Positive imagery training increases positive self-referent cognition in depression

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ABSTRACT

Depressed adults often show a bias towards negative self-referent processing at the expense of positive self-referent processing. The current study assessed whether a mental imagery intervention (Positive Self Reference Training—PSRT) delivered via the Internet could improve self-referent processing and depressive symptomatology among adults with moderate or greater depression symptoms. Participants were recruited via online methods and randomly assigned to one of two computerized interventions: active PSRT (*n* = 44) or control training (NTC; *n* = 43). The PSRT involved visualizing the self in response to different positive cues (e.g., an achievement) every other day for two weeks. The NTC provided neutral cues about objects. Self-referential processing of positive and negative adjectives and depression symptoms were measured at baseline, one week, and two weeks after initiating training. Over those two weeks, PSRT participants showed a greater increase in positive self-referent processing than did NTC participants. Negative self-referent processing and symptoms of depression declined comparably in both groups. Similarly, for both groups, increase in positive and decrease in negative self-referent processing was associated with a greater reduction in depression. These results indicate that mental imagery has the potential to improve self-referential processing, especially for positive stimuli, which may, in turn, help reduce depressive symptomatology.

1. Introduction

Over the past half-century of depression-related research, the field has accumulated a great deal of evidence pointing to the role of cognitive biases in maintaining depressive symptoms (Beck, 1967; Gotlib & Joormann, 2010; Gotlib & Krasnoperova, 1998). The relationship of such biases and depressive disorders is well established; individuals diagnosed with depressive disorders are more likely to have negative self-schemas and to view themselves negatively (Beck, 1967). Beck theorized that negative views about the self, the world, and the future (the cognitive triad) contribute to the maintenance of depression.

Such negativity is mirrored by a difficulty relating to positive information; Beck referred to this as a "positive blockade" (1967). Whereas negative self-referent information is preferentially processed with relative ease, positive information tends to be ignored, discounted, or processed with difficulty. Together, these biases help to define the existing memory representations of the world, including self-representations. Individuals with negative self-views (or schemas) are more likely to experience increased depressive symptomatology (Connolly, Abramson, & Alloy, 2016; LeMoult, Kircanski, Prasad, & Gotlib, 2017b).

The relationship between negative self-schema and the maintenance of depression is sometimes viewed in causal terms, with stronger negative self-schemas thought to produce a more protracted episode of depression (Beck, 1967). It is clear that both positive and negative schema are strongly correlated with depressive symptoms (Dainer-Best, Lee, Shumake, Yeager, & Beevers, 2018; Phillips, Hine, & Thorsteinsson, 2010), and can predict worsening of symptoms (Disner, Shumake, & Beevers, 2016); however, such studies are correlational and thus vulnerable to third variable explanations that account for the association between self-referent processing and depression.

As such, attempts to modify self-schema can be viewed as a direct test of whether maladaptive cognitions serve to maintain depression, as reductions in self-schema should precede reductions in depression symptoms, if there is a causal link. Although cognitive-behavioral therapy (CBT; Beck, 1979) targets maladaptive cognitions, few studies to date have directly measured self-referent information processing, with assessments such as the Self-Referent Encoding Task (SRET; Derry & Kuiper, 1981), before and after CBT. While schema change is a hypothesized mechanism for depression improvement, randomized

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controlled trials rarely track biased self-referent processing over the course of treatment.

Two such studies of adults with social anxiety disorder (Goldin et al., 2013; Thurston, Goldin, Heimberg, & Gross, 2017) measured self-referent processing with the SRET before and after CBT. Both studies found reduced negative self-reference and increased positive self-reference following treatment. With a depressed sample, Quilty, Dozois, Lobo, Ravindran, and Bagby (2014) measured change in self-reference in pharmacotherapy and CBT with the SRET. They reported that self-referent processing changed similarly across both treatment conditions. Further, Dozois et al. (2009) reported that depressed adults who received cognitive therapy in conjunction with pharmacotherapy saw improvement in positive and negative self-schemas that was not observed in people who received pharmacotherapy alone. Both treatment groups reported similar reductions in depression during treatment.

CBT interventions are multifaceted, and so even if change in self-referent processing is observed, it is unclear what aspect of treatment may be producing those changes. In contrast, there is a nascent literature using cognitive bias modification (CBM) techniques to target and change specific cognitive biases associated with depressive disorders (Hallion & Ruscio, 2011; MacLeod, Koster, & Fox, 2009). Studies that target specific cognitive mechanisms with CBM have generally been focused on attention (Ferrari, Möbius, van Opdorp, Becker, & Rinck, 2016; Wells & Beevers, 2010), overgeneral memory (Neshat-Doost et al., 2013; Raes, Williams, & Hermans, 2009; Watkins, Baeyens, & Read, 2009), and interpretation (Holmes, Lang, & Shah, 2009; Joormann, Waugh, & Gotlib, 2015; LeMoult et al., 2018). Assessing whether such focused interventions leads to symptom reduction is ideal for theory testing, and continues to be an important focus of clinical research (MacLeod et al., 2009).

