write down as many of the behaviors as they could remember.

3.1 Results and discussion

-------- Table 1 about here -------

The means and standard deviations for each of the OLIFEB subscales, the BDI and STAI-T, and the correlations between them are shown in Table 1. Strong correlations were found between most of the subscales and these results are similar to those noted previously (e.g., Mason et al., 2005; Reed, Wakefield et al., 2008).

3.1.1 Scoring of free recall

The free recall reports were judged by two individuals, who scored the data according to a 'gist' criterion (e.g., Green et al., 2005; Saunders, 2011, 2013), whereby judges were instructed to consider the recalled behaviors as correct if the participant got the valence and most of the behavior correct. The judges agreed on 85% of descriptors of behaviors, and the remaining behaviors were discussed to resolve the discrepancy. Recalling a behavior that was not studied, or changing the valence of the behavior, accounted for 12.1% of the traits reported, and these were removed prior to data analysis. This level of intrusions is comparable to that noted by Green and colleagues (2005) and Saunders (2011, 2013).

3.1.2 Data analysis of OLIFE subscales

Tables 2 to 5 show the mean recall performance for the behaviors for each of the subscales of the OLIFE. Participants were divided into high and low UE, CD, IA and INC groups based on a one third split of the data to provide responses from the extreme ends of the OLIFE scale. This method has previously been used by Randell and colleagues (2009), and is employed in preference to regression due to sampling size, because it is thought to be more conservative (see Osborne et al., 2008), and because it was not known whether the impact of the subscales on memory performance would have a linear or step function (Osborne et al., 2008). Where tied ranks occurred around the one third split these participants were excluded to ensure that participants' scores on the OLIFE subscales in the high or low groups truly represented the extreme ends of the schizotypy continuum in the population sampled.

Performance on the free recall task was subjected to Analysis of Covariance (ANCOVA), with scores on the BDI and STAI acting as covariates, as depression and anxiety are both associated with hallucination formation (Freeman & Garety, 2003).

---- Tables 2-5 about here -----

In the high UE group there were 26 participants (M = 6.46, SD = 1.27), and there were 26 participants in the low UE group (M = .54, SD = .51). A 2 (UE: high or low) x2 (centrality: central and peripheral) x2 (valence: positive and negative) mixed model ANCOVA, with BDI and STAI scores as covariates, was conducted. It revealed a significant three way interaction between the variables, $F(1,50) = 10.53$, $p < .01$, $\eta^2_p = .17$. To examine this interaction, separate two factor mixed-model ANCOVAs (UE x centrality, with BDI and STAI as covariates) was conducted on the positive and negative behaviors. For positive behaviors, it revealed a significant interaction between UE and centrality, $F(1,50) = 8.97$, $p < .01$, $\eta^2_p =$ = .15, and there was a marginal interaction for negative behaviors, $F(1,50) = 2.89$, $p = .09$, $\eta^2_p =$ .05. A between subjects ANCOVA was conducted to determine any differences between high and low UE groups on recall of behaviors, which revealed that low UE participants (M = .35) reported more central positive behaviors than high UE participants (M = .24), $F(1,50) = 8.73$, $p < .01$, $\eta^2_p =$ .15. The high UE group (M = .27) reported more central negative behaviors than the low UE group (M = .16), $F(1,50) = 9.49$, $p < .01$, $\eta^2_p =$ .16. There were no differences between high and low UE groups for recall of peripheral positive, $p > .30$, or peripheral negative, behaviors, $F < 1$. As the BDI and STAI scores were controlled for we can be more certain that the differences in performance between the high and low groups are due to unusual experiences and not depression or anxiety (see also Saunders et al., 2012).

In the high CD group there were 24 participants (M = 5.17, SD = .90), and 35 participants in the low group (M = .49, SD = .51). A three factor mixed model ANCOVA (CD x valence x centrality, with BDI and STAI as covariates) revealed a significant three-way interaction, $F(1,57) = 6.97$, $p < .01$, $\eta^2_p = .11$. Separate two factor ANCOVAs (CD x centrality) revealed a significant interaction for positive behaviors, $F(1,57) = 5.65$, $p < .01$, $\eta^2_p = .09$, but no interaction for negative behaviors, $p > .30$. Between subjects ANCOVAs revealed that low CD participants (M = .31) reported more central positive behaviors than high CD participants (M = .24), $F(1,57) = 5.24$, $p < .05$, $\eta^2_p = .08$, but there were no differences found between high and low CD groups for recall of peripheral positive behaviors, $p > .30$. As the BDI and STAI scores were controlled for we can be more certain that the differences in performance between the high and low groups are due to cognitive disorganisation and not depression or anxiety (see also Saunders et al., 2012).

