Learning cognitive restructuring in later life: The role of cognitive flexibility on cognitive restructuring skill acquisition in older adults with anxiety and depression.

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Abstract

Although there is consistent evidence supporting the efficacy of cognitive behaviour therapy for late-life anxiety and depression, there are still some suggestions that the use of cognitive restructuring should be modified or minimized with older adults due to declines in flexible and abstract thinking. There is some evidence that poorer executive functioning negatively impacts on cognitive behavioural therapy (CBT) efficacy, although it is unclear what specific executive functioning skills are important and what treatment components are affected. Older adults experience some age-related decline in cognitive flexibility skills, including the ability to consider multiple ideas, flexibly switch cognitive sets and inhibit habitual responding; skills which intuitively seem important for the successful use of cognitive restructuring. This thesis aimed to examine the role of cognitive flexibility on cognitive restructuring skill acquisition in older adults through four papers. The first paper examined the role of cognitive flexibility on cognitive restructuring skill acquisition in a normal community-dwelling sample of older adults. The second paper extended these findings, assessing cognitive restructuring skills in older adults with and without anxiety and depression, and the influence of cognitive flexibility on this relationship. The third paper examined the measurement of cognitive flexibility, comparing neuropsychological assessment and self-report measures in older adults. The final paper investigated the role of pre-treatment cognitive flexibility as a predictor of cognitive restructuring skill acquisition at the end of a group CBT intervention for late-life anxiety and depression, and as a predictor of treatment outcome. The results are expected to inform clinical practice for conducting CBT with older adults, and build on emerging research into treatment moderators and mediators for late-life anxiety and depression.

Statement of Candidate

I certify that the work in this thesis entitled "Learning cognitive restructuring in later life: The role of cognitive flexibility on cognitive restructuring skill acquisition in older adults with anxiety and depression" has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree to any other university or institution other than Macquarie University.

I also certify that the thesis is an original piece of research and it has been written by me. Any help and assistance that I have received in my research work and the preparation of the thesis itself have been appropriately acknowledged.

In addition, I certify that all information sources and literature used are indicated in the thesis.

The research presented in this thesis was approved by Macquarie University Ethics Review Committee, reference number: 5201000862 on 19th August, 2010.

Carly Johnco (Student ID 40519708)

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Introduction

The percentage of the world's population aged over 65 increased from 1% to 6% from 1900 to 2000, and is estimated to reach 20% by 2050 (House of Lords, 2005). With the ageing of the population, the demand on mental health care services catering for older adults is also likely to increase. While mental health in older age has historically been an overlooked topic area, there has been a substantial expansion in research into mental health problems and treatment in later life in recent years. However, the focus of aging research still tends to centre around dementia and physical health problems, and research into psychological therapy with older people remains in its infancy. While the prevalence of cognitive impairment is increasing as the population ages and diagnostic measures improve, dementia prevalence rates internationally vary between 1-6% and indicate that the majority of older adults will not experience a pathological cognitive decline, even in the oldest old (>85 years) who have the highest rates of dementia (9-33%; Ferri et al., 2005). Thus, research with non-demented older people is important. Moving forward it is important to better understand the factors implicated in the development, maintenance and treatment of mental health problems in cognitively intact older adults. This thesis focused on understanding one cognitive factor that may be implicated in the successful use of psychological treatment techniques for anxiety and depression in older adults. Specifically, this thesis focused on cognitive flexibility skills, and how these skills affect the ability to learn and use cognitive restructuring skills in cognitive behavioural therapy (CBT) treatment for late-life anxiety and depression.

Anxiety and Depression in Older Adults

Identification and Consequences of Late-life Anxiety and Depression

There is considerable variability in the prevalence rates reported for anxiety and

depressive disorders in older people. Overall, anxiety and depression appear to be relatively common in later life, but are less common at this developmental stage than among younger populations. Cross-sectional and longitudinal surveys generally show a decrease in anxiety and depressive symptoms and disorders as people age (Byers, Yaffe, Covinsky, Friedman, & Bruce, 2010; Kessler, Berglund, et al., 2005; Slade, Johnston, Browne, Andrews, & Whiteford, 2009). Population surveys suggest prevalence rates around 18% for anxiety disorders and 8-10% for depressive disorders in younger adults (Kessler, Berglund, et al., 2005; Kessler, Chiu, Demler, & Walters, 2005). Prevalence rates of geriatric anxiety internationally tend to range between 2-15% depending on the methodology (Beekman et al., 1998; Byers et al., 2010; Flint, 1994; Gum, King-Kallimanis, & Kohn, 2009; Trollor, Anderson, Sachdev, Brodaty, & Andrews, 2007; Wolitzky-Taylor, Castriotta, Lenze, Stanley, & Craske, 2010) with higher rates in medical settings (Bryant, Jackson, & Ames, 2009; Chung, Berger, Jones, & Rudd, 2006; Kim, Braun, & Kunik, 2001; Todaro, Shen, Raffa, Tilkemeier, & Niaura, 2007). Generalized Anxiety Disorder (GAD) and specific phobias tend to be the most prevalent disorders reported in later life, with lower rates reported for the other anxiety disorders (Beekman et al., 1998; Flint, 1994; Kessler, Berglund, et al., 2005; Wolitzky-Taylor et al., 2010). Prevalence rates of geriatric depression range between .4 - 35%, (Beekman, Copeland, & Prince, 1999), with a recent systematic review indicating a global point prevalence of 4.7% (Ferrari et al., 2013). Similar to geriatric anxiety, higher rates of depressive disorders are found in medical settings (Bryant et al., 2009; Goldberg et al., 2012) and dementia populations (Even & Weintraub, 2010).

Despite the lower prevalence of diagnostic anxiety and mood disorders, older adults are more likely that younger adults to experience subclinical symptoms, or symptoms that do not meet full diagnostic criteria for anxiety and depression, but which cause similar

levels of impairment and distress (Blazer, 1994; De Beurs et al., 1999; Diefenbach et al., 2003; Mohlman et al., 2012). Subsyndromal depression is two to three times more common than major depression in older adults (Meeks, Vahia, Lavretsky, Kulkarni, & Jeste, 2011), and longitudinal data suggests an initial decline in depressive symptoms after midlife followed by an increase after age 70, despite the lower prevalence of diagnosed anxiety and depressive disorders (Kessler, Foster, Webster, & House, 1992; Sutin et al., 2013), perhaps suggesting that diagnostic criteria may not be as suitable for older adults.

Mental health problems can be difficult to identify and diagnose in older people due to heterogeneous symptom presentations, and difficulties in distinguishing diagnoses in the context of physical health comorbidities. For example, anhedonia is a more prominent symptom of depression in older people, rather than excessive sadness or tearfulness that characterizes younger adult depression (Gallo, Rabins, Lyketsos, Tien, & Anthony, 1997; Gum, McDougal, McIlvane, & Mingo, 2010). Similarly, older adults are more likely to report appetite and weight loss, excessive guilt, hyperchondriasis and psychomotor slowing, but are less likely to experience hypersomnia than younger depressed patients (Brodaty et al., 2005; Brodaty et al., 1997; Brodaty, Peters, Boyce, Hickie, & et al., 1991; Fiske, Wetherell, & Gatz, 2009; Hybels, Landerman, & Blazer, 2012; Lawton, Kleban, & Dean, 1993). Anxiety can also be difficult to diagnose in older adults given they are less likely to report behavioural avoidance and their lifestyles have often adapted to suitably accommodate avoidance of anxiety-provoking situations (Bryant, 2010). Clinicians often have difficulty distinguishing pathological and adaptive anxiety in older people and commonly misattribute symptoms to normal aging or physiological causes (Lenze & Wetherell, 2009), especially given older adults commonly report somatic symptoms associated with anxiety (Heimberg, Turk, & Mennin, 2004) which may be misattributed to physical health problems. Conversely, differential diagnosis from

iatrogenic causes of depression is also difficult given there are a range of physical health problems (for example hyperthyroidism or pulmonary problems) and medication side effects (including neuroleptics, tranquilisers, steroids and Parkinson's disease medications) that can produce symptoms of anxiety or depression (Karajgi, Rifkin, Doddi, & Kolli, 1990; Kathol, Turner, & Delahunt, 1986; Palmer, Jeste, & Sheikh, 1997). Clearly there are a number of factors present that make identification and diagnosis of anxiety and depression in later life complex.

When geriatric anxiety and depressive disorder are left untreated, the consequences are severe. For example, geriatric anxiety is associated with a range of negative outcomes, including increased physical disability, impaired activities of daily living, decreased sense of well-being and life satisfaction (Brenes, Guralnik, Williamson, Fried, & Penninx, 2005; Brenes, Guralnik, Williamson, Fried, Simpson, et al., 2005; Wetherell, Thorp, et al., 2004), increased mortality due to cancer or cardiovascular disease (Beaudreau & O'Hara, 2008) and greater risk of coronary artery disease (Nabi et al., 2010). Even subthreshold symptoms are associated with increased functional impairments, health care use and distress (De Beurs et al., 1999). Geriatric depression is also associated with a litany of poor health outcomes, most notably an increased risk of suicide that escalates with advancing age (Conwell & Brent, 1995; Draper, 1994). Late-life depression has the potential to markedly decrease quality of life, increase functional impairment, increase the risk of cognitive decline and dementia, and increase medical burden (P. J. Brown & Roose, 2011; Gao et al., 2012; Royall, Palmer, Chiodo, & Polk, 2011). Given these potentially lethal outcomes, it is important to ensure that effective treatments are available to address anxiety and depression symptoms in older adults.

Anxiety and depression are highly comorbid in older adults, with almost half of those with major depressive disorder meeting criteria for a comorbid anxiety disorder, and

around one quarter of those with an anxiety disorder meeting criteria for a comorbid depressive disorder (Beekman et al., 2000; De Beurs et al., 1999). The lifetime prevalence of developing a mood disorder in the context of Generalized Anxiety Disorder (GAD) in older adulthood is as high as 80% (Beaudreau & O'Hara, 2008). Despite this high level of comorbidity, most research on older people focuses on only anxiety or depression, often excluding those with comorbid diagnoses or disregarding the impact of this comorbidity. Those with comorbid diagnoses experience the greatest level of disability and distress due to their psychological problems, show increased chronic physical illness, suicidal ideation, autonomic arousal, lower social functioning and accelerated cognitive decline, compared with those suffering with a single disorder (Beaudreau & O'Hara, 2008; De Beurs et al., 1999; DeLuca et al., 2005; Mohlman et al., 2012). There are inconsistent findings surrounding the implications of comorbidity, with some studies suggesting that this population are the most likely to be resistant to treatment efforts (Gum, Arean, & Bostrom, 2007; Wetherell, Thorp, et al., 2004), while others find better outcomes in those with psychiatric comorbidity (Wetherell et al., 2005). Individually, anxiety and depression are associated with executive functioning deficits (Beaudreau & O'Hara, 2009; Channon, 1996; Mantella et al., 2007; Steffens & McQuoid, 2005) and the impact of comorbidity on the severity of cognitive impairments is important to consider, especially given research indicating that comorbid anxiety and depression increases the risk for developing dementia (DeLuca et al., 2005). Therefore, more attention to comorbid presentations of anxiety and depression in older adults, especially their manifestation and treatment is needed.

