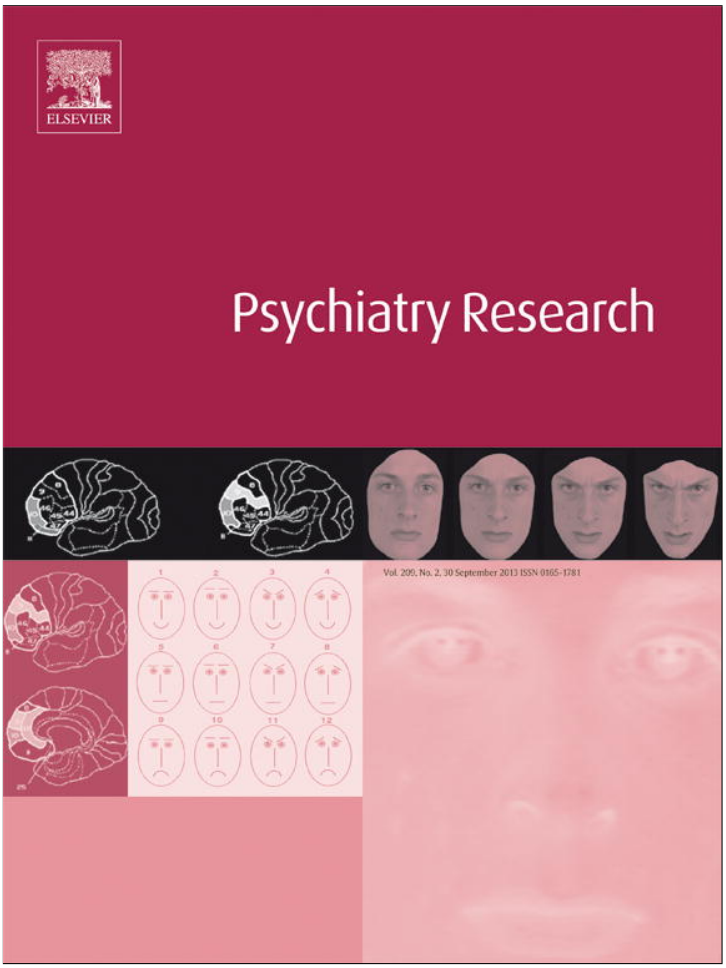

Psychiatry Research 209 (2013) 136–141

Contents lists available at ScienceDirect

Psychiatry Research

journal homepage: www.elsevier.com/locate/psychres

Affecting coping: Does neurocognition predict approach and avoidant coping strategies within schizophrenia spectrum disorders?

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ARTICLE INFO

Article history:
Received 7 January 2013
Received in revised form
29 March 2013
Accepted 1 April 2013

Keywords:
Affective traits
Avoidant and approach coping
Attention
Memory
Schizophrenia
Schizotypy

ABSTRACT

According to various diathesis-stress models of schizophrenia, life stress plays a defining role in the onset and course of schizophrenia-spectrum disorders. In this regard, individual differences in coping strategies and affective traits, variables related to the management and experience of stress, may play a large role in susceptibility to the disorder and symptom exacerbation. Furthermore, it has been posited that cognitive deficits may limit an individuals' ability to effectively respond to stressful situations. We investigated the relationships between attention, immediate memory, trait negative affect (NA), trait positive affect (PA) and specific coping strategies within three groups: chronic schizophrenia patients ($n=27$), psychometrically-defined schizotypy ($n=89$), and schizotypy demographically-matched controls ($n=26$). As hypothesized affective traits displayed predictable relationships with specific coping strategies, such that NA was associated with the greater use of avoidant coping strategies within the schizophrenia and schizotypy group, while PA was associated with greater use of approach coping styles within all groups. The schizotypy group reported significantly higher levels of NA and also greater use of avoidant coping strategies than both the control and schizophrenia group. As expected group differences were found in trait affect, coping strategies, and cognitive functioning. Importantly, these group differences remained significant even when demographic variables were entered as covariates. Contrary to our expectations, cognitive functioning displayed only a few tenuous relationships with coping strategies within the schizophrenia and schizotypy groups. Overall, results support the notion that affective traits and not cognitive functioning is the best predictor of approach and avoidant coping strategies.

