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Research paper

Examining differential relationships among self-reported attentional control, depression, and anxiety in a transdiagnostic clinical sample

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ABSTRACT

Background: Poor attentional control, defined as difficulty *focusing* attention on a task or *shifting* attention flexibly between tasks, is a transdiagnostic construct theorized to confer risk for, and maintain, depression and anxiety. Research to date in non-clinical samples has suggested a dissociable relationship between the two factors of self-reported attentional control and psychopathology, with depression being associated with difficulties *shifting* and anxiety being associated with *focusing*. However, to our knowledge no study has tested this differential set of relationships in a clinical sample.

Methods: Adults ($N = 493$) presenting for psychiatric treatment completed measures of depressive and anxiety symptom severity and self-reported attentional control. Hierarchical linear regression and Zou's (2007) confidence interval method were used to examine the relationship between clinical symptoms and attentional control.

Results: Both shifting and focusing were significantly correlated with anxiety and depressive symptoms in this sample. However, focusing was more strongly associated with clinical symptomatology than shifting, which showed a weak correlation.

Limitations: All constructs were measured cross-sectionally by self-report questionnaires.

Conclusions: In contrast to studies conducted in non-clinical samples, attentional focusing appears to be more relevant than attentional shifting in a clinical sample for both depression and anxiety symptoms. These findings lend support to efforts to develop neurocognitive interventions that improve focusing. Replication of these findings, particularly in longitudinal studies, is warranted.

Introduction

Attentional control, the "general capacity to control attention in relation to positive as well as negative [emotional] reactions" (Derryberry and Reed, 2002, p. 226), is a process suggested to play a crucial function in emotion regulation (Derryberry and Reed, 2002; Ochsner and Gross, 2005). Theoretical models of depression and anxiety have implicated attentional control processes in their pathophysiology (De Raedt et al., 2010; Eysenck and Derakshan, 2011). Research in non-clinical samples has found that self-reported attentional control is associated with performance on behavioral tasks of attention (e.g., Judah et al., 2014; Reinholdt-Dunne et al., 2013) and with a variety of clinical constructs such as depression severity, state/trait anxiety, affect regulation, worry, and rumination (e.g., Armstrong et al., 2011; Bardeen and Read, 2010; Cox et al., 2018; Reinholdt-Dunne et al., 2013; Spada et al., 2010).

Models of self-reported attentional control often subdivide attentional control into two factors: attentional focusing and attentional shifting (referred to hereinafter as *focusing* and *shifting;* Derryberry & Rothbart, 1988). The focusing factor relates to the ability to sustain attention on a task in the face of distraction (e.g., "When I am reading or studying, I am easily distracted if there are people talking in the same room" or "When trying to focus my attention on something, I have difficulty blocking out distracting thoughts") and is associated with performance on behavioral tasks requiring inhibition of processing of task-irrelevant information (e.g., the attention network task; Reinholdt-Dunne et al., 2013). Shifting relates to the ability to flexibly switch attention between tasks (e.g., "After being interrupted or distracted, I

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can easily shift my attention back to what I was doing before" or "It is easy for me to alternate between two different tasks") and is associated with performance on tasks requiring switching of task demands (e.g., a letter-number sequencing task; Judah et al., 2014). Empirical studies in non-clinical samples have found a differential pattern between focusing/shifting and depression/ anxiety. In such samples, lower self-reported shifting is associated with higher depression severity, whereas lower self-reported focusing is associated with higher anxiety severity (e.g., Judah et al., 2014; Reinholdt-Dunne et al., 2013). To our knowledge, no study to date has examined this differential relationship within a psychiatric sample.

Understanding how aspects of attentional control uniquely relate to depression and anxiety symptoms in a transdiagnostic clinical sample may improve our understanding of how these processes relate to the development and maintenance of emotional disorders. If found in such a sample, the dissociable relationship between focusing/shifting and depression/anxiety would suggest distinct pathways through which attention is involved in both types of symptoms. Consistent with prior research in non-clinical samples, we hypothesized that both attentional control processes would be significantly negatively correlated with depression and anxiety. As theory and empirical findings suggest that anxiety is associated with orienting biases towards task-irrelevant threats (i.e., impaired resistance to threatening distractors; e.g., Eysenck et al., 2007; Mogg et al., 2007; Ouimet et al., 2009; Pine, 2007; Shechner et al., 2013), we hypothesized that anxiety severity would be more strongly associated with impaired focusing than shifting. In contrast, given cognitive theories and research regarding depression has suggested depression is characterized not by orienting biases towards negative stimuli but rather impaired disengagement from negative stimuli (e.g., Disner et al., 2011; Sanchez et al., 2013), we hypothesized that depression severity would be more strongly associated with impaired shifting than focusing. These hypotheses are also in line with findings from previous research in non-clinical samples.