Treatment of Late-Life Depression and Anxiety

Older adults face numerous obstacles to receiving appropriate interventions for anxiety and depression including limited knowledge about evidence-based treatments

among practitioners, logistical problems with accessing appropriate services, stigma surrounding mental health in older generations, financial constraints and competing health demands that may be prioritised (Bartels & Smyer, 2002; Olfson & Pincus, 1996; Slade et al., 2009). Compared to younger adults, fewer older adults seek treatment for mental health problems, and those who do are less likely to receive evidence-based interventions or access specialist mental health services (Slade et al., 2009). Despite the potentially lethal outcomes of anxiety and depression in the elderly, only 9% of people aged over 60 receive treatment for their anxiety from a psychiatrist, psychologist or social worker (De Beurs et al., 1999). Improving access to efficacious pharmacological and psychological treatments of late-life anxiety and depression is important given the potential for both short-term and long-term sequelae when left untreated.

Medication is the most commonly received treatment for mental health problems in the elderly, with few receiving any form of ongoing psychological treatment (De Beurs et al., 1999; Klap, Unroe, & Unutzer, 2003; Wetherell, Kaplan, et al., 2004). One in five older people with a diagnosed anxiety disorder use benzodiazepines to manage their symptoms (De Beurs et al., 1999), despite the increased risk of falls and cognitive impairment (Hanlon et al., 1998; Klap et al., 2003; Sheahan et al., 1995; Simoni-Wastila & Yang, 2006). Pharmacotherapy treatments have potentially harmful side effects, and can increase the risk of drug interactions, blood pressure problems and sleep difficulties when added to an older person's existing medication regime (Gilhooly, 2005). Even if antidepressant medication is tolerated and taken regularly, the prognosis for late-life depression is poor, with almost half experiencing a relapse within three years (Reynolds et al., 1999). Selective serotonin reuptake inhibitor (SSRI) treatment studies tend to show promising results for geriatric anxiety in the short-term, but there is minimal evidence of

long-term efficacy (Katz, Reynolds, Alexopoulos, & Hackett, 2002). Thus improvements in the medical treatment of anxiety and depression are needed.

CBT is the most supported psychological therapy used with late-life anxiety and depression with cognitively intact older adults. Beck's cognitive theory of depression proposes that what we think and what we do influences how we feel (Beck, 1976). So rather than situations themselves eliciting an emotional response, it is the way we perceive the world that determines our emotional reaction. Our perceptions of the world depend on our automatic cognitions, which are based on underlying assumptions and core beliefs derived from previous experiences (Beck, Rush, Shaw, & Emery, 1979). CBT consists of a range of cognitive therapy and behavioural therapy techniques targeted at modifying how we think and how we behave, with the assumption that this will influence how we feel. The cognitive therapy component of CBT teaches clients to identify strings of negative automatic thoughts by keeping dysfunctional thought records. Clients gradually recognize that thoughts are subjective opinions rather than objective fact. With this understanding about the potential inaccuracy of thoughts, clients learn to test the validity of their thoughts, often through cognitive restructuring skills (Evans, 2007; Wilkinson, 1997). The other core skills used to challenge negative automatic thoughts is the use of behavioural experiments where clients test the validity of their dysfunctional thoughts by behaviourally testing the predictions these would generate in a range of settings (Bennett-Levy et al., 2004; Evans, 2007). In addition, to cognitive components, CBT also typically encompasses behavioural therapy techniques for anxiety and depression including behavioural activation and graded exposure.

CBT is currently the gold standard psychological intervention for anxiety and depression in adults (Cuijpers et al., 2013; Hofmann & Smits, 2008; Stewart & Chambless, 2009), and is increasingly supported as an effective treatment for late life anxiety and

depression, with similar effect sizes to those seen with younger adults (Ayers, Sorrell, Thorp, & Wetherell, 2007; Cuijpers, van Straten, & Smit, 2006; Goncalves & Byrne, 2012; Gould, Coulson, & Howard, 2012; Thorp et al., 2009). Research suggests that CBT is more effective than passive control groups, and shows similar effect sizes to pharmacotherapy (Cuijpers et al., 2006; Goncalves & Byrne, 2012; Gould et al., 2012; Thorp et al., 2009); however, effect sizes tend to be smaller for late-life depression compared with geriatric anxiety (Goncalves & Byrne, 2012; Thorp et al., 2009). While there is a clear superiority of CBT compared with no-treatment or treatment-as-usual, findings about the superiority of CBT in comparison to other treatment modalities is varied, with one meta-analysis suggesting superiority of CBT compared with active control groups (supportive counselling, discussion groups, psychoeducation or pharmacotherapy) at follow-up (Gould et al., 2012) but other meta-analyses failing to find superiority over other psychological treatments including acceptance and commitment therapy, psychodynamic, and reminiscence therapy (Cuijpers et al., 2006; Goncalves & Byrne, 2012). Despite evidence supporting the use of CBT with older adults, there is limited evidence assessing potential treatment moderators and mediators, and there remains a need to better understand what factors affect treatment outcomes for CBT in older adults. One area that is potentially very important, is the association of cognitive ability and the ability to learn specific CBT strategies in older adulthood.

Cognitive Restructuring with Older Adults

Although CBT encompasses a range of treatment components, cognitive restructuring is one of the key techniques involved in encouraging changes in automatic thought processes, and is often assumed to be a skill that older adult have difficulty implementing. While component analyses with younger adults fail to find any unique value

of cognitive therapy (Longmore & Worrell, 2007) other studies suggest that cognitive restructuring skill acquisition is important for maintenance of treatment outcomes. Neimeyer and Feixas (1990) found that while cognitive restructuring skill acquisition had no immediate impact on CBT outcome at post-treatment, it was related to the maintenance of treatment gains six months following treatment completion in younger depressed patients. They concluded that cognitive restructuring skills may not be as important when other therapeutic elements are present (e.g. group support, therapist-directed framing), but are important skills to ensure that treatment gains are maintained following the active treatment phase. Similarly, increased cognitive restructuring skill acquisition reduced the risk of relapse following CBT for depression in a younger adult sample (Strunk, DeRubeis, Chiu, & Alvarez, 2007). These findings suggest that successful acquisition of cognitive restructuring skills may also be important for the ongoing maintenance of treatment gains in older adults.

There has remained an ongoing clinical and academic debate about the suitability of cognitive therapy as a treatment method for psychological problems in older adults. There has historically been a sense of therapeutic nihilism towards implementing cognitive therapy strategies such as cognitive restructuring with older clients, and there have been a number of claims suggesting a need to eliminate or adapt the cognitive restructuring element of CBT. Church (1983) reported that older clients did not see the relevance of completing dysfunctional thought records (where negative automatic thoughts are analysed and disputed) in treatment, and that they benefited from more concrete treatment elements, while Steuer and Hammen (1983) suggested that normal age-related cognitive decline and an increase in physical health comorbidities may necessitate the modification of CBT for use with older adults. Wilkinson (1997) supported the need to focus on concrete techniques, claiming that older adults have difficulty using dysfunctional thought records

due to declines in abstract thinking ability. These recommended adaptations reinforce the idea that older adults experience a homogenous decline in cognitive abilities, and that treatment needs to be changed as a result. While some studies do not comment directly on the utility of using cognitive restructuring, the treatment incorporates alternative cognitive skills such as coping statements, either instead of or in addition to traditional cognitive restructuring skills (e.g., Stanley et al., 2013; Stanley, Diefenbach, & Hopko, 2004).

Conversely, others have suggested that modification and adaptions should not be considered necessary with all older people (Laidlaw, 2001; Laidlaw & McAlpine, 2008; Laidlaw, Thompson, Dick-Siskin, & Gallagher-Thompson, 2003; Zeiss & Steffen, 1996). Given the available evidence about the efficacy of CBT with older adults, the more current discussions tend to centre not around whether or not CBT is suitable, but rather, how much the cognitive therapy elements need to be modified to incorporate age-specific issues (Knight & Poon, 2008; Laidlaw, 2001; Laidlaw & McAlpine, 2008; Satre, Knight, & David, 2006). Knight and Poon (2008) propose a model to facilitate accommodations of individual developmental issues, environmental issues and socio-cultural issues into the understanding and treatment framework for older adults, and encourage an individual formulation-based approach to any modifications to therapy. Koder, Brodaty, and Anstey (1996) proposed a number of age-related adjustments for CBT programs, including addressing ageist beliefs about change, using reinforcement strategies such as handouts, slowed pace of therapy, increased repetition, group formats to normalize experiences and lessen isolation, incorporating age-related themes such as loss, life reviews, and involving significant others in therapy to encourage generalization. Similar adaptations have been suggested by Evans (2007) and Chand and Grossberg (2013), who reinforced the importance of repetition and summarizing, along with presenting material in multiple ways to assist with generalization (including recordings and written summaries). One study with

older adults found added benefit by including between-session reminders to complete homework tasks and review content (Mohlman et al., 2003), supporting the use of adaptations to standard treatment with older clients. While many of these adaptations and modifications seem important for some older adults, there remains confusion over whether they need to be included with all older adults.

Older adults represent a heterogeneous group and suggested treatment modifications can have the unintended effect of implying that older adults are not able to effectively engage in existing treatments. Given the limited knowledge of evidence-based treatments for older adults within many practitioners, these adaptations have the implied notion that therapy needs to be altered for all older adults. This can result in clinicians with limited experience in working with older adults being reluctant or unwilling to provide treatment services to them. Laidlaw (2001) suggests that major modifications should not be considered necessary in every case on the sole basis of chronological age, noting that minor modifications based on individual client needs, such as pacing or accounting for sensory deficits, may be incorporated, without considering this a major modification to the cognitive therapy process per se. However these recommendations are based on consensus rather than empirical data. There is limited evidence available to indicate what clinical markers would specify a need to adapt a standard treatment, and what adaptations would be necessary. Clinically it is possible that while the process of cognitive therapy may be more difficult to implement, it may still have benefits for the older person, however there is no available empirical support for the modification or removal of cognitive therapy treatment components for cognitively intact older adults. The necessity to adapt or remove more cognitive elements of treatment for older adults remains an important empirical and clinical question given that the number of older people experiencing anxiety and depressive disorders is expected to increase, (Jeste et al., 1999; Kessler, Berglund, et al.,

2005), and the role of age-related cognitive changes in non-demented older adults is important to understand.

Measurement of Cognitive Restructuring

Although we have assumptions that cognitive restructuring skill acquisition is a necessary element for change with CBT, there are few studies that examine cognitive restructuring skill acquisition, and it is important to consider how this outcome is measured. Previous methods include qualitative ratings of cognitive restructuring responses (Neimeyer & Feixas, 1990; Strunk et al., 2007) and magnitude of reduction in subjective units of distress ratings (Mohlman, 2013). Strunk et al. (2007) used quality ratings from video recordings of therapy sessions with younger adults, and quality ratings were made on a number of domains, including the ability to identify automatic thoughts and feelings, consider disconfirmatory evidence, consider alternative explanations and more realistic consequences, see things from a different perspective, and ability to generate a rational response. This coding system was lengthy and there appeared to be some conceptual overlap between rating categories. Similarly, Neimeyer and Feixas (1990) scored each section of a completed cognitive restructuring form and gave ratings of the quality of completion in a young adult sample. Mohlman (2013) used the number of pieces of evidence generated, and the magnitude of reduction in subjective distress ratings as a measure of emotional efficacy of cognitive restructuring with older adults. However there has been little replication of these methods of assessing cognitive restructuring skill acquisition, and thus comparing findings across studies is limited. There is an increased need to understand how older adults learn cognitive restructuring, and to understand the role of age-related cognitive changes in this process.