1. Introduction

Diathesis-stress models of schizophrenia posit that life stress plays a defining role in the onset and course of schizophrenia, in which stress is thought to trigger a cascade of neurobiological events that are associated with both symptom manifestation and symptom reoccurrence in schizophrenia (see Walker and Diforio, 1997). However, the degree to which stress produces elevations in clinical symptoms levels is not the same for every patient (Norman and Malla, 1993). Thus, investigating characteristics that heighten or diminish individuals' responses to stress remains an important direction for research. Central to certain diathesis stress models of schizophrenia is the personality construct of schizotypy, which is believed to represent an underlying vulnerability toward development of schizophrenia spectrum disorders. Schizotypal individuals often display many of the premorbid features of schizophrenia, including similar but less severe neurocognitive deficits, as well as having subclinical levels of positive, negative, and disorganization symptoms (Siever et al., 2002). Thus, the use of a schizotypy sample provides functional information that can serve to enhance our understanding of certain individual differences that have been associated with increased stress reactivity and symptomatology within the schizophrenia spectrum disorders. The present study investigated whether individual differences in trait affect and neurocognitive functioning differentially influenced coping strategies within schizophrenia, psychometrically defined schizotypy, and non-psychiatric individuals.

Coping strategies, which are important moderators of psychosocial stress, can be defined as the cognitions and behaviors that are directed at managing stressful experiences (Lazarus and Folkman, 1984). The specific domains of approach and avoidant coping strategies have both been found to be important predictors of individuals' psychological and physiological responses to stress, as well as functional outcomes (see Taylor, 2010). Approach to coping strategies, involving active problem solving (e.g. planning and initiating action against the stressors), are associated with reduced psychological and physiological responses to stress in healthy individuals (see Olff et al., 2005). In contrast, avoidant

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0165-1781/$ - see front matter © 2013 Elsevier Ireland Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.psychres.2013.04.004

coping strategies, such as behavioral disengagement and denial, are associated with poorer overall psychological adjustment and heightened neuroendocrine reactivity to stress (Olff et al., 2005). Likewise, in schizophrenia patients the use of more approach coping strategies has been associated with reductions in positive and negative symptoms, while greater use of avoidant coping strategies has been linked to greater distress and negative symptoms (see Phillips et al., 2009). Furthermore, the use of avoidant coping strategies potentially impedes patients' ability to adapt to their environment through altering their physiological responses to stress (Jansen et al., 1998).

An important individual difference variable that appears to influence both stress reactivity and coping strategies is that of affective traits. Trait negative affect (NA) reflects the general tendency to experience aversive mood states, and is highly correlated with heightened perceptions of stress (Watson et al., 1988). In contrast, trait positive affect (PA) is associated with dispositional enthusiasm and the facilitation of rewarding experiences (Watson et al.). Within the schizophrenia literature, patients reliably report higher levels of trait negative affect and lower levels of trait positive affect. In turn, these affective traits predictably coincide with the use of specific coping strategies. For example, Horan and Blanchard (2003) found that higher levels of trait negative affect were associated with greater use of avoidant coping, and heightened reactivity to a psychosocial laboratory stressor amongst schizophrenia patients. Similarly, psychometrically defined schizotypal individuals report higher levels of perceived stress and negative affect, lower levels of positive affect, and greater usage of avoidant coping strategies (Horan et al., 2007). In non-psychiatric individuals, positive affect appears to facilitate problem solving (see Isen, 1993) and attenuate physiological responses to stress (Steptoe et al., 2007). Given affective traits ability to moderate physiological and subjective responses to stressful situations, it would follow that trait positive and negative affect would differentially influence the use of specific coping strategies.