Methods

Participants

Participants were 493 patients enrolled in treatment at a partial hospitalization program from March to December 2015. The program provides brief, evidenced-based psychotherapy and pharmacological treatment to patients with mood, anxiety, personality, and psychotic disorders (for more information see Forgeard et al., 2018). Participants present to the partial hospitalization program each day and complete questionnaires at the beginning of the day as part of their standard of care. With the exception of the diagnostic interview (see below), the data used for this study were based on the participant's first day presenting to the program. For this naturalistic sample, the inclusion criterion was whether or not the patient consented to use their questionnaire responses for research purposes. Patients were excluded if they were not stable enough to complete questionnaires.

Participants were 32.7 years old on average (SD = 13.5, range 18–70) and primarily single (64.0%, n = 336), White (87.4%, n = 485), and female (55.9%, n = 292). Of the participants that had diagnostic data available[1] (n = 400), the most common primary diagnosis was Major Depressive Disorder, severe, without psychotic features (46.5%, n = 186). Overall, 60% (n = 240) of participants met criteria for a current Major Depressive Episode (MDE), 39% (n = 156) met for current Generalized Anxiety Disorder (GAD), and 60.5% (n = 242) met criteria for any DSM-IV anxiety disorder. Of note, 41.75% (n = 167) met for both a current MDE and a current DSM-IV anxiety disorder. Additional information on clinical characteristics is provided in the Supplemental Materials.

[1] Diagnostic interviews may not have been completed due to a variety of reasons (e.g., clinical crises, conflicting appointments with other clinical staff).

Measures

All αs provided to describe the measures' internal consistency were for the current sample.

The *Mini International Neuropsychiatric Interview* (MINI; Sheehan et al., 1998) is a brief structured clinical interview assessing DSM-IV Axis I disorders. The MINI demonstrates strong reliability and validity with the Structured Clinical Interview for the DSM-IV-TR (inter-rater reliabilities ranging from 0.89 to 1.0; Sheehan et al., 1998). MINIs were administered on the participant's second day of the program by doctoral level practicum students and interns in clinical psychology who received weekly supervision by a postdoctoral fellow. Training included review of administration manuals and completion of mock interviews. All assessors were required to pass a set of training interviews with their supervisor before independently administering MINIs.

The *Attentional Control Scale (ACS; Derryberry & Reed, 2002)* is a 20-item self-report questionnaire (α = 0.87) that assesses perceived ability to flexibly shift attention between tasks (shifting subscale; α = 0.75), as well as perceived ability to focus on relevant stimuli while ignoring distractors (focusing subscale; α = 0.87). Scoring for the shifting and focusing subscales were based on Judah et al. (2014). The ACS has demonstrated convergent validity with behavioral measures of attentional control (e.g., Judah et al., 2014; Reinholdt-Dunne et al., 2013). Higher scores are associated with better self-reported attentional control.

The Patient Health Questionnaire - 9 (PHQ-9; Kroenke et al., 2001) is a brief self-report diagnostic screening instrument and symptom severity measure of depressive symptoms (α = 0.87). Higher scores are associated with greater depression symptom severity.

The 7-item Generalized Anxiety Disorder Scale (GAD-7; Spitzer et al., 2006) is a self-report questionnaire that assesses general symptoms of anxiety (α = 0.87). Although originally developed as a screening instrument for GAD, it is widely used as a measure of global anxiety symptoms. Higher scores are suggested to be indicative of stronger anxiety severity.

Procedures

The local Institutional Review Board approved all study procedures. Upon admission, patients completed computerized self-report questionnaires as part of standard clinical care. Assessments were collected and managed using Research Electronic Data Capture (REDCap; Harris et al., 2009).