Cognitive Functioning in Older Adults

Age-related Decline

As people age, there is robust evidence to suggest that there is a decline in some cognitive processes, even in the absence of any dementing illness (Mayr, Spieler, & Kliegl, 2001). Cognitive abilities that have been consistently shown to decline due to normal ageing include: new learning, ability to shift between abstract concepts, psychomotor speed, set shifting, initiation of novel responses, working memory and increased perseveration (Evans, 2007; Head, Kennedy, Rodrigue, & Raz, 2009; Lockwood, Alexopoulos, & van Gorp, 2002; Piguet et al., 2005; Steuer & Hammen, 1983). Executive functioning is one of the main cognitive skills that declines over the age-span, and refers to a heterogeneous set of cognitive processes, including planning, organization, working memory, attention, problem solving, verbal reasoning, initiation, inhibitory control, cognitive flexibility, hypothesis or goal generation and monitoring of actions (Baudic, Tzortzis, Dalla Barba, & Traykov, 2004; Mohlman, 2005). The presence of executive dysfunction does not implicate deficits in basic cognitive skills, and the cause of this decline can range from normal age-related declines to part of a more pervasive cognitive decline, early dementing disorders or medical problem (Alexopoulos, Raue, Kanellopoulos, Mackin, & Arean, 2008). It is suggested that age-related declines in executive functioning skill may be due to neurobiological changes to the frontal lobe, including a loss of brain volume, decreased dopamine concentration and receptors and a loss of myelin during the ageing process (West, 2000). Alternative explanations suggest that declines in executive skills result from disuse, where fluid intelligence skills (the ability to activity problem solve novel tasks) and more active problem solving skills are required less regularly in retirement (Christensen et al., 1996; Orrell, 1995; Paggi & Hayslip, 1999).

While there is evidence about a decline in some cognitive skills, there is preservation of many others. Skills relying less on use and practice, such as semantic memory and crystallized intelligence (general knowledge), do not show age-related declines (Baltes, Staudinger, & Lindenberger, 1999; Christensen, 2001; O'Brien, 1999). The notion of age-related cognitive decline has propelled the commonly held belief that 'you can't teach an old dog new tricks', which has had a flow-on effect to encourage ageist attitudes towards older people and their capabilities. Experimental tasks have shown that increasing mentally stimulating activities with older people can improve fluid intelligence even in the absence of a change in anxiety or depression (Tranter & Koutstaal, 2008), supporting the idea that it is the lack of use that contributes to a decline in some cognitive abilities, and that this can be remedied with increased cognitive stimulation. Although the precise cause of age-related declines in executive functioning skills is not known at this stage, there is consistent evidence that these skills do change over the lifespan, however the implications of these age-related cognitive declines on therapy outcomes is unclear.

Cognitive Flexibility

Cognitive flexibility is one component of executive functioning that appears to have specific relevance to CBT skills. There are varied definitions of cognitive flexibility; however, in general it refers to the ability to flexibly shift cognitive sets, thoughts or attention in order to process or respond to situations in a different way (Eslinger & Grattan, 1993; Rende, 2000). Cognitive flexibility can be divided into two overarching forms; spontaneous flexibility and reactive flexibility. Spontaneous flexibility includes the ability to produce diverse ideas, consider response alternatives and modify plans. This form of cognitive flexibility is often divided into the ability to produce large numbers of ideas (ideational fluency) and the ability to produce diverse ideas (divergent thinking or semantic

spontaneous flexibility). To be spontaneously flexible, a person has to generate ideas through the use of varied effective search strategies to move among classes and categories of knowledge (Eslinger & Grattan, 1993). Reactive flexibility, includes the ability to freely shift cognition and behaviour in response to changing task or situational demands (Rende, 2000). Cognitive *inflexibility* (or rigidity) refers to an impairment in the ability to disengage from a particular cognitive set. When assessing cognitive flexibility, it is important to obtain evidence of poor shifting across multiple cognitive and perceptual domains, regardless of sensory input or response modality (Lezak, 1995) to exclude these as explanations.

Psychological theories of cognitive flexibility propose that there is a hierarchy of cognitive skills where higher-order processes organise and control lower levels (Canas, Antoli, Fajardo, & Salmeron, 2005). When people improve on their ability to perform a task, they lose conscious control over the steps involved in the task completion and perform the task more automatically. With repetition of a task, a mental representation is formed where smaller process details are hidden, and tasks are performed automatically. This transition to automaticity decreases the time to complete the task, but can result in inflexibility in the way a task is performed when the task demands change. Theories of cognitive flexibility suggest that an individual must select an optimal level of cognitive control for tasks that minimizes the cognitive demand (Canas et al., 2005; Rasmussen, 1983, 1986). When learning a new task, there are high cognitive load demands until the person develops a strategy or heuristic to complete the task. Developing a strategy or heuristic is characteristic of learning, the time required to complete the task decreases and so too does the amount of cognitive resources required through this process of automation. Cognitive inflexibility occurs when a strategy is used repeatedly, even though the conditions have changed and the strategy is no longer appropriate. According to the levels

of cognitive control, the person had failed to identify that the situation is new and that a new strategy needs to be developed (Canas et al., 2005).

Measurement of Cognitive Flexibility

Given the many aspects of cognitive flexibility, the measurement of this construct is multifaceted. Most neuropsychological tasks involve a number of cognitive operations, for example the Wisconsin Card Sorting Test (WCST; Heaton, Chelune, Talley, Kay, & Curtiss, 1993) involves visual processing, short-term memory, planning, hypothesis generation, inhibitory control and self-monitoring (Lezak, 1995; Strauss, Sherman, & Spreen, 2006) and as such it is important to use multiple measures across different response domains when assessing impairments in cognitive flexibility. Given the distinction between processes involved in spontaneous and reactive flexibility, it is important to include measures that assess both of these concepts.

Spontaneous flexibility represents the ability to produce diverse ideas, and is often measured with verbal fluency and design fluency tasks. Verbal fluency tasks, such as the Controlled Oral Word Association Test (COWAT; Benton & Hamsher, 1976) require a person to spontaneously produce words beginning with a specified letter or belonging to a semantic category (e.g. fruit) under time constraints. The person will generate an initial list of words, and then will need to develop cognitive strategies to identify other ways of generating appropriate words. To successfully achieve this, there is some need to bypass automatic and habitual responses and strategies in order to attend to other features and aspects of knowledge. Design fluency is another way of assessing spontaneous flexibility in a non-verbal domain. Tasks such as the Ruff Figural Fluency Test (RFFT; Ruff, 1988) require the participant to generate unique non-verbal designs under time constraints, and

similarly require an ability to use different cognitive strategies to develop unique patterns without replication.

Measurement of reactive flexibility often uses concept learning tasks and inhibitory control tasks, both of which require responses to be altered in response to changing situational demands. This ability to override a prepotent response is characteristic of cognitive flexibility. Inhibitory control tasks assess reactive flexibility in terms of how easily a person can suppress a habitual response in favour of a less automatic one. These types of tasks require the flexibility to shift between the levels of cognitive control to over-ride the automaticity of habitual responding tendencies. A classic measure of inhibitory control is the Stroop Color-Word test (Golden, 1978), which requires the participant to suppress a habitual reading response in order to correctly name the colour of the ink that an incongruent word is printed in. The Wisconsin Card Sorting Test (WCST) is a classic measure of concept learning and measures a number of cognitive skills, including categorization, abstraction ability, ability to maintain set, set switching, strategic planning and the ability to modulate impulsive responding (Lezak, 1995; Strauss et al., 2006). This is a highly complex task that requires participants to sort decks of cards into piles with no specific instructions. The person must generate strategies to sort the cards, and alter their sorting behaviour based on feedback about the accuracy of their previous sort. Perseverative errors are an important index on this task, and represent how often the individual continued to respond to a stimulus characteristic, or sort under a particular heuristic, despite feedback that it is incorrect (for example, continuing to sort by colour despite feedback that their sort is incorrect). After a period of correct responding, the WCST changes the sorting principle without warning, and the individual must suppress a learned response pattern and develop a new way of responding. A theoretical analysis of the WCST identified three critical abilities for successful performance on the WCST, 1)

the ability to change the rule in response to negative reward, 2) the capacity to remember which rules had been previously tested, and 3) the ability to reject some rules a priori based on logic and reasoning (Dehaene & Changeux, 1991). Failure can arise when too many rules are evaluated, the reward signal is neglected, or when an individual fails to alter their behaviour in response to negative feedback. All of these skills are important for the assessment of cognitive flexibility.

Major criticisms of using neuropsychological testing to assess cognitive flexibility lie in the validity of these tests as a proxy for behaviour in real world situations. Neuropsychological test are conducted in quiet, controlled environments, and often have clear structure and demands. Participants have a clear instruction to concentrate and focus their efforts on completing the brief task, which may not mimic the unstructured and complex nature of everyday living that may place more complex demands on executive functioning skills where behaviours are more automatic and influenced by social and contextual information (Dennis & Vander Wal, 2010). It is also unclear whether the skills required in neuropsychological tasks apply to the more abstract thinking elements of cognitive flexibility that are required in cognitive restructuring (Dennis & Vander Wal, 2010).

Given the critique of the external validity of neuropsychological testing, some have proposed that other methods should be employed to assess cognitive flexibility, including self-report measures such as the Cognitive Flexibility Scale (CFS; Martin & Rubin, 1995) and Cognitive Flexibility Index (CFI; Dennis & Vander Wal, 2010), however neither has been validated in an older population. The CFS is a12-item self-report measure of cognitive flexibility designed to assess flexibility in communication style. The three domains assessed are an awareness of alternative ways of communicating, willingness to adapt responding style to the situation and self-efficacy in being flexible (Martin & Rubin,

1995). The CFI is a self-report questionnaire that was designed to assess the type of cognitive flexibility targeted in CBT interventions. This 20-item scale assesses a person's ability to perceive multiple alternative explanations, generate multiple alternative solutions to difficult situations, and an individual's tendency to perceive difficult situations as controllable (Dennis & Vander Wal, 2010). Unfortunately, both of these measures were developed in young adult samples and have not been validated with older adults, raising questions about their utility in treatment settings.

The comparability of these self-report measures of cognitive flexibility to neuropsychological measures of cognitive flexibility has not been established in an older adult sample and the relationship to treatment outcome is unclear. One study assessed the relationship between the CFS and a neuropsychological measure of concept formation and found no relationship in a young adult healthy control sample, or a sample with anorexia nervosa (Lounes, Khan, & Tchanturia, 2011).Another study compared the CFS and CFI with neuropsychological measures in a younger sample and found no evidence of convergent validity (Dennis, 2009). Unfortunately the neuropsychological measures used in this study were limited, and these findings warrant further examination in an older population, and against more commonly used measures of cognitive flexibility. It has been suggested that self-report measures may assess more conscious aspects of self-perceived cognitive flexibility and abstract problem solving abilities, while neuropsychological tests assess cognitive flexibility processes that are dependent on organic brain processes or the capacity to shift mental sets in response to concrete task demands (Dennis, 2009). The assessment of other aspects of cognitive flexibility, such as a willingness to be flexible, or perceived self-efficacy to be flexible may have value in CBT interventions, where clients need to understand the rationale for skill use and have some sense of internal agency to

change their emotional circumstances. The relationship of these self-report measures to treatment outcome remains unclear.