Davidson (1998) proposed that there are two neurobiological systems that underlie positive versus negative affect. These distinct systems are believed to encourage withdrawal behaviors through the generation of certain types of negative affect (e.g. fear), and to facilitate approach behaviors via positive affect (e.g. enthusiasm). From this perspective, affective systems would play a large role in the initiation of coping processes. However, whether or not these affective systems act independently of neurocognition remains of great interest. An alternative explanation would be that neurocognitive deficits in attention and working memory, which are believed to facilitate problem solving strategies, limits an individual's ability to effectively respond to stressful situations. Consistent with this view, Ventura et al. (2004), who assessed the impact of neurocognitive functioning on coping strategies, found that better neurocognitive performance on a measure of sustained attention was associated with greater use of approach coping strategies in schizophrenia patients. In contrast, there is evidence to suggest that patients who have greater cognitive impairments in executive functioning and memory use more avoidant coping strategies and are less likely to use problem solving strategies (Lysaker et al., 2005).

Given the heterogeneity within schizophrenia, differences in affective traits along with neurocognitive functioning are likely to play a role in contributing to patients' preferences of coping strategies. Therefore, we hypothesized that trait affect would associate with coping strategies in a linear fashion, such that regardless of group, higher levels of trait negative affect would associate with greater use of avoidant coping strategies, while higher levels of trait positive affect would associate with greater use of approach coping strategies. Additionally, attention and memory deficits are premorbid features of schizophrenia that are believed to have an etiological root in the disorder, as well as being strongly correlated with patients' functional outcomes (see Green et al., 2004). We hypothesized that better neurocognitive performance on tests of attention and immediate memory would associate with the use of more approach coping strategies and less use of avoidant coping strategies in both the schizotypy and schizophrenia patient group, but this relationship would be less evident in the healthy control group due to hypothesized baseline differences in neurocognitive functioning. We also analyzed whether these individual difference variables were significantly intercorrelated with each other.

2. Methods

2.1. Subjects

Subjects were either recruited from a large public university or a community mental health outpatient clinic.

2.1.1. Patient group

The patient group included 31 adults with DSM-IV (American Psychiatric Association, 1994) diagnoses of schizophrenia. Diagnoses were made based on information obtained from the patients' medical records and from a structured clinical interview (SCID; First et al., 1996). Exclusion criteria included: (a) Global Assessment of Functioning rating below 30, indicating a level of psychosis that could interfere with participation in the study, (b) documented evidence of mental retardation from the medical records, (c) current or historical DSM-IV diagnosis of alcohol or drug abuse suggestive of severe physiological symptoms (e.g., delirium tremens, repeated loss of consciousness), and (d) history of significant head trauma (requiring overnight hospitalization). All patients were clinically stable at the time of testing and were receiving pharmacotherapy under the supervision of a multidisciplinary team. All patients were prescribed psychotropic medications at the time of testing, and there was considerable variability in type, dosage, and medium (i.e., depot versus oral) across patients (for additional information regarding sample, see Cohen et al., 2012).

2.1.2. Schizotypy and schizotypy demographically matched controls

Subjects from the schizotypal and nonpatient control groups were undergraduate freshman and sophomores who were approached (*N*'s = 1775) by email to participate in an on-line survey and offered a chance to win monetary prizes. Embedded within this survey were a consent form, basic demographic questions and the Schizotypal Personality Questionnaire (SPQ; Raine, 1991), the Brief Symptom Inventory (Derogatis and Melisaratos, 1983) and the Chapman Infrequency Scale (Chapman and Chapman, 1983; profiles endorsing >3 items were excluded). Using sex and ethnicity derived means from the larger screening database on positive, negative or disorganized scales, individuals who scored at or above the 95th percentile on at least one of three positive, negative or disorganization symptom subscales were recruited for the schizotypy group. Control participants were recruited from a pool of individuals scoring below the 50^{th} percentile on each of the three schizotypy subscales. The final sample consisted of 89 individuals with schizotypy and 26 control participants (for further details regarding recruitment, see Minor and Cohen, 2010). Subjects were compensated $10/hour for their participation in this study. Informed consent was obtained from each subject and all research procedures were approved by the Institutional Review Board.