Analyses

Analyses were computed in R (R Core Team, 2017; version 3.4.2). *Zero-order* correlations were calculated between attentional control (ACS full-scale and subscale scores) and depression and anxiety symptoms, with correlations being classified (Cohen, 1988) as weak ($0.1 < |r| < 0.3$), moderate ($0.3 < |r| < 0.5$), or strong ($|r| > 0.5$). Similar to previous studies (c.f., Judah et al., 2014; Reinholdt-Dunne et al., 2013), we used hierarchical linear regression to examine shifting and focusing as predictors of depression or anxiety symptoms. Predictors were entered in a stepwise fashion, with the first step including demographics (i.e., age and gender), followed by co-morbid symptom (e.g., when predicting depression severity, anxiety severity was entered as the second step of the hierarchical linear regression) in step two, then shifting and focusing subscales simultaneously in step three. If both attentional control predictors were significantly associated with symptom severity, we directly compared correlations between the attentional control processes and symptom severity. Specifically, to test whether depression and anxiety were more strongly correlated with

Table 1
Descriptive statistics and correlations for all measures.

	1	2	3	4	*M*	*SD*
1. ACS - Total	–				56.99	9.63
2. ACS – Focusing	.85***	–			22.59	3.61
3. ACS - Shifting	.77***	.46***	–		10.90	2.89
4. PHQ-9	−0.47***	−0.48***	−0.26***	–	15.13	6.68
5. GAD-7	−0.34***	−0.41***	−0.13**	.63***	11.51	5.35

Note: *$p < 0.05$, **$p < 0.01$, ***$p < .001$. ACS = Attentional Control Scale; PHQ-9 = Patient Health Questionnaire - 9; GAD-7 = the 7-item Generalized Anxiety Disorder Scale

shifting or *focusing*, we employed Zou's (2007) method of calculating a confidence interval of the difference between two overlapping correlations implemented by the R package cocor (Diedenhofen & Musch, 2015). The two correlations are considered significantly different if the confidence interval of the difference does not include zero.

Results

Correlations between attention control, depression, and anxiety

Results of zero-order correlations between self-reported attentional control and depression and anxiety symptoms are displayed in Table 1. The ACS full-scale and focusing scores were moderately correlated with both depression and anxiety symptoms (all *r*s between −0.3–0.5, all *p*s < 0.001). ACS shifting scores were only weakly correlated with both depressive symptoms ($r = -0.26$, $p < .001$) and anxiety symptoms ($r = -0.13$, $p = .004$).

Association between shifting and focusing with depression and anxiety symptoms

Results of the hierarchical linear regressions with robust standard errors are shown in Table 2.[2] For depression symptoms, steps one (demographics; $R^2 = 0.023$, $p < .001$), two (anxiety; $\Delta R^2 = 0.374$, $p < .001$), and three (attentional control subscales; $\Delta R^2 = 0.078$, $p < .001$) were associated with significant increases in R^2. After controlling for demographics and anxiety severity, shifting ($B = -0.22$, $SE = 0.09$, $p = .017$) and focusing ($B = -0.45$, $SE = 0.08$, $p < .001$) were significantly negatively associated with depression symptoms. When directly comparing shifting versus focusing, focusing was more strongly associated with depression symptom severity than shifting (95% CI: [0.14 0.31]). For anxiety symptoms, steps one (demographics; $R^2 = 0.014$, $p = .004$), two (depression; $\Delta R^2 = 0.377$, $p < .001$), and three (attentional control subscales; $\Delta R^2 = 0.026$, $p < .001$) were also associated with significant increases in R^2. After controlling for demographics and depression symptoms, shifting was positively associated ($B = 0.21$, $SE = 0.08$, $p = .006$) and focusing was negatively associated ($B = -0.29$, $SE = 0.07$, $p < .001$) with anxiety symptoms. When directly comparing shifting versus focusing, focusing was more strongly associated with anxiety symptom severity than shifting (95% CI: [0.20 0.37]).

Table 2
Results from hierarchical analyses examining shifting and focusing as predictors of depression and anxiety symptoms.