The Relationship between Anxiety, Depression and Cognitive Flexibility

It is likely that the relationship between affective disorders and cognitive flexibility is a bidirectional one. Declines in cognitive flexibility may negatively impact on emotional symptoms by reducing the consideration or implementation of alternate coping strategies. It is also possible that older people with increased emotional symptoms, such as anxiety and depression, are likely to demonstrate more rigid thought processes and exhibit impairments in concentration and attention as a part of their symptoms. There appear to be similar neurological structures involved in cognitive flexibility and anxiety and depression, namely frontal lobe structures and the corticostriatal system, which are associated with cognitive flexibility impairments (Eslinger & Grattan, 1993). To better understand the relationship between anxiety, depression and cognitive flexibility it is important to consider the neurobiological structures that underlie both processes, and to assess the theoretical and empirical findings that examine the co-occurrence of both. Given the potential for both age-related and psychopathology-related declines in cognitive flexibility skills, it is especially important to consider how this impacts cognitive functioning in older adults with anxiety and depression, and whether these impairments impact on their ability to learn cognitive restructuring during therapy.

Depression and Cognitive Flexibility

The neurobiological, theoretical and empirical accounts, all suggest that there are impairments in executive functioning in late-life depression. Cognitive-behavioural models of depression suggest that depression is related to pervasive negative beliefs about the self,

world and future that are maintained despite exposure to contrary experiences and evidence (Beck et al., 1979). Maintenance of the disorder relies on rumination on selective aspects of awareness that reinforce a sense of hopelessness and helplessness in the sufferer. Rumination and negative attentional biases are common in depression (Gotlib & Joormann, 2010; Mathews & MacLeod, 2005; Peckham, McHugh, & Otto, 2010) and are likely to be the result of impaired inhibitory control systems, where the individual is unable to disengage from the negative information (Drevets, 1999; Siegle, Steinhauer, Thase, Stenger, & Carter, 2002).

Frontal lobe structures appear to play a role in both executive dysfunction and depression. Some patients with depression exhibit reduced blood flow to the frontal lobe (Bench, Friston, Brown, Scott, & et al., 1992; Krishnan, 1993; Lesser, Mena, Boone, Miller, & et al., 1994). Given that the prefrontal cortex is connected to limbic structures that affect emotional functioning (Goldapple et al., 2004), changes in frontal lobe volume or structure may have implications for the development of both emotional disorders and deficits in executive function skills (Alexopoulos, Kiosses, Klimstra, Kalayam, & Bruce, 2002). Empirical findings examining the relationship between depression and executive functioning in older adulthood range from relatively intact functioning to severe impairments, with increased executive dysfunction in those with more severe depressive symptoms (Baudic et al., 2004; Boone et al., 1995; Lockwood, Alexopoulos, Kakuma, & Van Gorp, 2000; Osorio, Garcia de Lozar, Ramos, & Aguera, 2009; Rapp et al., 2005; Sexton et al., 2012). Overall there does seem to be some impairment in cognitive skills in older patients with depression, although there are some discrepancies between studies on the specific aspects of executive functioning that are affected. For example one study found that moderately depressed older adults had deficits in planning, strategy development, spatial working memory and verbal fluency despite intact set shifting and

psychomotor speed (Elliott, Sahakian, McKay, & Herrod, 1996), while other studies have found impaired verbal fluency, set shifting, recognition memory and planning skills (Baudic et al., 2004; Beats, Sahakian, & Levy, 1996). Other studies have found deficits in set-shifting but intact verbal fluency in depressed older adults (Jones, Henderson, & Welch, 1988). Longitudinal studies also vary in their findings, with some suggesting that depressive symptoms are associated with a decline in attention and executive control but not basic memory functions (Royall et al., 2011) and others suggesting that depression increases the risk of dementia (DeLuca et al., 2005).

Current depression may impact on neuropsychological performance due to impaired concentration and psychomotor speed that are symptomatic of the depressive illness, however studies continue to find deficits in executive functions with older depressed patients in remission (Osorio et al., 2009). These findings support the suggestion of a distinct depression-executive dysfunction syndrome, common in late-onset depression, that is characterised by impaired visual naming, verbal fluency, and increased perseveration (Alexopoulos et al., 2002). The identification of depressed patients with co-occurring executive dysfunction may be important given this group experience increased disability and poorer treatment response (Alexopoulos et al., 2002). It is unclear whether the combination of age-related and depression-related declines in executive function are synergistic, and what impact these impairments may have on the ability for older adults to engage with cognitive therapy strategies.

Anxiety and Cognitive Flexibility

Similar to depression, neurobiological studies suggest common structures involved in executive functioning and anxiety, namely the amygdala and prefrontal cortex. However the two dominant theoretical models of anxiety, suggest different roles for executive

function processes in the development and maintenance of anxiety disorders. The avoidance theory of worry in GAD (Borkovec, 1994; Borkovec, Alcaine, & Behar, 2004) suggests enhanced inhibitory processing skills, where worrying serves to inhibit threat-related images. Increased prefrontal cortex activity has been found in young adult clients with GAD (Hoehn-Saric, Lee, McLeod, & Wong, 2005) and increased medial orbital cortex volume had been found in older adults with GAD (Mohlman et al., 2009), suggesting overactivity of the frontal lobe and resulting dampening in the limbic system (Hoehn-Saric, McLeod, & Zimmerli, 1989; Mohlman et al., 2009; Thayer & Lane, 2000) consistent with avoidance models.

However, traditional cognitive theories of anxiety disorders propose deficits in executive function, with individuals experiencing difficulty inhibiting or shifting away from threat-related cognitions (Beck, Emery, & Greenberg, 1985; Butler & Mathews, 1983). Most neurobiological and empirical studies suggest impaired executive functioning skills in anxious older adults. Rodent models show that exposure to anxiety or stress, which activates the hypothalamic-pituitary-adrenal axis can cause atrophy in the prefrontal cortex, and hypertrophy in the amygdala (Holmes & Wellman, 2009; Schroeder, Schiltz, & Kelley, 2003; Singewald, Salchner, & Sharp, 2003). This is consistent with traditional accounts of anxiety, suggesting overactivity in the limbic system and poor frontal lobe control of negative affect (Lorberbaum et al., 2004). Attention biases are consistently found in young and old anxious patients, indicating deficits in inhibitory control that prevent appropriate shifts in attention away from threat cues (Brown, White, Doan, & de Bruin, 2011; Eldar, Yankelevitch, Lamy, & Bar-Haim, 2010). Studies also suggest impairments in executive skills using neuropsychological assessment. Older patients with GAD show impaired set-shifting, processing speed, inhibition (Beaudreau & O'Hara, 2009; Mantella et al., 2007), with those reporting higher medical burden showing even greater

problems (Mantella et al., 2007). Cross-sectional studies have found that anxiety is associated with poorer set-shifting, delayed verbal memory, executive functioning and information processing speed (Beaudreau & O'Hara, 2008; Mantella et al., 2007; Schultz, Moser, Bishop, & Ellingrod, 2005; Wetherell, Reynolds, Gatz, & Pedersen, 2002), while longitudinal studies suggest that late-life anxiety disorders predict accelerated cognitive decline (Beaudreau & O'Hara, 2008; Bierman, Comijs, Jonker, & Beekman, 2005; DeLuca et al., 2005).

Despite the high comorbidity between anxiety and depressive symptoms in older people, their combined effect on cognition is rarely considered. One study has found that comorbid anxiety and depression was associated with impairments in processing speed/shifting attention, episodic memory and semantic memory, although impaired inhibitory control was only associated with anxiety (Beaudreau & O'Hara, 2009). Compared with older adults suffering only anxiety or depression, those with comorbid anxiety and depression show accelerated memory decline and increased risk of dementia, (Beaudreau & O'Hara, 2008; DeLuca et al., 2005). Given the negative effect of comorbidity on cognition, it is important to better understanding the relationship between cognitive flexibility skills and anxiety and depressive disorders given that this may have implications for treatment, where impairments in this domain may negatively impact attempts for clients to learn skills to alter their thinking patterns.

The Role of Cognitive Functioning on Treatment Efficacy

There is some emerging evidence to suggest that executive dysfunction can impact on treatment outcome with older adults. Several medication studies have found that executive dysfunction predicts reduced treatment response in older patients treated with antidepressant medication (Kalayam & Alexopoulos, 1999; Potter, Kittinger, Wagner,

Steffens, & Krishnan, 2004; Simpson, Baldwin, Jackson, & Burns, 1998). In contrast, one study failed to find a relationship between executive functioning and risk of relapse following medication treatment in late-life depression (Butters et al., 2004). One study has found that improvement in anxiety symptoms with antidepressant medication treatment was also associated with improvements in some cognitive functions (Butters et al., 2011).

Examination of the relationship between executive functioning and psychological treatment outcomes has been limited until recent years. Mohlman and Gorman (2005) examined the impact of executive function on treatment outcome in a CBT intervention for GAD in older adults. Although pre-treatment executive functioning did not predict treatment outcomes, change in executive functioning over treatment did. They found that those with intact executive functioning at the beginning and end of treatment improved on measures of anxiety over the course of treatment. They found that those who had reduced executive functioning at the beginning and end of treatment had a poor treatment response. In addition, they found a small proportion of participants who exhibited reduced executive functioning at pre-treatment but improved on measures of executive functioning over treatment, and found that this group showed slightly better treatment response than those with intact executive function. Mohlman and Gorman (2005) suggested that CBT may improve both anxiety and executive functioning deficits for some older adults. This assumption has been supported by neuroimaging studies with younger adults that have found that CBT alters brain structures within the cortical and limbic systems (Goldapple et al., 2004). Although this initial study demonstrated a link between executive dysfunction and CBT treatment response, it is not clear what component of the wide range of executive functioning skills impacted on treatment outcome, and on which CBT elements it had an effect.

Subsequently, Mohlman (2008) pilot tested an intervention comparing a standard CBT intervention to CBT including a cognitive remediation element targeting executive functioning skills. The rationale behind this executive function skills training was that improving executive function skills would improve ability to inhibit unwanted responses, enhance logical reappraisal of threat stimuli, disengage from rumination and shift attention from threat-related stimuli towards neutral or positive stimuli (Mohlman, 2008). By adding an attention process training task (Sohlberg, Johnson, Paule, Raskin, & Mateer, 2001), treatment outcome was improved compared to standard CBT treatment, supporting the notion that executive functioning skills are important for the successful implementation of CBT skills (Mohlman, 2005, 2008; Mohlman & Gorman, 2005). While the additional cognitive remediation provided in this intervention demonstrated potential to improve efficacy of treatment for a vulnerable subgroup of clients, this study was conducted with a very small sample (4 participants in each group) and these findings need to be replicated in a larger sample. Similar to the earlier limitations of the previous study by Mohlman and Gorman (2005), it is not clear which aspect of executive functioning was critical in the improvement given that sustained attention, alternating attention, focussed attention and divided attention were all targeted, and it is unclear on which treatment component of CBT it primarily had an impact.