2.2. Procedures and measures

2.2.1. Coping. 2.2.1

The Brief Cope (Carver, 1997), a well-validated coping inventory, was used to measure coping strategies. Participants are asked to rate how often they utilize certain coping strategies on a 4-point likert scale, with each item response being independent from the others. Guided by Roth and Cohen's (1986) theoretical models of coping strategies and past research (Horan and Blanchard, 2003), two index scales were formed to create an "approach" coping scale and an "avoidant" coping scale. Items aimed at reducing the threat of the stressor by the planning and initiating of problem solving processes (active and planning coping subscales) were summed to create a composite score, which formed the approach coping scale. Similarly, the avoidant coping scale was formed from summing items that entail giving up attempts to directly cope with the stressor (i.e. the behavioral disengagement and denial scales).

2.2.2. Diagnostic and symptom ratings

The Brief Psychiatric Rating Scale (Lukoff et al., 1986) was used to measure patients' symptoms. Factor subscale scores reflecting positive (i.e., bizarre behavior, suspiciousness, unusual thought content, disorientation, and hallucinations items), negative (i.e., self-neglect, blunted affect, motor retardation, and emotional withdrawal items), depressive (i.e., depression, guilt, suicidality, and anxiety items), and mania/excitement (i.e., motor hyperactivity, elevated mood, excitement, distractibility, hostility, and grandiosity items) symptoms (defined in Ventura et al. (2000) were employed here. Preliminary diagnoses and symptom ratings were made by one of four doctoral level students who were trained to criterion (intra-class correlation coefficient values >0.70). Diagnoses and ratings were based on information obtained from medical records, the patients' treatment teams, and self-report and behavioral observations made during the research interviews. All diagnoses and ratings were videotaped and reviewed during a monthly case conference meeting that was led by a licensed clinical psychologist with considerable diagnostic experience (Alex S. Cohen). Final ratings and diagnoses were recorded when full agreement by the case conference members was made.

2.2.3. Trait affect

The Positive and Negative Affect Scale inventory (PANAS; Watson et al., 1988) was used to measure levels of trait positive and negative affect. The trait version of this scale consists of 10 positive affect items (e.g., interest and enthusiasm) and 10 negative affect items (e.g., guilt and anger). Participants were requested to rate on a 5-point likert scale from 1 (very slightly or not at all) to 5 (extremely) their experience of all 20 items.

2.2.3.1. Neurocognitive functioning

The Repeatable Battery for the Assessment of Neuropsychological Status (RBANS; Randolph, 1998) has proven to be a sensitive measure for patients with schizophrenia (Wilk et al., 2004). All tests were administered as described in the RBANS Manual (Randolph, 1998). Due to unacceptable reliability between the Attention subtests (Chronbach's $\alpha < 0.10$) and the Immediate Memory subtests (Chronbach's $\alpha < 0.26$) within all three groups, index scores were not formed for these constructs; instead each attention and immediate memory subtest were independently analyzed.

The RBANS attention index is comprised of two tests: Forward *Digit Span* (AT-Digit Span) and *Digit Coding* (AT-Digit Coding). The two tasks presumably tap different neurological constructs of attention. Digit span primarily involves sustained attention, although reception and temporary memory storage are also necessary, while Coding evaluates attentiveness with a large proportion of its variance being reflective of psychomotor skills.

The RBANS List Learning and Story Memory tests were used to assess for immediate memory (IM) functioning (i.e. ability to remember information immediately after it is presented). List Learning tests participants' recall of 10 unrelated words over 4 distinct trials, and Story Memory tests recall of a 12-item story, over two trials.