	B	*SE B*	*β*	*t*
Dependent variable: depression (PHQ-9)				
*Step 1 ($R^2 = 0.023$***)*				
Age	0.04	0.03	0.08	1.67†
Gender	−1.60	0.60	−0.12	−2.64**
*Step 2 ($R^2 = 0.397$, $\Delta R^2 = 0.374$***)*				
Age	0.03	0.02	0.05	1.42
Gender	−0.76	0.48	−0.06	−1.57
Anxiety (GAD-7)	0.77	0.05	0.62	15.89***
*Step 3 ($R^2 = 0.474$, $\Delta R^2 = 0.078$***)*				
Age	0.05	0.02	0.09	2.61**
Gender	−0.84	0.45	−0.06	−1.89†
Anxiety (GAD-7)	0.62	0.05	0.50	11.99***
Shifting	−0.22	0.09	−0.10	−2.39*
Focusing	−0.45	0.08	−0.25	−5.75***
Dependent variable: anxiety (GAD-7)				
*Step 1 ($R^2 = 0.014$**)*				
Age	0.02	0.02	0.05	1.11
Gender	−1.10	0.48	−0.10	−2.27*
*Step 2 ($R^2 = 0.391$, $\Delta R^2 = 0.377$***)*				
Age	0.00	0.01	0.00	−0.04
Gender	−0.30	0.38	−0.03	−0.79
Depression (PHQ-9)	0.50	0.03	0.62	17.99***
*Step 3 ($R^2 = 0.417$, $\Delta R^2 = 0.026$***)*				
Age	0.00	0.01	0.01	0.36
Gender	−0.45	0.38	−0.04	−1.19
Depression (PHQ-9)	0.44	0.03	0.55	13.46***
Shifting	0.21	0.08	0.11	2.76**
Focusing	−0.29	0.07	−0.20	−4.32***

Note: PHQ-9 = Patient Health Questionnaire-9, GAD-7 = the 7-item Generalized Anxiety Disorder Scale. Statistics from the final model are displayed.
† $p < .10$,
* $p < .05$,
** $p < .01$,
*** $p < .001$.

Discussion

Theoretical models suggest that impairments in attentional control contribute to the vulnerability for, and maintenance of, depression and anxiety. Studies of attentional control in non-clinical samples have suggested that the two factors of self-reported attentional control have a dissociable relationship with depression and anxiety severity. The present study is the first to examine these relationships in a large, transdiagnostic, clinical sample.

We hypothesized that both self-reported attentional control factors would be significantly associated with depression and anxiety severity. We further predicted that depression symptom severity would be more strongly associated with self-reported difficulties with shifting and that anxiety symptoms would be more strongly associated with self-reported challenges in focusing. Our hypotheses were partially supported. Both shifting and focusing were negatively correlated with depression and anxiety symptom severity. In addition, regression analyses found that focusing is negatively associated with depression and anxiety symptom severity, even after accounting for multiple covariates. However, when controlling for age, gender, depression, and focusing, shifting was positively associated with anxiety. Although studies have generally shown

[2] Regression models were tested for linear regression assumptions (e.g., homoscedasticity, absence of multicollinearity). Examining variance inflation factors (VIF) for all predictors across all linear regression models failed to reveal any multicollinear predictors (i.e., VIF > 4; Garson, 2012). Testing for homoscedasticity revealed that predicting depression and anxiety symptoms with the inclusion of predictors aside from age and gender resulted in significant heteroscedasticity (Breush Pagan tests all greater than $p < .001$). We tested regression models that used Box Car Transformations and generalized least squares regression to successfully address heteroscedasticity but the pattern of results mirrored those of the hierarchical linear regression models simply employing robust errors to account for heteroscedasticity. Consequently, for ease of interpretation we have provided model results from the hierarchical linear regression models employing Hubert-White robust standard errors.

anxiety to be associated with impaired cognitive functioning (c.f., Derakshan and Eysenck, 1998; Eysenck et al., 2007; Moran, 2016), some studies have found that anxiety may be associated with increased cognitive performance (e.g., Moriya and Sugiura, 2013, 2012). Further replication of this unexpected finding is needed across clinical samples to clarify the extent to attentional shifting might be positively associated with anxiety, after controlling for other related predictors. Finally, contrary to our hypotheses and in contrast with previous findings, both depression and anxiety symptom severity were more strongly associated with self-reported difficulties in focusing than shifting.

These findings suggest that the focusing component of attentional control ought to be studied more closely in clinical populations (see also DeVito et al., 2018; Judah et al., 2013). Our results are consistent with research showing that individuals with depression and anxiety specifically have difficulty inhibiting distracting stimuli (e.g., Eysenck et al., 2007; Eysenck and Derakshan, 2011; Snyder, 2013). Moreover, the processes involved in attentional focusing match the more central "common" executive functioning factor identified in general models of executive functioning (as opposed to shifting, which is partially subsumed under the "common" factor; see Miyake and Friedman, 2012). Consequently, our findings allude to the broader executive functioning literature suggesting that impairments in executive functioning may be a transdiagnostic process of interest in the study of psychopathology (Snyder et al., 2015). These impairments have been connected with other transdiagnostic risk and maintenance factors for depression and anxiety (e.g., rumination; Hsu et al., 2015; Snyder and Hankin, 2016). Though alternative models of attentional control have been proposed (e.g., Chun et al., 2011), there is a relative dearth of research examining how components in these models of attentional control are associated with psychopathology; consequently, further study examining the relative predictive validity between various models of attentional control in emotional disorders is warranted.