Recently, Mohlman (2013) extended these findings to assess the impact of verbal and non-verbal executive functioning skills on treatment outcome and cognitive restructuring ability in an elderly GAD sample. Pre-treatment verbal and non-verbal executive functioning was not predictive of treatment outcome, but similar to a previous study (Mohlman & Gorman, 2005), intact or improved executive skills over treatment was related to better treatment outcome. Increased depressive symptoms and better verbal (but not non-verbal) executive functioning skills were related to the number of pieces of

evidence collected during cognitive restructuring when this skill was practiced for the first time in treatment. Verbal and non-verbal executive functioning skills were also related to the magnitude of reduction in subjective units of distress (SUDs) ratings, suggesting that executive functioning skills appear to be important for the successful use of cognitive restructuring. This study provides preliminary evidence for a role of executive functioning skills in cognitive restructuring, however the use of number of pieces of evidence and reduction in subjective distress as outcome measures has some limitations and it is unclear whether this is the best way to measure this outcome. Further, cognitive restructuring was assessed during the first time this skill was practiced in treatment and it is unclear whether this is representative of the type of learning that takes place over the course of treatment. This study highlights the need to further consider the best way to measure cognitive restructuring and whether it is done once, or over the course of treatment.

Research Rationale

There appears to be consistent evidence suggesting that a proportion of elderly clients with depression and anxiety experience impairments in executive functioning skills. There is also emerging evidence that impaired executive functioning skills have implications for poorer treatment response to CBT interventions. Given the broad range of cognitive abilities encapsulated by the terms ‘executive functioning’ it is important to better understand the specific cognitive skills underlying this effect and to better understand which CBT treatment elements are impacted. There is an intuitive relevance of skills involved in cognitive flexibility (including the ability to produce diverse ideas, consider response alternatives, and modify behaviours to manage changing circumstances) to the use of cognitive restructuring, where individuals are required to dismantle negative automatic thoughts, generate evidence that supports and refutes them and subsequently

generate alternative thoughts. CBT for both anxiety and depressive disorders involves challenging the validity of beliefs in the context of contradictory information in order to modify these beliefs to more adaptive ones. Difficulty shifting away from negative stimuli and effectively using feedback to alter behaviour would have significant implications for the client's ability to utilise and benefit from cognitive therapy interventions. In older adults, this difficulty in modifying unhelpful thoughts may be compounded by the effect of normal declines in executive functioning with age, and as such older adults might need cognitive restructuring skills to be modified or adapted.

This thesis focused on understanding the relationship between cognitive flexibility and cognitive restructuring skill acquisition in community and clinical samples of older adults. The first study assessed whether there was a relationship between cognitive flexibility and cognitive restructuring skill acquisition in a normal community-dwelling sample. The second study extended this by comparing the impact of anxiety and depressive symptoms on the relationship between cognitive flexibility and on cognitive restructuring skill acquisition in both clinical and non-clinical samples. The third study assessed the measurement of cognitive flexibility and the validity of using self-report measures as an alternative or supplement to neuropsychological testing in clinical and non-clinical samples of older adults. The final study aimed to understand the longitudinal impact of cognitive flexibility skills by examining: 1) whether poor cognitive flexibility at pre-treatment impacts the ability to learn cognitive restructuring over the course of treatment, 2) whether cognitive flexibility impacts overall CBT treatment outcome, and 3) whether cognitive flexibility changes as a result of a CBT intervention.

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PAPER 1. The role of cognitive flexibility in cognitive restructuring skill acquisition among older adults

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Abstract

Cognitive flexibility is one aspect of executive functioning that encompasses the ability to produce diverse ideas, consider response alternatives, and modify behaviours to manage changing circumstances. These processes are likely to be important for implementing cognitive restructuring. The present study investigated the impact of cognitive flexibility on older adults' ability to learn cognitive restructuring. Neuropsychological measures of cognitive flexibility were administered to 40 normal community-dwelling older adult volunteers and their ability to implement cognitive restructuring was coded and analyzed. Results indicated that the majority of participants showed good cognitive restructuring skill acquisition with brief training. The multiple regression analysis suggested that those with poorer cognitive flexibility on neuropsychological testing demonstrated poorer quality cognitive restructuring. In particular, perseverative thinking styles appear to negatively impact the ability to learn cognitive restructuring. Further research is needed to clarify whether older adults with poor cognitive flexibility can improve their cognitive restructuring skills with repetition over treatment or whether alternative skills should be considered.

Introduction

There is an increasing body of evidence suggesting that cognitive behavioral therapy (CBT) is effective for older adults experiencing anxiety and depression (Ayers, Sorrell, Thorp, & Wetherell, 2007; Gallagher-Thompson, Steffen, & Thompson, 2010; Goncalves & Byrne, 2012; Gould, Coulson & Howard, 2012; Hendriks, Voshaar, Keijsers, Hoogduin, & van Balkom, 2008; Laidlaw, Thompson, Dick-Siskin, & Gallagher-Thompson, 2003; Serfaty, Haworth, Blanchard, Buszewicz, Murad & King, 2009). Despite the efficacy of CBT for older adults, there is still clinical debate about whether, and the extent to which CBT needs to be adapted (Koder, Brodaty, & Anstey, 1996; Laidlaw, 2001). There has been longstanding debate in regards to whether older adults are able to engage sufficiently with cognitive restructuring due to normal age-related cognitive decline or the onset of dementia (Church, 1983; Evans, 2007; Koder et al., 1996; Steuer & Hammen, 1983; Wilkinson, 1997). Some researchers suggest that cognitive restructuring should be avoided or minimized due to difficulties in utilizing abstract reasoning abilities (Wilkinson, 1997). However, these recommendations are often made on the basis of clinical consensus, rather than empirical data. While modification of CBT may be needed for some older adults, this age group represents a heterogeneous group of people with varying sensory, cognitive, physical and social abilities. Suggestions for modification and simplification of therapy can have the unintended effect of implying that older adults are not able to effectively engage with therapy and result in clinicians being reluctant to introduce important therapeutic techniques in treatment. The necessity to adapt or remove more cognitive elements of CBT remains an important empirical and clinical question for the treatment of psychological distress among older adults.

Meta-analyses indicate that CBT is effective for the treatment of depression in older adults, and is superior to waitlist, care-as-usual, placebo and other control groups

(Cuijpers et al., 2006; Mackin & Arean, 2005). Recent meta-analyses indicated that psychological interventions, including CBT, show similar treatment response rates to pharmacotherapy for late-life generalized anxiety disorder (GAD), and that both psychological and pharmacological treatments were superior to control or treatment as usual (Goncalves & Byrne, 2012; Gould, Coulson & Howard, 2012). However, in two meta-analyses, CBT was not superior to other psychological inventions such as acceptance and commitment therapy and discussion groups for treatment of anxiety (Goncalves & Byrne, 2012; Gould, Coulson & Howard, 2012). Also, CBT appears to be less effective in older adults compared to younger adults (Gould, Coulson & Howard, 2012), and generally results in lower effect sizes compared to treatment for late-life depression (Gum & Areán, 2004). It is unclear why these differences occur and more research is clearly needed, particularly for the treatment of anxiety.

Research has consistently found that some cognitive abilities decline with age, even in the absence of any dementing illness (Mayr, Spieler, & Kliegl, 2001), while other areas are preserved. Domains controlled by the frontal lobe, such as executive functioning, psychomotor speed and working memory seem to be particularly affected by increasing age (Evans, 2007; Head, Kennedy, Rodrigue, & Raz, 2009; Lockwood, Alexopoulos, & van Gorp, 2002; Piguet et al., 2005; Steuer & Hammen, 1983). Executive functioning (EF) represents a heterogeneous set of cognitive processes, including problem solving, verbal reasoning, planning, organization, inhibitory control and self-monitoring. The presence of anxiety and depression in older adults can compound the age-related change in EF skills. Older adults with depression demonstrate varied EF skills ranging from almost intact functioning to severe impairment (Baudic, Tzortzis, Dalla Barba, & Traykov, 2004), potentially reflecting a distinct depression-executive dysfunction syndrome common in late-onset depression (Lockwood, Alexopoulos, Kakuma, & Van Gorp, 2000; Rapp et al.,

2005). It is unclear what the effect of anxiety on EF skills is due to methodological limitations in studies examining this issue. Heterogeneous samples of anxiety disorders, comorbid depression, and medication effects are common confounding factors in research into this relationship (Castaneda, Tuulio-Henriksson, Marttunen, Suvisaari, & Lonnqvist, 2008). However, most studies find reduced EF skills among older adults with anxiety (Beaudreau & O'Hara, 2008; Davis & Nolen-Hoeksema, 2000; Mantella et al., 2007). The impact of anxiety and depression on EF skill mirrors that seen in younger adults, but may be more devastating in older adults if it coincides with age-related reductions.

There is emerging evidence that reduced EF skills can decrease the effectiveness of some psychological interventions for older adults. Mohlman and Gorman (2005) examined the role of reduced EF on treatment outcome following a CBT intervention for older adults with GAD and found that those with intact EF skills at the beginning of treatment improved on measures of anxiety following treatment. In contrast, those who had reduced EF skills before treatment and continued to demonstrate reduced EF after treatment did not show an improvement in anxiety symptoms as a result of treatment. Of particular interest was that a third group exhibited low EF prior to treatment, but demonstrated improvements on both measures of EF and anxiety over the course of treatment. The authors suggested that CBT may improve both cognitive functioning and anxiety symptoms for some people with low EF. A subsequent pilot study tested a CBT-based intervention for anxiety with older adults, augmented with cognitive remediation training (Mohlman, 2008). This study found that those who received additional cognitive remediation training showed superior treatment response to those who received the CBT intervention alone. There appears to be preliminary evidence that reduced EF may affect the efficacy of CBT for some older adults, however it is unclear which specific skills are mediating treatment effectiveness, or which CBT skills are assisting to improve EF skills post treatment.

Cognitive flexibility is one component of EF that appears to facilitate new learning. Cognitive flexibility refers to the ability to shift cognitive set, thought or attention in order to perceive, process or respond to situations in a different way (Eslinger & Grattan, 1993; Rende, 2000). Cognitive flexibility encompasses the ability to produce diverse ideas, consider response alternatives and modify behaviour and cognition in response to changing environmental demands (Rende, 2000). Cognitive rigidity occurs when the individual fails to recognize a change in environmental or task demands, and utilizes the same strategy despite it being ineffective. This process reflects a failure to identify that the situation is novel and requires a new strategy to be implemented (Canas, Antoli, Fajardo, & Salmeron, 2005). This form of rigidity where previously effective strategies continue to be used despite a change in task demands, often referred to as perseverative errors, is more frequently observed in neuropsychological testing with older adults compared with younger adults (Daigneault, Braun, & Whitaker, 1992).

The skills involved in cognitive flexibility seem likely to be important for the successful implementation of cognitive restructuring skills within CBT. Given the skill-based nature of CBT, it is important that individuals are able to adapt and learn new ways of responding to their internal and external environment. Cognitive restructuring typically involves stopping a habitual response (negative belief), generating new alternatives and shifting the previous negative belief to a more accurate one. Therefore, cognitive flexibility may be an important ability for CBT to be effective, in particular for the ability to implement cognitive restructuring skills. Research with young depressed adults has found that those who demonstrated either good or poor cognitive restructuring skill acquisition showed similar improvements in depressive symptoms immediately following treatment completion; however those with good cognitive restructuring skills were more likely to maintain these gains six months later (Neimeyer & Feixas, 1990). Given the crucial role of

cognitive restructuring skill acquisition to long-term treatment gains, there is a need to better understand the relationship between cognitive flexibility and cognitive restructuring skill acquisition in older adults whose EF skills may be generally reduced. This is particularly relevant given premature suggestions that cognitive therapy skills should be excluded or minimized during treatment with older adults.