2.3. Data analysis

Data analyses were conducted in several steps (as described below). Significant relationships between demographic characteristics (sex, ethnicity, education and age) and variables of interest were examined within all levels of analyses. Table 1 presents the demographic characteristics of the three groups. Two-tailed tests were used to compute all *p*-values. All variables were normally distributed (skewed scores $< \pm 1.0$) with the exception of a floor effect for avoidant coping strategies in controls. Separate analyses of variance (ANOVAs) were used to analyze whether groups differed in (1) trait affect, (2) coping strategies, and (3) cognitive functioning. Within each group, correlational analyses examined whether (1) trait affect associated with specific coping strategies, and (2) cognitive functioning associated with specific coping strategies. The magnitude of the difference between the correlation coefficients between the schizotypy and control group were calculated via Fisher's *r*-to-*z*-transformations (see Tables 3 and 4). Last, intercorrelations amongst all the variables were performed to assess for possible confounds regarding the hypothesized relationships.

Table 1
Demographic characteristics of groups.

	Schizophrenia group ($n=31$)	Schizotypy group ($n=89$)	Control group ($n=26$)
Age: *M* (S.D.)	38.74 (9.89)[1]	19.19 (1.39)[2]	19.23 (1.18)[2]
Education: *M* (S.D.)	11.53 (2.06)[1]	12.65 (0.92)[2]	12.92 (1.02)[2]
Ethnicity			
% Caucasian	35.5	87.6	76.9
% African American	61.3	5.6	19.2
% Other	3.2	6.7	3.8
Sex			
% Female	38.7	70.0	53.8
% Male	61.3	30.0	46.2

Note: Means significantly differed between groups with different superscripts, *ps* < 0.05.

3. Results

3.1. Group differences in demographic variables, trait affect, coping strategies, and neurocognitive performance

No significant relationships between demographic variables and individual difference variables were found within the schizotypy or control group. Age had an inverse relationship with approach coping strategies within the schizophrenia group ($r=-0.39$, $p<0.05$). Multivariate analyses, followed by relevant pairwise comparisons, were used to assess group differences in coping strategies, trait affect, neurocognitive performance, and demographic variables. Table 2 presents the descriptive statistics for group differences in coping strategies, affective traits, and neurocognitive performance. As previously reported (Cohen et al., 2012), significant group differences were found in trait negative affect, with the schizotypy group reporting the highest negative affect

Table 2
Multivariate analysis of mean group differences.

	Schizophrenia ($n=31$)	Schizotypy ($n=89$)	Controls ($n=26$)	$F=$	Partial eta^2 ≤
Trait affect					
Negative affect[1]	22.67 (8.42)[a]	27.06 (7.44)[b]	17.17 (3.90)[c]	17.17**	0.20
Positive affect	32.44 (8.95)[a]	31.12 (6.78)[a]	38.27 (4.82)[b]	10.66**	0.13
Coping					
Avoidant	10.96 (3.92)[a]	13.55 (4.29)[b]	8.02 (2.49)[c]	21.37**	0.24
Approach[3]	11.48 (3.51)	11. 36 (3.08)	11.77 (2.37)	1.80	0.01
Attention					
Digit span	9.97 (2.36)[a]	11.53 (2.68)[b]	12.88 (2.76)[c]	8.66**	0.11
Coding	37.39 (10.98)[a]	58.57 (8.82)[b]	57.96 (11.51)[b]	56.23**	0.44
IM-memory					
List recall[1]	24.32 (5.41)[a]	31.10 (3.83)[b]	30.44 (4.25)[b]	25.00**	0.26
Story recall[1,3]	11.67 (4.41)[a]	18.84 (3.14)[b]	17.40 (2.71)[b]	28.02**	0.29

Notes: Groups with different superscripts significantly differed on post-hoc analysis. The following superscript applies when demographics were entered as covariates: Sex[1], Ethnicity[2], Age[3] and Education[4].
*$p<0.05$.
** $p<0.01$.

Table 3
Intercorrelations between trait affect and coping strategies within groups.

	Schizophrenia ($n=27$)	Schizotypy ($n=89$)	Controls ($n=26$)	Fisher r-to-z, Schizotypy vs. controls
Avoidant coping strategies				
Negative affect	0.48**	0.46**	0.25	1.03
Positive affect	−0.21	−0.16	−0.01	0.63
Approach coping strategies				
Negative affect	−0.22[a,b]	-0.24*[a]	0.15[b]	−1.66†
Positive affect	0.49**	0.46**	0.35*	0.55
Avoidant coping	−0.12	−0.25*	0.04	0.35

Note: Groups with different superscripts significantly differed.
† $p < 0.10$.
* $p < 0.05$.
** $p < 0.01$.

