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Cognitive remediation for neuropsychological impairment in hoarding disorder: A pilot study

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ABSTRACT

The aim of this pilot randomized controlled trial was to investigate whether an extended, standardized program of computer-assisted cognitive remediation (CR; a behavioral intervention designed to improve cognitive function through repeated task practice and strategy acquisition) improves disordered attention and related cognitive functions in patients with hoarding disorder (HD) as compared to patients with HD assigned to a relaxation control condition. Seventeen participants with primary HD were randomized to receive 8 weeks and 24 sessions of either CR or relaxation control treatment, and blinded assessments of cognitive functioning and hoarding severity were conducted before and after treatment. Results revealed that cognitive remediation produced improvements in attention relative to the relaxation control condition; the two conditions did not differentially influence memory or executive functioning, or hoarding severity. Future research should confirm these findings in larger sample studies and investigate the utility of cognitive remediation for attentional impairment as an adjunct to cognitive-behavioral therapy for hoarding disorder.

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1. Introduction

According to *DSM-5* criteria, hoarding disorder (HD) is associated with high levels of disability and functional impairment, and is characterized by persistent difficulty discarding or parting with possessions, distress associated with discarding and the accumulation of a large number of possessions which clutter living areas and compromise their use (American Psychiatric Association, 2013). The prevalence of HD is estimated to be over 2% according to epidemiologic research (Iervolino et al. 2009; Samuels et al. 2008). HD therefore appears more common than previously thought, and thus developing effective treatments for the disorder is of substantial public health significance.

A growing body of research suggests that cognitive impairment is a hallmark feature of HD that is linked directly to symptoms. HD patients consistently report more symptoms of adult attention-deficit/hyperactivity disorder (ADHD) than do control subjects; estimates of the proportion of patients meeting symptom criteria for the inattentive subtype of ADHD range from 28% in HD patients (Frost, Steketee, & Tolin, 2011a) to 39% in OCD patients with prominent hoarding symptoms (Sheppard et al. 2010). In a group of HD and OCD patients, and healthy controls, ADHD inattentive symptoms, but not OCD symptoms, predicted the severity of hoarding symptoms when controlling for age and general distress (Tolin & Villavicencio, 2011).

Results from performance-based studies of neurocognition in HD have confirmed these observations. Research using the Continuous Performance Test (CPT; Conners, 2000) has revealed the presence of significantly longer mean reaction times on the CPT compared to healthy controls, suggesting difficulty with sustained attention (Grisham, Brown, Savage, Steketee, & Barlow, 2007; Tolin, Villavicencio, Umbach, & Kurtz, 2011b). Other studies have reported impairments in memory (Hartl et al. 2004) and executive function (Grisham, Norberg, Williams, Certoma, & Kadib, 2010) in HD, although results have been mixed.

Cognitive-behavioral therapy (CBT) research on hoarding has increasingly highlighted problems of patient compliance as a rate-limiting step for benefit. In an open trial, therapists rated patients' degree of homework compliance at each session based on amount of homework completion and found that on average participants completed 26–50% of homework assignments (Tolin, Frost, & Steketee, 2007). In a second trial (Steketee, Frost, Tolin, Rasmussen, & Brown, 2010), in which motivational interviewing strategies were used more prominently, median compliance scores increased to estimated completion of 51–75% of homework

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assignments (Fabricant, Frost, Tolin, & Steketee, 2007). Given the importance of treatment compliance in CBT for hoarding, the researchers conducted several *post-hoc* explorations of predictors of homework compliance ratings. In both trials, ADHD symptoms were assessed using the ADHD Symptom Scale (ADHDSS; Barkley & Murphy, 1998). ADHDSS inattention scores correlated $r=-.44$ with homework compliance in the first trial, and $r=-.42$ with homework compliance in the second trial (Fabricant et al., 2007). In each case, patients reporting greater pre-treatment inattentive symptoms showed reduced CBT compliance, and, subsequently, reduced benefit from treatment.

A growing body of evidence suggests that cognitive remediation (CR) strategies produce mild to moderate improvements in cognitive function among patients with psychiatric and neurological illness. For example, with respect to cognitive deficits in schizophrenia, Wykes, Reeder, Corner, Williams, and Everitt (1999) found a moderate-sized improvement for global cognition ($d=0.40$) in a meta-analysis of 40 studies. Furthermore, CR has been employed as a crucial element of comprehensive traumatic brain injury (TBI) and stroke rehabilitation for over 40 years (e.g., Luria, 1963). Recent systematic literature reviews, as well as formal meta-analyses (e.g., Cicerone et al. 2005; Rohling, Faust, Beverly, & Demakis, 2009) provide modest evidence for the efficacy of CR procedures for improving a variety of domains of cognition including attention and memory, and stronger evidence for the use of specific attention-training remediation procedures for patients with TBI (Cicerone et al., 2005).