For clinicians, findings from this study also suggest that individuals experiencing anxiety symptoms might also benefit from neurocognitive interventions originally developed for depression that aim to improve focusing (e.g., cognitive control training; Calkins et al., 2015; Siegle et al., 2014). Preliminary findings suggests such interventions improve emotion regulation in anxious individuals (Sari et al., 2016). The idea of training attentional control as an approach for treatment emotional disorders is not new; Wells first proposed the Attention Training Technique in 1990 (ATT; Wells, 1990). Subsequent research has found ATT to be efficacious, both as a standalone intervention and as a component of metacognitive therapy (see Fergus and Bardeen, 2016 for a review). Other treatments that may involve broadly improving attention control as a mechanism underlying treatment response, including Attentional Bias Modification (ABM), have also demonstrated therapeutic promise (e.g., Beevers et al., 2015). These interventions (e.g., ATT and ABM) have been posited to improve attentional control for valenced and non-valenced stimuli (Bar-Haim, 2010; Fergus and Bardeen, 2016; Heeren et al., 2015). Future experimental studies manipulating focusing versus shifting through targeted trainings would allow for better experimental testing of these relationships between attentional control and anxiety and depression severity. Studying how targeting focusing versus shifting impacts other transdiagnostic cognitive processes associated with depression and anxiety (e.g., repetitive negative thinking, cognitive biases) also merits investigation.

The strengths of the study include the use of a well-established measure of attentional control in a large, transdiagnostic, psychiatric sample. We also used symptom measures of depression and anxiety severity that have been better validated for use in clinical samples (i.e., the PHQ-9 and the GAD-7 versus the State-Trait Anxiety Inventory Depression subscale; see Beard et al., 2016; Beard and Björgvinsson, 2014). Though this difference may have contributed to the discrepant findings, the use of well-validated clinical severity measures suggests our findings may be better reflective of the relationship between focusing, shifting, and depression and anxiety severity, especially with clinical samples. There were several limitations to the study. Although self-report attentional control has been validated with behavioral measures of attentional control in non-clinical populations (e.g., Derryberry & Reed, 2002; Judah et al., 2014; Reinholdt-Dunne et al., 2013), future research should employ behavioral, psychophysiological (e.g., electroencephalography), or neural (e.g., function Magnetic Resonance Imaging) measures of attentional control in addition to self-reported measures in clinical populations. One important limitation was that although our sample was diverse in its clinical presentation, ethnoracial and socioeconomic status diversity was lacking. In addition, it is possible that individuals presenting for treatment to a partial hospital setting may exhibit especially severe impairments in focusing that do not manifest in individuals experiencing milder symptoms. However, impairments with focusing are not exclusive to the most severe clinical populations and appear in clinical samples with less severe symptomatology (e.g., outpatient samples; see Snyder, 2013). Regardless, replication of our findings is required, particularly in samples with more ethnoracial and socioeconomic status diversity and across clinical samples. In addition, this study did not include a control group. Although we contrasted our findings to previous results in non-clinical samples, we did not directly compare our results to a non-clinical control group. Examining the relationship between attentional control processes and depression and anxiety symptoms in clinical versus non-clinical samples would improve our understanding of how these processes do or do not differ in these different populations. Finally, our study was cross-sectional in nature. Although we found that focusing was more strongly associated with depression and anxiety symptom severity than shifting, we did not examine whether focusing prospectively predicted depression and anxiety onset and maintenance. Both longitudinal studies in naturalistic samples and with experimental manipulation of attentional control processes will be important for clarifying the precise role of focusing and shifting in depression and anxiety. Despite these limitations, the present study contributes to our understanding of attentional control processes in psychopathology by highlighting the potential importance of attentional focusing in an acute psychiatric sample.

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Contributors

K.J.H., C.B., and T.B. designed the study and wrote the protocol. K.J.H. and M.F. managed the literature searches. K.J.H. conducted the statistical analyses and wrote the first draft of the manuscript. A.S. also conducted statistical analyses. All authors contributed to and have approved the final manuscript.

The local Institutional Review Board approved all study procedures.

The authors declare that there are no conflicts of interest.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jad.2019.01.017.

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