The present study therefore investigated the relationship between cognitive flexibility and cognitive restructuring skill acquisition in a non-clinical older adult sample. Examining the relationship between cognitive restructuring and cognitive flexibility in a non-clinical sample allows for an exploration of these processes without the confounds of clinically interfering anxiety and depression symptoms, which are likely to negatively impact on cognitive flexibility. It was hypothesized that cognitive inflexibility would be associated with worse cognitive restructuring skill acquisition after controlling for cognitive status and measures of anxiety and depression.

Method

Participants

Forty-one community-dwelling participants (female N=31, 75.6%) aged over sixty years (range=60-86 years, M=68.07, SD=6.34) were recruited from advertisements in local newspapers for “happy healthy older adult volunteers”. While happiness was not an inclusion criteria, the advertisement was worded as such to minimize the likelihood of clinically depressed and anxious volunteers. Participants were initially screened on the telephone and asked some basic questions to assess functionality and ensure they could attend a testing session at the university. Participants were asked some screening questions (e.g., “Have you been worrying about things lately?”, “Have you been feeling anxious/nervous/stressed lately?”, “Have you been feeling down/flat/blue lately?”, “Have

you found that you are not enjoying things the way you used to?") and excluded if they experienced anxiety, depression or any other mental health condition to a clinically significant degree. Two participants reported using benzodiazepine medication occasionally to aid sleep, and one participant reported the occasional use of sertraline. Sixty-nine percent reported using medication for physical health problems, primarily for management of hypertension and high cholesterol. Four participants who responded to the advertisement were excluded, two of whom reported significant anxiety symptoms, one reported notable low mood, and one participant exhibited symptoms of psychosis. One male participant (aged 80) was excluded after testing due to severe hearing impairment that prevented accurate understanding of task instructions. Demographic information for the remaining participants is provided in Table 1.

Materials

General Cognitive Status and Working Memory

Mini-Mental State Exam (MMSE; Folstein, Folstein & McHugh, 1975): This brief 30-point test is commonly used to screen for cognitive impairment and as a severity marker for dementia progression. This test assesses orientation, planning and organization, attention, short term memory, basic language skills and motor skills. Scores ≤ 24 are indicative of cognitive impairment.

Digit Span (Wechsler, 2008): The Digit Span subscale from the Weschler Adult Intelligence Scale – Fourth Edition (WAIS – IV; Wechsler, 2008) and recommended scoring was used to assess working memory capacity. This subtest requires a person to actively maintain information in conscious awareness, perform some mental operation or manipulation with it, and produce a result. Only the backwards version was used in the analyses.

Table 1

Sample Demographics

	Total (N=40)		
CHARACTERISTIC	*Range*	*M*	*SD*
Age	60-86	68.07	6.34
Education *(years)*	8-20	14.60	3.35
Number of Physical Health Conditions	0-8	2.97	2.17
		N	*% of sample*
Female		31	77.5
Region of birth			
Australia		26	65.0
UK/Europe		11	27.5
Asia		2	5.0
America		1	2.5
Marital status			
Never Married		2	5
De Facto		1	2.5
Married		20	50
Divorced		9	22.5
Widowed		8	20
Employment Status			
Employed Full-time		3	7.5
Unemployed		1	2.5
Full-time Home Duties		2	5.0
Semi-retired		15	37.5
Retired		19	47.5
Annual Gross Income ($AUS)			
<$25,999		14	35
$26,000 - $62,399		14	35
$62,400 - $103,999		7	17.5
$104,000 – $134,999		2	5.0
Refused to answer		3	7.5

Measures of Cognitive Flexibility

Wisconsin Card Sorting Test- Computer Version 4 (WCST-C4; Heaton & PAR Staff, 2003): The WCST-C4 is a widely used computerized neuropsychological test that requires test takers to sort decks of cards into four piles. The participant must determine the current matching rule (color, shape or number) based on feedback to their previous sorts. This task measures abstract reasoning and ability to shift cognitive strategies in response to

environmental changes (Heaton et al., 1993). This task requires strategic organization and planning, the ability to effectively utilize feedback to shift cognitive set and the ability to modulate impulsive responding (Spreen & Strauss, 1998). Normative data corrected for age and education was used from Heaton et al. (1993) to score participants' responses. Scoring focused on the percentage of perseverative and non-perseverative errors corrected for age and education given these are important measures of cognitive flexibility from this task.

Trail Making Test Part B (TMT-B; Reitan & Wolfson, 1985): TMT-B is a pencil and paper task that involves alphanumeric sequencing. It measures mental flexibility and set shifting in addition to visual processing and motor speed (Spreen & Strauss, 1998). During administration errors are pointed out by the examiner and the participant is redirected from the point the mistake occurred without stopping the timer. TMT is scored by completion time with greater completion time indicating poorer functioning. Normative data corrected for age and education was used from the Mayo's Older American's Normative Studies to score the task (MOANS; Ivnik et al., 1996). Part A was also administered but not scored as it does not relate specifically to cognitive flexibility.

Controlled Oral Word Associations Test (COWAT; Benton & Hamsher, 1976): The COWAT is a widely used test of verbal fluency, which requires the participant to generate as many words as they can beginning with a specified letter during a one-minute interval excluding proper nouns. The standard letters used for this phonemic fluency task were F, A and S (Strauss, Sherman, & Spreen, 2006). Repetitions were excluded from the total score. MOANS normative data corrected for age and education was used to score this task (Ivnik et al., 1996).

Stroop Color-Word Test (Golden, 1978): The Stroop Color-Word Test is commonly used to assess inhibitory control, cognitive flexibility and selective attention

(Strauss et al., 2006). This task consists of three parts: a Word trial, a Color trial and a Color-Word trial. The Word trial requires the participant to read aloud from a list of color words in an alternating sequence under time constraints with the words printed in black ink. The Color trial requires the participant to name the color of the ink that sequences of X's are printed in under time constraints. The Color-Word Trial requires participants to name the color of the ink that color-incongruent words are printed in, involving the need to inhibit the tendency to read the word in order to correctly name the color of the ink, with a lower score reflecting poorer functioning (Strauss et al., 2006). MOANS normative data corrected for age and education was used to score this task (Ivnik et al., 1996). Only the Color-Word trial measures cognitive flexibility and so only the scores from this trial were included in the analyses. The Stroop Color-Word test demonstrates good reliability and validity (Golden, 1978; Strauss et al., 2006).

Ruff Figural Fluency Test (RFFT; Ruff, 1988): The RFFT is a non-verbal measure of design fluency that requires participants to generate unique designs by connecting patterns of dots under time constraint. The error ratio reflects the participants' ability to minimize repetition while maximising unique design generation, and the error ratio score is corrected for age and education (Ruff, 1988).

Symptom Measures

Geriatric Anxiety Inventory (GAI; Pachana et al., 2007): The GAI is a 20-item self-report measure designed for use with older adult populations to indicate severity of anxiety symptoms in the elderly. A cut-off score of 8 (out of 20) indicates clinical levels of anxiety with sensitivity of 73% and a specificity of 80% (Pachana & Byrne, 2012). This measure shows sound psychometric properties for use with community, residential and

psychiatric samples (Pachana & Byrne, 2012; Pachana et al., 2007). The internal consistency for this sample was acceptable (Cronbach's alpha=.78).

Geriatric Depression Scale (GDS; Yesavage et al., 1982): The GDS is a 30-item self-report screening measure to assess the severity of depressive symptoms in older adults. A score of 11 or more (out of 30) is indicative of clinical levels of depression (Brink et al., 1982). This measure demonstrates good reliability and validity for use with older people (Yesavage et al., 1982). The internal consistency for this sample was acceptable (Cronbach's alpha=.74)

Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990): This 16-item self- report scale assesses the extent to which a person engages in worry. A cut-off of 50 predicts a diagnosis of Generalized Anxiety Disorder in samples of older medical patients referred for anxiety (Stanley et al., 2003). The measure has shown high internal consistency, good test-retest reliability, and discriminant validity with other measures of anxiety and depression and is appropriate for use with older persons (Meyer et al., 1990). The internal consistency for this sample was good (Cronbach's alpha=.87).

Cognitive Restructuring Task

In order to assess cognitive restructuring (CR) skill acquisition, a task was developed for this study which took 60 minutes to complete. The task was administered by a registered psychologist with postgraduate training in clinical psychology and CBT. Based on the suggestions from Zeiss and Steffen (1996), the administration of the CR task consisted of three multimodal training phases in order to promote optimal learning for older adults using a "say it, show it, do it" format. The initial teaching phase consisted of the experimenter demonstrating the link between thoughts and feelings using a standardized example. The exercise highlighted the central role of cognition in affective

responses, showing how different cognitions can result in different feelings in the same situation. For example, it was demonstrated that for the ambiguous situation where a strange noise is heard outside at night, different interpretations can elicit different emotional responses. Next, a completed example of a structured CR form was presented and explained to participants in a standardized format and participants were encouraged to ask questions. The example situation was running late to meet a friend, with the irrational thought of "she will be angry with me and will go home". The CR form used the format 'situation – thought – feeling' followed by a disconfirmatory evidence collecting phase where seven prompting questions were presented to prompt generation of evidence to dispute the thought (e.g. "What would a friend tell you in this situation", "What has happened in the past?" and "How could you cope if this was true?"). The final section of the form consisted of generating a helpful replacement thought and re-assessing the subjective distress rating on the affect associated with the original cognition. During the practice phase, participants selected a problem and completed the form from the perspective of a friend. Participants were assisted to identify the unhelpful thoughts and rate the strength of their affective response. They then worked through the form in the way they had been shown in the previous example, with assistance given by the experimenter as needed. In the final testing phase, participants selected a personal problem and were again assisted by the experimenter to identify the target unhelpful cognition. They then proceeded to complete the remainder of the CR form unassisted.

Only the final CR task that participants completed unaided was scored based on adapted coding criteria from Neimeyer and Feixas (1990). Scoring was completed by an independent clinically trained psychologist with accreditation as a CBT therapist with the British Association for Behavioural and Cognitive Psychotherapies. The scoring system was designed to evaluate participants' competence in completing each of six components

(generation of appropriate situation, unhelpful thought, emotion, evidence to dispute the thought, a replacement thought, and the outcome emotion), with higher scores reflecting better quality responses. Scoring criteria are outlined in Table 2. To check reliability of scoring, 20% of the CR tasks were scored by the first author (CJ) and resulted in acceptable inter-rater reliability (k=0.80).