Group studies have also investigated cognitive remediation strategies for patients with ADHD. In a randomized controlled trial (RCT) of 43 adults with ADHD, a two-hour, once-per-week cognitive training program consisting of strategy training in attention and organization (along with training in anger management and other skills) produced large-effect size improvements in self-reported ADHD symptoms ($d=1.4$), organizational skills ($d=1.2$), and state levels of anger ($d=0.50$) that were significantly larger than changes in a waitlist control group (Stevenson, Whitmont, Bornholt, Livesey, & Stevenson, 2002). Within-subject effects on self-reported symptoms and organizational skills were maintained one year after the intervention. Other studies have investigated the utility of non-contingent attention prompts for modulating attention performance in ADHD. In one study, 15 children with ADHD and 15 matched controls were administered eight random non-contingent alerts during two of four blocks of the Sustained Attention to Response Task (O'Connell et al. 2008), consisting of non-informative, auditory "alerting cues" for improving sustained attention. Results suggested that sustained attention deficits commonly noted in ADHD can be improved with a brief intervention designed to engage underfunctioning attention systems (O'Connell, Bellgrove, Dockree, & Robertson, 2006). Thus, deficits in the ability to maintain goal-directed focus commonly evident in people with ADHD are amenable to cognitive remediation strategies.

The application of CR to other psychological conditions has become more widespread in recent years. For example, Tchanturia, Lloyd, and Lang (2013) in a recent review describe the current status of research on the clinical utility of using CR in the treatment individuals with anorexia nervosa, citing medium-to-large effect sizes for improvements in set-shifting ($d=0.62$), cognitive flexibility ($d=0.32$), and central coherence tasks ($d=0.25$); and low drop-out rates from treatment (approximately 10–15%) as a result of this therapeutic adjunct.

Of immediate relevance to the present research, one recent uncontrolled study investigated the feasibility of an age-adapted behavioral treatment for geriatric (mean age=66 years) hoarding for a small sample ($n=11$) of older adults (Ayers et al. 2013). Treatment encompassed 24 individual sessions of psychotherapy that included both strategy-based cognitive rehabilitation targeting executive functioning and exposure to discarding/not acquiring. Results demonstrated clinically and statistically significant changes in hoarding severity at posttreatment. Eight participants were classified as treatment responders, and three as partial responders; this response rate was approximately twice that found by the same research team with a similar population using CBT only (Ayers, Wetherell, Golshan, & Saxena, 2011).

The aim of the present study was to explore the feasibility and preliminary efficacy of an extended, standardized and comprehensive computerized, drill-and-practice CR program for patients with HD. CR is appealing in many respects: it is efficacious for treating cognitive impairments such as inattention in several disorders including TBI and schizophrenia, as well as ADHD, it has been shown to improve performance on the same neuropsychological tests on which HD patients perform poorly, and it leads to better functional outcomes when paired with other rehabilitative interventions (Wykes et al., 1999) and thus might improve CBT performance. We predicted that (1) the program would be feasible as evidenced by a low drop-out rate and high patient satisfaction, and (2) participants with HD who were treated with CR would demonstrate improved scale-rated and performance-based cognitive skills at post-treatment compared to patients receiving a relaxation intervention. A secondary, exploratory aim was to examine whether cognitive remediation improves hoarding severity, compared to relaxation.

2. Methods

2.1. Participants

Individuals with HD were recruited via fliers posted in public settings (e.g., grocery stories, libraries) and local outpatient treatment centers, and via email sent to a database of over 8000 individuals who had contacted the researchers between January 2004 and January 2007 for information about HD. Eligible participants met all of the following criteria: (1) over 18 years of age, (2) a current primary diagnosis of hoarding disorder according to the Hoarding Rating Scale-Interview (HRS-I; Tolin, Frost, & Steketee, 2010) and Mini International Neuropsychiatric Interview (MINI; Sheehan et al. 1998), (3) no untreated and/or unstable concurrent psychiatric diagnoses, (4) a score on the inattentiveness subscale of the ADHDSS (Barkley & Murphy, 1998) that was one standard deviation or more above the normative mean identified in previous research with community control participants in this age group (Frost et al., 2011a), and (5) stable on all psychotropic medications during and up to four weeks preceding enrollment in the study. Potential participants were excluded if they met any of the following criteria: (1) currently taking any cognitive enhancers or stimulants, (2) a history of Multiple Sclerosis, Traumatic Brain Injury, loss of consciousness lasting more than 5 min, seizures, dementia, or other organic brain-related disorders, or (3) current Alcohol or Substance Abuse and/or a history of Alcohol or Substance Dependence. A total of 21 participants were screened out; 28 declined participation; and none dropped out after consenting to participate (see Fig. 1).

A total of 17 eligible participants completed the study. These individuals were uniformly White (100%) and predominantly female (77%). Their ages ranged from 23 to 79 ($M=60$, $SD=13$). Forty-seven percent had received a Master's degree. Two were concurrently enrolled in a HD treatment group at the outpatient psychological clinic at which the research study was conducted.

2.2. Materials

Diagnostic Measures. Axis I psychiatric diagnoses were assessed using the *Mini-International Neuropsychiatric Interview* (MINI; Sheehan et al., 1998), a clinician-rated, semi-structured interview used to determine lifetime and current Axis I disorders. As the current study began prior to the release of DSM-5, to classify participants as having HD we used a combination of the MINI, general interview, and the *Hoarding Rating Scale-Interview* (HRS-I; Tolin et al., 2010), a semi-structured interview which assesses the severity of clutter, acquisition, difficulty discarding, distress, and impairment, each on a 0–8 scale. The HRS-I shows excellent internal consistency ($\alpha=.97$) and reliably discriminates hoarding from non-hoarding participants (sensitivity=.97, specificity=.97) (Tolin et al., 2010). These strategies allowed the research team to select individuals that closely approach the current DSM-5 criteria. The HD diagnosis was defined as a score of "moderate" or above on HRS-I items assessing difficulty discarding and clutter, and impairment or distress,

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