In the high IA group there were 17 participants (M = 5.19, SD = .98), and in the low IA group there were 16 participants (M = .69, SD = .48). A three way ANCOVA (IA x valence x centrality, with BDI and STAI as covariates) revealed no significant three way interaction, $F < 1$.

In the high INC group there were 33 participants (M = 4.09, SD = 1.16), and in the low INC group there were 21 participants (M = .00, SD = .00). A three way ANCOVA (INC x valence x centrality, with BDI and STAI as covariates) revealed no significant three way interaction, $F < 1$.

4. Discussion

Previous research has suggested that individuals with schizophrenia have difficulties processing emotion (Kring, 1999; Myin-Germeys et al., 2001), and this effect has recently been extended to

include memory recall of emotional scenes in schizotypy (Hoshi et al., 2011). The current experiment is the first to examine the effect of schizotypy on memory for self threatening information (i.e., self-referent material that is threatening to the self). High schizotypy participants recalled fewer central positive behaviors and more central negative behaviors, as well as more peripheral behaviors, than low schizotypy participants, but was only associated with unusual experiences and cognitive disorganization – the positive symptoms of schizophrenia and schizotypy.

The reduced recall of central positive behaviors in high UE and CD is consistent with Kring's (1999) finding of fewer self-reported positive experiences in individuals with schizophrenia. It should be noted, however, that an increase was numerically observed in recall of peripheral positive behaviors associated with cognitive disorganization and impulsive nonconformity. This suggests that not all positive stimuli are processed in the same manner. Positive stimuli that are central to the self, appear to be impaired, while stimuli peripheral to the self appears to be facilitated. This finding suggests that UE and CD are associated with disrupted self image, whereby peripheral information to the self is processed, and attended to equally with central information; that is, central self-referential information in schizotypy is attended to more poorly than in low schizotypy.

The increase in recall of central negative behaviors in the high UE and CD groups is consistent with Kerns' (2005) finding of increased recall of emotional stimuli in high schizotypy individuals. This finding, again, suggests a disrupted self-image in high schizotypal individuals whereby self-threatening information is attended to and processed deeply. Consistent with this suggestion are previous findings that high UE participants reported feeling more frightened and emotional after the presentation of emotional stories (Hoshi et al., 2011). Thus, disruptions in

emotional processing in schizotypy may lead to self threatening information being highly available in conscious awareness and, coupled with difficulties in being able to ignore, or set aside, self threatening information, may lead to increased affective responses and cognitions. Also consistent with this finding is that subjective emotional arousal is associated with an increase in attention and encoding of salient stimuli in the environment (Anderson et al., 2006; Buchanan et al., 2006; Kensinger & Corkin, 2003). Thus, high schizotypal individuals may experience heightened emotional processing leading to attention to be paid to self threatening information in the environment.

There were no effects for either IA or INC in the current study. These two subscales outwardly appear to relate to negative emotions and negative behaviors as included in the task (e.g., some of the trustworthy-untrustworthy, or kind-unkind, items could be considered impulsive or non-conformist). In addition, both UE and CD were found to correlate with INC, which might imply the latter subscale would show similar affects as the former. The reasons for these null results are unclear, although it may be that only the positive symptoms of schizotypy (and schizophrenia) strongly impact this task. Certainly, it may the case that the negative symptoms do not have an effect over and above the impact of depression and anxiety, which were statistically controlled for in this study, although we speculate on a possible reason in more depth below.

The current findings suggest a possible role for self referential information and memory processing – particularly self threatening information – in either the formation, or maintenance, of positive symptoms of schizotypy. Although both of these areas require further investigation there are some indications from previous research using diverse investigative approaches which also point to the role of the self, and memory, in hallucinations and delusions, although further

work is required in order to clarify this complex link with positive symptomatology in schizophrenia and schizotypy. For example, negative beliefs about the self, others and the world are associated with the development of psychosis (Bentall et al., 2001; Garety et al., 2001; Morrison, 2001), especially hallucinations (Kilcommons & Morrison, 2005), and particularly in relation to negative self referential beliefs formed as the result of past trauma (Kilcommons & Morrison, 2005), which may fuel hallucinatory content (Read et al., 2004). Similarly, it has also been suggested that the formation of faulty self referent information in response to trauma increases susceptibility to psychosis (Morrison, 2001).