Table 4
Correlations between neurocognitive measures and coping strategies within groups.

	Avoidant coping strategies			
Neurocognitive Measures	Schizophrenia ($n=27$)	Schizotypy ($n=89$)	Controls ($n=25$)	Fisher r-to-z: Schizotypy vs. Controls
AT-Digit Span	−0.13	−0.22*	−0.09	0.56
AT-Coding	−0.06	-0.02	0.31	1.43
IM-List	−0.24[a]	0.19†[b]	−0.31[a]	2.15*
IM-Story	−0.19[a]	−0.05[a]	0.35†[b]	−1.74†
	Approach coping strategies			
AT-Digit Span	0.36†	0.15	−0.04	0.8
AT-Coding	−0.21[a]	−0.15[a]	0.28[b]	1.84†
IM-List	0.37†[a]	0.04[a]	−0.52**[,b]	2.58**
IM-Story	−0.12	−0.18	−0.05	0.16

Note: Groups with different superscripts significantly differed: †$p < 0.10$, *$p < 0.05$, **$p < 0.01$.

followed by patients, and then controls. The schizophrenia and the schizotypy group reported significantly lower trait positive affect than controls. The schizotypy group reported significantly greater use of avoidant coping strategies than both the schizophrenia and control group, followed by the schizophrenia group who significantly differed from the control group in avoidant coping strategies. No significant group differences were found in the use of approach coping strategies. The schizophrenia group performed significantly worse than both the schizotypy and control group on the four neurocognitive tests. The schizotypy group performed significantly worse than controls on the attentional measure digit span.

3.2. Correlations between individual differences and demographic variables

Intercorrelations were computed between coping strategies, trait affect, and neurocognitive performance within each group. Fisher's r-to-z transformation values are provided for the schizotypy as compared to the control group within each table. No significant relationships between trait affect and cognitive functioning were found.

Intercorrelations between trait affect and coping strategies within each group are presented in Table 3. Avoidant coping strategies were significantly associated with NA within the schizophrenia and schizotypy groups. Approach coping strategies were significantly associated with PA within all of the groups. Within the schizotypy group, NA was significantly associated with less approach coping strategies. Avoidant coping strategies were significantly associated with less approach coping strategies, and NA had an inverse relationship with PA ($r=0.23$, $p < 0.05$) within the schizotypy group; however these relationships did not significantly differ from the control or schizophrenia group.

Table 4 presents correlations between cognitive functioning and coping strategies.

Among schizophrenia patients, approach but not avoidant coping strategies displayed a trend with better attention and immediate memory performance. Better attention performance as measured by digit span was significantly related to less avoidant coping strategy use within the schizotypy group. Better immediate memory list performance and greater use of avoidant coping strategies showed a trend relationship within the schizotypy group, and worse immediate memory story performance significantly associated with more approach coping strategies within the control group.

4. Discussion

We investigated the relationships between attention, immediate memory, trait affect and specific coping strategies in schizophrenia patients, individuals high in schizotypal traits and their demographically matched-control group. As hypothesized certain affective traits displayed predictable relationships with specific coping strategies. Moreover, as expected substantial group differences were found in trait affect, coping strategies, and cognitive functioning. Importantly, these group differences remained significant even when demographic variables were entered as covariates. Results supported many of the predictions between the individual difference variables; however, correlational analyses revealed two unexpected relationships between cognitive functioning and coping strategies within the schizotypy and control groups.

Contrary to our expectations, affective traits were not significantly associated with cognitive functioning within any of the groups. Overall, results support the notion that affective traits are a better predictor than cognitive functioning of approach and avoidant coping strategies within schizophrenia spectrum disorders.