Table 2

Cognitive Restructuring Task Scoring

Situation	
0	Missing of irrelevant responses that fail to specify the situation or context in which the distressing emotion is experienced e.g. "I feel upset".
1	Marginal descriptions of the problem situation, or descriptions that are confounded with one's automatic thoughts e.g. "My neighbour purposely ignored me when they were watering the garden".
2	Reasonably complete and "objective" descriptions of a specific situation triggering a negative emotion, e.g. "My husband is three hours late returning from the meeting without phoning me in advance".
Target Cognition	
0	Missing responses, or responses that are merely restatements of problem situation or emotional reactions, e.g. "He's late again. I feel so lonely".
1	Vague interpretations, or rhetorical questions that obscure the dysfunctional belief that has been activated, e.g. "Putting myself down", "Why does this keep happening to me?"
2	Clear identification of the mental imagery or stream of consciousness that sustains the specified emotion, e.g. "This just proves what a failure I am" "You can never really trust a man".
Emotion	
0	Missing responses, or responses that specify automatic thoughts rather than feelings, e.g. "I can't take it anymore".
1	Vague emotional descriptions (e.g. "bad" "lousy"), or specific emotions (e.g. "anxious" "sad") unaccompanied by ratings of intensity of feeling.
2	Accurate identification and ratings of specific feelings uncontaminated by automatic thoughts (e.g. "guilty, 75").
Evidence Against the Thought	
0	Evidence is irrelevant to the automatic thought, missing, or is evidence that supports the thought "e.g. last week I forgot to pay the electricity bill too".
1	Weak attempt to challenge the automatic thought, or only 1 or 2 pieces of evidence generated that would be unlikely to reduce negative affect.
2	Reasonable attempt to challenge that negative thought. Several pieces of evidence generated that question the validity of the thought, and would reasonably reduce negative affect.
3	Strong attempt to challenge the negative thought. At least 3 pieces of strong evidence which would directly challenge the validity of the thought and would result in a reduction in negative affect.

Replacement Thought/Rational Response	
0	Missing or inappropriate responses that fail to challenge the automatic thoughts identified, e.g. "I shouldn't feel this way".
1	Problem solving statements or problem solving responses with no direct challenging of the cognitions (e.g. in response to challenging a cognition about having no-one to talk to at a social function - "try to avoid future situations like this", or challenging a cognition about having a heart attack - "be brave, drink water and pray")
2	Weak attempts to dispute or disprove automatic thoughts, or responses that specify no clear adaptive perspective or behaviour (e.g. "Maybe it won't happen", "Hang in there", "You're just catastrophizing".)
3	Realistic attempts to seek evidence that disputes the validity of automatic thoughts, or developing an adaptive alternative interpretation of the situation (e.g. "Just because my child got a divorce doesn't mean I'm a failure as a parent". "His behaviour stems from his alcoholism, and I can't take the blame for that".)
Outcome	
0	Missing response or vague statement of a different feeling, other than those identified in Emotions column, e.g. "Better".
1	Specification of emotional outcome, but unaccompanied by rating of intensity (e.g. "still somewhat fearful".)
2	Clear specification of previous emotion, with rating of its present level of intensity (e.g. fearful, 25).

Note. This scoring system was adapted from Neimeyer & Feixas (1990).

Data Analysis

Correlational analyses were used to examine the relationship between emotional symptoms and measures of cognitive flexibility and between emotional symptoms and cognitive restructuring ability. Regression analyses were used to examine the relationship between neuropsychological measures of cognitive flexibility and cognitive restructuring ability. Age and education-adjusted percentile scores were used in analyses for all neuropsychological measures.

Procedure

This study was approved by the Macquarie University Human Research Ethics Committee, and all participants provided informed written consent. Participants telephoned the researcher in response to a newspaper advertisement, and were briefly screened over the phone for current clinically significant mental health problems. Participants first

completed the questionnaire tasks at home and brought them to the testing session conducted at Macquarie University during which they completed the neuropsychological tasks, followed by a short break, and then they completed the cognitive restructuring task. The neuropsychological tasks were completed first by all participants to minimize the impact of fatigue.

Results

Descriptive Statistics

None of the participants fell within the probable dementia range (MMSE ≤ 24). Two participants scored above the 50 point cut-off on the PSWQ (52 and 62) suggesting possible GAD. Otherwise, all scores on measures of anxiety and depression fell within the non-clinical range. Table 3 summarizes descriptive statistics for each measure of anxiety and depression, along with the neuropsychological measures. The percentage of participants who fell in the borderline to impaired range on neuropsychological measures (lower than the 9th percentile) is also reported in Table 3. All variables met the assumptions for normality, linearity and constant variance of errors except for the COWAT (skewness=-0.826, kurtosis=2.007), and the MMSE was negatively skewed (skewness=1.234, kurtosis=0.429), as would be expected among a cognitively intact sample.

Correlational Analyses

Given that depression and anxiety are found to impact EF (Beaudreau & O'Hara, 2008; Baudic et al., 2004), we first examined the bivariate correlations between the symptom measures of anxiety and depression and the neuropsychological cognitive flexibility measures. None of these correlations were significant (see Table 4). Given that

anxiety and depression might be associated with worse cognitive restructuring ability (e.g., due to difficulties with concentration), we also examined relationships between symptoms of anxiety and depression and cognitive restructuring skills. None of these correlations were significant (all *p*'s >.05).

Education and gender were not significantly correlated with performance on the neuropsychological measures (p > .05, see Table 4). Age was significantly correlated with TMT-B and the percentage of Perseverative Errors made on the WCST despite scores already being adjusted for age in the scaled scoring. Also working memory (Digit Span Backwards) was significantly correlated with the percentage of perseverative errors on the WCST and COWAT performance (see Table 4). As such, age and working memory were included in regression analyses to account for these relationships.

To assess the relationship between cognitive status and measures of cognitive flexibility, correlations between the MMSE and neuropsychological measures were conducted. MMSE performance was correlated with Stroop performance only (see Table 4). To account for the role of cognitive status, MMSE performance was included in the regression analysis.

Significant bivariate correlations were found between CR quality and MMSE, RFFT Error Ratio and WCST Perseverative Errors (see Table 4). Further analyses were conducted to examine this relationship.

Table 3

Descriptive Statistics for Symptom Measures and Neuropsychological Measures (N=40)

MEASURE	***Range***	***M (SD)***	***% meeting impairment criteria***
Geriatric Anxiety Inventory	0-7	0.50 (1.38)	0
Geriatric Depression Scale	0-9	2.13 (2.51)	0
Penn State Worry Questionnaire	18-62	33.00 (9.24)	5
Mini Mental State Examination	27-30	29.42 (0.84)	0

	PERCENTILE RANGE	***M (SD)***	***T-SCORE RANGE***	***M (SD)***	
Stroop Color-Word Test	2-99.60	69.06 (30.02)	30-77	57.43 (11.67)	7.5
Trail Making Test – Part B	5-99	63.45 (28.41)	33-73	54.70 (9.83)	5
Controlled Oral Word Association Test	.40-99.60	77.62 (25.12)	23-77	60.15 (10.92)	5
Ruff Figural Fluency Test Error Ratio	3.40-96.60	47.62 (28.20)	32.40-68.60	50.00 (9.40)	5
Wisconsin Card Sorting Test Percent Perseverative Errors	2-99	65.50 (27.33)	30-80	55.20 (11.86)	7.5
Wisconsin Card Sorting Test Percent Non-Perseverative	1-99	48.48 (33.33)	25-80	50.85 (14.66)	12.5
Errors	5-91	40.13 (25.67)	33-63	47.13 (7.80)	2.5
Digit Span Backwards					

Note. Percentile and T-score data reported for the Stroop Color-Word Test, Trail Making Test – Part B and Controlled Oral Word Association Test were converted from MOANS standard scores.

Table 4

Bivariate correlations between all measures

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. Age	-												
2. Gender	-.156	-											
3. Education	-171	-.192	-										
4. GAI	-.090	-.066	-.133	-									
5. GDS	.003	.003	-.073	.648**	-								
6. PSWQ	-.236	-.026	-.030	.580**	.548**	-							
7. MMSE	.082	-.084	-.093	.165	.131	-.109	-						
8. Stroop Color-Word Test	.297	-.032	-.214	.172	.209	-.063	.330*	-					
9. TMT-B	.352*	-.149	-.280	.011	.028	-.042	.295	.536**	-				
10. COWAT	.262	.029	-.144	.002	-.117	-.103	.156	.595**	.538**	-			
11. RFFT Error Ratio	.257	-.047	-.130	-.080	-.109	.030	-.095	-.200	-.118	-.233	-		
12. WCST Perseverative Errors	.349*	-.132	-.085	.108	.072	-.234	.208	.372*	.331*	.424*	-.144	-	
13. Digit Span Backwards	.165	.087	.129	-.175	-.112	-.153	.123	.296	.299	.435*	-.245	.383*	-
14. CR Total	-.132	.033	.123	.139	.248	-.079	.485*	.148	.176	.029	-.443*	.346*	.298

Note. *p < .05, **p < .001, CR=Cognitive Restructuring, GAI = Geriatric Anxiety Inventory, GDS = Geriatric Depression Scale, PSWQ = Penn State Worry Questionnaire, MMSE = Mini Mental State Examination, Stroop = Stroop Colour-Word Test, TMT-B = Trail Making Test Part B, COWAT = Controlled Oral Word Associations Test, RFFT = Ruff Figural Fluency Test, WCST = Wisconsin Card Sorting Test

Cognitive Restructuring Ability

Each section of the CR form was coded for quality. Given that participants were assisted by the experimenter to generate appropriate target cognitions to complete the CR task, it was not surprising that the CR Evidence and CR Replacement Thought sections were the main sections demonstrating variability in scores. A total score that summed all six sections of the CR process had limited variation in scores (Range 9-14, $M = 12.9$, $SD = 1.482$). Therefore we created a score that summed the CR Evidence and CR Replacement Thought sections only (range 1-6, $M = 4.975$, $SD = 1.405$). The majority (77.5%) of older adults were able to learn this skill well with only one hour of instruction, scoring ≥ 5 out of the possible quality score of 6. The other 22.5% demonstrated difficulty generating evidence to dispute the unhelpful thought, and integrating that evidence into a more realistic replacement thought (scoring ≤ 4).

Cognitive Flexibility and Cognitive Restructuring Ability

A linear regression analysis was conducted to examine the relationship between CR skill acquisition and cognitive flexibility. All cognitive flexibility measures were entered simultaneously in the regression, along with age, MMSE score and working memory (Digit Span Backwards). Age and working memory were included in the regression analysis due to the significant correlation with several neuropsychological measures. MMSE performance was included to assess whether cognitive flexibility impacted cognitive restructuring above and beyond the effect of cognitive status. Results of the multiple regression analysis are included in Table 5. The quality of cognitive restructuring skill was significantly predicted by the MMSE score, RFFT Error ratio score, and percentage of perseverative errors made on the WCST (see Table 5). The overall model explained 53.8% of the variance in cognitive restructuring quality.

Table 5

Summary of multiple regression results for cognitive restructuring quality

Predictor Variable	B	SE(B)	β	*t*	*p*
Constant	-12.662	6.651		-1.904	.066
Age	-.035	.033	-.159	-1.081	.288
Digit Span Backward	.115	.085	.191	1.346	.188
Mini Mental State Exam	.686	.221	.412	3.109	.004*
Stroop Color-Word Test	-.021	.068	-.051	-.306	.762
Trail Making Test – Part B	.052	.077	.107	.674	.505
Controlled Oral Word Association Test	-.135	.074	-.315	-1.822	.078
Ruff Figural Fluency Test Error Ratio Percentile Score	-.017	.007	-.342	-2.475	.019*
Wisconsin Card Sorting Test Percent Perseverative Errors Percentile Score	.016	.008	.310	2.110	.043*

Note. Higher scores indicate better cognitive flexibility on all measures except the Ruff Figural Fluency Test Error Ratio Percentile Score, where a lower percentile score indicates better cognitive flexibility. *$p < .05$.