Likewise, it has been suggested that around three quarters of individuals with psychosis believe that the voices that they hear are connected to a prior trauma (Romme & Escher, 1993, 2000; Romme et al., 2009), and Johnstone (2011) has also claimed that the content of an individual's delusions are closely related to abuse experienced during childhood. The relationship, thus, between the self and memory is likely to be complex largely due to the infinity variability in individual's personal history and sense of self which will shape the phenomenology of positive symptomatology, as well as affecting how an individual reacts and copes with unusual experiences.

Although the possible link between positive symptoms of schizotypy and self referential processing and memory remains currently speculative it does potentially explain the current failure, and previous failures (e.g., Saunders et al., 2012) to find an effect of introvertive anhedonia and impulsive nonconformity on self referential memory. The research outlined above clearly indicates a relationship between formation and/or maintenance of hallucinations and delusions, memory and self referential processing/information rather than for other symptoms or behaviors of psychosis, such as problems in experiencing pleasure or acting impulsively.

However, that is not to say that IA and INC do not affect cognitive processing but, rather, they may play more specific roles in other cognitive tasks, such as those tapping into attentional processes, rather than self referential memory.

A potential limitation of the study in terms of understanding schizophrenia from a clinical perspective is, of course, the use of a nonclinical sample of undergraduate students scoring highly in terms of sub clinical schizotypy. The degree to which their results will generalize to a clinical sample will need to be established. However, similarities between high schizotypal and schizophrenic individuals have been noted in many previous studies of various phenomena (see above), and the use of a nonclinical sample avoids some confounds (e.g., the impact of medication) noted in clinical samples.

In summary, schizotypy was found to be associated with reduced recall of central negative behaviors and increased recall of self-threatening information. These effects were found to be associated with UE and CD and suggest disrupted processing of self referential information.

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Table 1: Mean, standard deviation and correlations for each of the OLIFE-B subscales, the BDI and STAI-T in Experiment 1.

	UE	CD	IA	INC	BDI	STAI-T
	M = 3.41	*M* = 2.36	*M* = 2.40	*M* = 2.16	*M* = 13.90	*M* = 38.18
	SD = 2.59	*SD* = 2.08	*SD* = 2.11	*SD* = 1.89	*SD* = 4.98	*SD* = 5.97
CD	.48**					
IA	.05	.05				
INC	.27*	.37**	.18			
BDI	.06	.10	.07	.06		
STAI-T	-.02	.13	.01	.21	.05	

* $p < 0.05$; ** $p < 0.01$.

Note. OLIFE-B = Oxford-Liverpool Inventory of Feelings and Experiences. BDI = Beck Depression Inventory. STAI-T = Spielberger Trait Anxiety Inventory- Trait. UE = unusual experiences. CD = cognitive disorganisation. IA = introvertive anhedonia. INC = impulsive nonconformity.

Table 2: Mean recall of traits by valence and behavior in high and low unusual experiences (UE) groups.

	Central		Peripheral	
	Positive	Negative	Positive	Negative
High UE (n = 26)	.24 (.14)	.27 (.14)	.24 (.13)	.24 (.14)
Low UE (n = 26)	.35 (.13)	.16 (.10)	.20 (.10)	.21 (.12)

Note. UE = unusual experiences. Standard deviations enclosed in parentheses.

Table 3: Mean recall of traits by valence and behavior in high and low cognitive disorganization (CD) groups.

	Central		Peripheral	
	Positive	Negative	Positive	Negative
High CD	.24	.28	.27	.23
(*n* = 24)	(.12)	(.14)	(.13)	(.14)
Low CD	.31	.21	.22	.22
(*n* = 35)	(.13)	(.12)	(.13)	(.13)

Note. CD = cognitive disorganization. Standard deviations enclosed in parentheses.

Table 4: Mean recall of traits by valence and behavior in high and low introvertive anhedonia (IA) groups.

	Central		Peripheral	
	Positive	Negative	Positive	Negative
High IA	.27	.23	.17	.21
(*n* = 17)	(.12)	(.13)	(.08)	(.10)
Low IA	.30	.18	.20	.20
(*n* = 16)	(.15)	(.10)	(.09)	(.11)

Note. IA = introvertive anhedonia. Standard deviations enclosed in parentheses.

Table 5: Mean recall of traits by valence and behavior in high and low impulsive nonconformity (INC) groups.

	Central		Peripheral	
	Positive	Negative	Positive	Negative
High INC (n = 33)	.28 (.13)	.22 (.15)	.27 (.13)	.24 (.14)
Low INC (n = 21)	.31 (.13)	.21 (.11)	.19 (.11)	.18 (.11)

Note. INC = impulsive nonconformity. Standard deviations enclosed in parentheses.