Replicating past research, the schizophrenia and schizotypy group both reported higher levels of trait negative affect, lower levels of positive affect, and greater use of avoidant coping strategies than the control group. Of notable interest, neither the schizophrenia nor the schizotypy group significantly differed from controls in their use of approach coping strategies. As predicted, trait negative affect was significantly associated with greater use of avoidant coping strategies, although this relationship was only significant within the schizophrenia and schizotypy group. Similarly, as expected, trait positive affect was associated with greater use of approach coping strategies within each of the groups. No significant relationships were found between avoidant coping strategies and neurocognitive performance within the schizophrenia or control group. In summary, affective traits show a reliable pattern with approach and avoidant coping strategies that is consistent with Davidson's (1998) theoretical model of affective system's role in motivated behaviors. Less predictable, and likely to be more complex than the linear relationship implied in simple correlational techniques, is the relationship between cognitive functioning and coping strategies.

Several notable findings were observed within the schizotypy group. To begin, the schizotypy group reported significantly

greater trait negative affect as well as greater use of avoidant coping strategies than both the control and schizophrenia group. Next, in the substantially higher-powered schizotypy group, we were able to detect a significant relationship between better attention performance (digit span) and less avoidant coping strategies. Moreover, the magnitude of this correlation difference between the schizotypy and other groups reached trend. This is interesting considering that digit span was the only cognitive test that the schizotypy group displayed impaired performance as compared to the control group. Additionally, some unexpected relationships were found between immediate memory and coping strategies. Better immediate memory performance was linked to less approach coping strategies in controls, and more avoidant coping strategies within the schizotypy group. The correlational nature of this study prevents us from making meaningful conclusions to this seeming paradox. However, it is plausible that controls with worse better immediate memory may rely more on approach coping strategies (especially, planning) as an adaptive compensatory mechanism for poor memory; whereas, it appears that individuals on the schizophrenia spectrum appear to utilize avoidant coping strategies despite better memory functioning.

Several limitations within this study should be noted. First, no psychiatric control group was included. Second, uneven group sizes and the use of a college student sample for the control and schizotypy group are limitations that may respectively restrict the interpretations of group differences in observed correlational values and the generalizability of these findings. Third, the present study did not provide analysis of the potential impact of medications on neurocognitive functioning within the schizophrenia group. However, patients were clinically stable on atypical antipsychotics, which have been associated with improved neurocognitve functioning (see Meltzer and McGurk, 1999). Thus, it is unlikely that pharmacological treatment can explain patients' impaired neurocognitive performance. Fourth, the reliance on self-report measures for schizotypal traits, trait affect and coping strategies is a possible limitation. Lastly, we cannot establish whether the self-reported coping strategies were associated with more or less favorable outcomes.

A substantial amount of research has found that schizophrenia patients use more avoidant coping strategies than non-psychiatric individuals; however, differences found in the use of approach coping strategies has been less consistent. While it can be posited that chronic schizophrenia patients develop a larger repertoire of coping strategies than younger patients (Thurm and Haefner, 1987); this explanation would be inconsistent with our findings, as the older patients used less approach coping strategies than the younger patients. Of further relevance is that several studies have failed to find a relationship between schizophrenia patients' use of coping strategies and neurocognitive processes (Myin-Germeys et al., 2002, Myin-Germeys and van Os, 2007; Bak et al., 2008). However, other groups have found that cognitive function, in particular attentional processes, are associated with approach coping strategies in schizophrenia patients.

While it is possible that ineffective coping strategies may lead to increased emotional reactivity thereby potentiating distress, basic research suggests that affective systems modulate the respective coping strategies through the interaction of affective (i.e. limbic) systems and certain regions of the prefrontal cortex (for review, see Cabib and Puglisi-Allegra, 2012). As our understanding of neurobiological systems increases, it has become more evident that trait affect is likely to play a causal role in our behavioral responses to stressors. One could speculate that trait affect works in concert with specific cognitive processes (i.e. attention systems) to modulate the respective coping strategies through the interaction of affective (i.e. limbic) systems and certain regions of the prefrontal cortex. However, in order to address these questions more sophisticated manipulable measures of affect and attention will need to be employed.

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