Interpretation-focused CBM studies in particular have used imagery-based techniques to remediate maladaptive cognitive processes (Hitchcock et al., 2016; Holmes et al., 2009). Such techniques rely on participants' mental imagery rather than providing cues to specific stimuli. They may also have a more idiographic target, focusing on individualized information processing rather than directing all participants to specifically attend to the same stimuli. Such cue-based mental imagery interventions may directly target maladaptive schema in depression (Holmes, Blackwell, Burnett Heyes, Renner, & Raes, 2016) and elicit emotional reactions as though imagined events were happening (Holmes & Mathews, 2010).

Mental imagery interventions that focus on depression-specific maladaptive cognitions have the potential to change self-referent cognitions. Given a biased self-schema, any such interventions must change the way that judgments of information about the self are made. Previous research has shown that making self-referential judgments about emotional material enhances specific verbal and visual information and can boost memory for that information (Hamami, Serbun, & Gutchess, 2011). Thus, by repeatedly encoding positive self-referent information through mental imagery, it becomes more salient when self-schema is accessed. This prioritization makes a positive self-schema more accessible, thus reducing negative self-referent processing biases. Studies have shown that positive memory activation can improve mood following simple procedures (Hall, Raedt, Timpano, & Joormann, 2018), which may have an overall impact on mood and self-schema.

However, memories are (by definition) limited to accessible retrievals—given the theoretical (Beck, 1967) and empirical (Bradley, Mogg, & Williams, 1995; Gupta & Kar, 2012) memory biases seen in depression, imagery techniques may focus instead on a future orientation. Klein (2013) has additionally theorized that future-oriented imagery is straightforward even when individuals have no episodic memory of a situation. Other work has also shown that simulating positive future events in a single session can increase depressed participants' ratings of the likelihood and importance of other future events (Boland, Riggs, & Anderson, 2018).

Given the robust association between the self-referential bias and dysphoria, we developed a CBM intervention focused on enhancing positive self-referent processing by encouraging participants to repeatedly practice viewing themselves positively and imagining a pleasant and positive future. To provide an adequate control, we developed a neutral intervention that focused instead on detailing objects in a neutral, present situation. This training directly mirrored the positive intervention, but without what we believed to be the active components of that intervention. That is, participants did not focus on positive, self-referent, or future-focused imagery.

We thus compared a positive self-reference training (PSRT), focused on using positive cues to encourage positive, future, self-referent processing, to a neutral training condition (NTC) that used neutral cues to encourage neutral, current, non-self-referent processing. We hypothesized that participants in the PSRT—but not the NTC—group would show improvement on measures of self-referential bias (i.e., the SRET), especially in terms of their response to positive items. We also hypothesized that the reduction in depressive symptoms in the PSRT group would be linked to their improvement in self-reference.

2. Methods

2.1. Participants

Participants in the study were eligible if they were adults between the ages of 18–45, had elevated total score > 13 on the Center for Epidemiologic Studies–Depression (CES-D) scale, were fluent in English, and provided informed consent. Participants who completed the study (completers; $N = 87$) were on average 26.4 years old ($SD = 7.0$), female (84%), and white (66%). They were paid between $25 and $35 for completing the study, with higher payments being received for completing additional training sessions as discussed below. Participants in the intention-to-treat (ITT) sample, who completed the full baseline assessment and thus were randomized into one of the two training conditions ($N = 264$), were on average 26.8 years old ($SD = 7.0$), female (75%), and white (67%).

Participants were recruited through online postings advertising an online mood study using three online forums: (1) Craigslist, an online bulletin board, in several major cities; (2) ResearchMatch, a national health volunteer registry supported by the U.S. National Institutes of Health as part of the Clinical Translational Science Award (CTSA) program; and (3) online postings through a community events board at the University of Texas at Austin. The advertisements directed participants to a website to determine study eligibility. Here, participants provided informed consent, provided their age, and filled out the CES-D. If they were eligible for the study, further measures (discussed below) were collected, and participants were randomized into one of two training conditions.

2.2. Measures

2.2.1. Center for Epidemiologic Studies–depression scale (CES-D)

The CES-D (Radloff, 1977) is used to assess depressive symptoms over the past week using a 20-item self-report questionnaire. Scores may range from 0 to 60, with higher scores indicating elevated depressive symptoms. Scores greater than 16 have been regularly used as an indication of possible diagnosis of major depressive disorder (Radloff, 1977; Santor, Zuroff, Ramsay, Cervantes, & Palacios, 1995); scores above 13 may thus indicate mild or greater depressive symptoms. The CES-D was used to determine eligibility at baseline, and assessed again following one week (T1) and two weeks (T2).

2.2.2. Self-Referent Encoding Task (SRET)

The SRET (Derry & Kuiper, 1981) is an affective decision-making task designed to assess schema-related processing. Participants make decisions about whether positive and negative adjectives are self-