To look at the difference in test performance on the predictive measures for those who demonstrated poor quality and good quality CR, 31 participants were classified into the good quality CR group and scored 5-6, while 9 participants were categorized as falling in the poor quality CR group, scoring ≤ 4 for the quality of their CR as examination of the frequency plot suggested a bimodal distribution with a natural split in the sample at this point. A one-way ANOVA revealed that those in the poor CR category demonstrated significantly lower MMSE scores, F (1, 38) = 5.190, p = .028, with a mean of 28.890 (*SD* = .928) compared to those with good quality CR (*M* = 29.580, *SD* =.765), and significantly lower RFFT Error Ratio percentile scores, F(1, 38) = 5.448, p =.025, with a mean of 65.922 (*SD* = 23.180) compared to the mean of the good quality CR group (42.310, *SD* = 27.586). The difference between the groups on WCST perseverative errors performance showed a non-significant trend towards being different between the groups, F (1, 38) = 3.595, p = .066, with the poor CR quality group having lower mean scores (*M* = 50.780, *SD* = 33.767) than those in the good quality CR group (*M* = 69.770, *SD* = 24.142).

Discussion

This novel study examined the impact of cognitive flexibility on cognitive restructuring skill acquisition in older adults. First, contrary to suggestions that the elderly are unable to effectively use cognitive restructuring skills (Church, 1983; Wilkinson, 1997), results of this study broadly support the use of cognitive restructuring with this population. Seventy-eight percent of the sample were able to implement the cognitive restructuring technique in this single session experimental task with reasonable or strong quality responses after brief training. This finding supports the notion that for those with intact cognitive flexibility and normal levels of anxiety and depression, cognitive restructuring is a skill that can be satisfactorily performed by older adults. For the minority of people who demonstrated poorer quality cognitive restructuring skills, this difficulty was related to impairments in cognitive status and cognitive flexibility performance.

As cognitive status declined and the number of perseverative errors increased, the quality of cognitive restructuring became poorer. There appears to be a necessity for both intact basic core cognitive competencies and cognitive flexibility that allows one to learn from errors and adapt their thinking in order to acquire good cognitive restructuring skills with brief training. Generally, these basic skills deteriorate in people with mild cognitive impairment and dementia, possibly indicating limitations for implementing cognitive restructuring when these basic processes are affected. The two cognitive flexibility measures that significantly predicted cognitive restructuring quality both involved minimizing perseveration. The percentage of perseverative errors made on the WCST represents the extent to which the individual continued responding to a stimulus characteristic despite explicit and repeated feedback that this was incorrect. The RFFT, although being a measure of design fluency, also provides an error ratio that calculates the ratio of perseveration to unique design generation. There is no explicit feedback on

perseverative behaviour, and the individual is required to monitor this internally. This is similar to skills required in cognitive restructuring, where the person must monitor their tendency to perseverate back to their unhelpful cognition and modify this as needed. Perseveration was consistently related to poorer cognitive restructuring ability, while the ability to generate new ideas was not.

Unexpectedly, inhibitory control as measured by the Stroop task and set-shifting as measured by the TMT-B were unrelated to CR skill acquisition. It is not clear why this is the case. Possibly, inhibitory control is not associated with CR skill acquisition. However, given our sample was non-clinical; it is possible that CR may be an easier process in the context of non-clinical worry and hence may be less affected by inhibitory control. Previously, Price and Mohlman (2007) found that inhibitory control as measured by the Stroop task was associated with worry severity in a clinical sample, but not in the non-clinical sample. Future research should assess whether improved inhibitory control is related to CR skill acquisition in an older sample with increased worry severity, including those with GAD. Also unexpectedly, verbal fluency as measured by the COWAT was not associated with CR skill acquisition, even though design fluency (as measured by the RFFT) was. Fluency assessed by the COWAT represents the total number of words produced; however, this total score does not necessarily reflect a person's ability to produce diverse ideas (Rende, 2000), as individuals may use non-flexible strategies to complete this task. It is possible that the relationship between these measures may have been non-significant due to limited statistical power given the relatively small sample size, although a post-hoc power analysis suggested sufficient observed power (.864).

A limitation of the experimental procedure used here is that participants learned CR in a single one hour session. When introduced in therapy, CR is usually introduced gradually over several sessions, with lots of repetition of the skill and guidance from the

therapist to promote effective learning. It is possible that those who showed poor CR skill acquisition may show improved ability with more repetition of the skill. This is a likely possibility given the results by Mohlman and Gorman (2005) who found that some of the participants with low EF skills pre-CBT treatment demonstrated significant improvements in both anxiety symptoms and cognition post-CBT. A second potential limitation of this study is that the wording of the recruitment advertisement requesting "happy" older adults may have biased the sample. Happy older adults have less physical illnesses and tend to be more physically active than unhappy older adults (Koopmans, Geleijnse, Zitman, & Giltay, 2010). While happiness was not an inclusion criteria for the study, and many of the participants experienced normal levels of emotional distress related to health, family relationships and life events, it is possible that the sample may be biased towards higher-functioning older adults. A third limitation of this study is that the CR task was skewed, with majority of participants (77.5%) scoring high, likely due to the structure of the task. A more complex task allowing more variation in performance may be informative in future studies. Finally, due to the high correlation between the measures of cognitive flexibility, high multicollinearity between the independent variables is likely to have impacted on the results of the multiple regression analyses, and future research would ideally select fewer cognitive flexibility measures.

It is noteworthy that in this study there was no relationship of anxiety and depression with cognitive flexibility, which might not be surprising given that this was a non-clinical sample with low levels of anxiety and depression. It is possible that CR is an easier skill to learn when emotional distress is low and therefore these findings may not generalize to clinical populations. However, CBT has been demonstrated to be an effective technique for the prevention of anxiety and depressive disorders in non-clinical older populations with lasting benefit (van't Veer-Tazelaar et al., 2009; van't Veer-Tazelaar et

al., 2011) and so the CR process is likely to be used similarly in both clinical and non-clinical populations. Future research should compare these results to a population of older adults with clinical anxiety and mood disorders to determine the impact of cognitive flexibility on CR ability in emotionally distressed individuals. This is particularly important given that individuals with clinical anxiety and depression are likely to be more perseverative in their thinking style, and demonstrate poorer cognitive flexibility and hence poor quality cognitive restructuring skill acquisition. This study found that less than one quarter of older adults performed poorly on the cognitive restructuring task. However, those with anxiety and depression are likely to have impaired cognitive flexibility, and may be disproportionately likely to fall into this category. Further research should also examine whether individuals presenting with poor cognitive flexibility can improve their cognitive restructuring skills with increased repetition of the skill to enhance learning or can enhance their skill acquisition using cognitive training specifically aimed at building flexibility.

The results of this study support the idea that most older adults are able to learn simple CR effectively after brief training. Intact cognitive status appears to be important for the implementation of cognitive restructuring with brief training. Cognitive flexibility appears to impact CR skill acquisition above and beyond the influence of cognitive status. There appears to be a minority of older adults who were more rigid in their thinking, and these individuals demonstrated poorer CR skill acquisition. In particular these individuals had a perseverative thinking style and demonstrated difficulty recognizing errors in thinking and making appropriate corrections. The implications of these findings suggest that CR may be a more difficult therapeutic skill for older adults who are more rigid in their thinking, or with decline in cognitive status. It may be the case that older adults with poor cognitive flexibility are likely to find CR more difficult to learn and might need extensive practice and repetition to learn this skill. Alternatively, it may be the case that

other CBT strategies, such as behavioral activation, behavioral experiments and relaxation will be more useful for these individuals. Finally, although not specifically tested in this study, it is important to consider that even poor quality cognitive restructuring may result in a change in interpretation of situations and consequent emotional reactions to an event. Given that a large proportion of older adults were able to benefit from brief training, we posit that those with cognitive impairment or rigid thinking styles should not be excluded from learning cognitive restructuring.

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PAPER 2. Learning cognitive restructuring in later-life: The relationship between anxiety and depression, cognitive flexibility and cognitive restructuring skill acquisition in older adults

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Abstract

Objective: Research has consistently found that executive functioning skills decrease with age, and that higher levels of anxiety and depression decrease executive functioning performance. Models of depression and anxiety both suggest that there is an attentional bias inherent in the disorder, and this difficulty in flexibly shifting away from distressing stimuli has implications for the maintenance of the disorders. One of the key cognitive behavioural therapy techniques for anxiety and depression is cognitive restructuring, which teaches people to identify and dispute maladaptive thoughts in order to change the way they perceive and respond to the world. Cognitive flexibility has been implicated in the ability to learn cognitive restructuring in a non-clinical sample. The present study investigated cognitive restructuring skill acquisition in older adults with and without anxiety and depression, and the influence of cognitive flexibility on this relationship.

Method: A clinical sample of 47 older adults diagnosed with anxiety and depression were compared to a non-clinical sample (n = 53) on measures of cognitive flexibility, and cognitive restructuring skill acquisition was assessed.

Results: The clinical sample showed poorer cognitive flexibility on some but not all measures, poorer quality cognitive restructuring and a smaller reduction in subjective units of distress (SUDs). Cognitive flexibility partially mediated the relationship between clinical status and cognitive restructuring quality, and between clinical status and SUDs.

Conclusions: The results suggest that older adults with anxiety and depression are worse at learning and benefiting from cognitive restructuring with brief intervention and that this is partially due to poorer cognitive flexibility.

Introduction

Older adults represent one of the fastest growing segments of the world's population. With the change in demographics there is likely to be an increase in the number of older adults presenting for psychological therapy. There are a range of issues to be aware of when working therapeutically with older adults, one of which is age-related cognitive changes. Older adults demonstrate a natural age-related decline in many cognitive functions, particularly executive functioning skills (Eslinger & Grattan, 1993; Head, Kennedy, Rodrigue, & Raz, 2009; Lockwood, Alexopoulos, & van Gorp, 2002; Piguet et al., 2005). Decline in executive functioning skills due to normal ageing is thought to be due to reduced use (Christensen et al., 1996; Paggi & Hayslip, 1999), and/or as a result of normal neurological changes in the frontal lobe that occur with ageing (West, 2000). Regardless of the cause, these age-related cognitive changes may have the potential to impact older adults' ability to effectively engage in particular therapeutic techniques that rely heavily on executive functioning skills.

Cognitive behavioural therapy (CBT) is an evidence-based psychological treatment that teaches individuals a range of cognitive and behavioural skills to overcome mental health issues. While there is evidence that CBT is effective with older people experiencing anxiety and depression (see recent reviews: Cuijpers, van Straten, & Smit, 2006; Goncalves & Byrne, 2012; Gould, Coulson, & Howard, 2012), the effect sizes are smaller than with younger adults (Gould et al., 2012), and the reasons for this are unclear. Cognitive restructuring is a key component of many CBT programs, and involves individuals learning to identify and dispute unhelpful or irrational thoughts in order to generate a more adaptive or helpful thought that will influence the way the individual perceives or responds to the world. Some researchers have suggested that cognitive therapy techniques such as cognitive restructuring are especially difficult for older adults and may

need to be adapted or eliminated to accommodate age-related cognitive changes (Church, 1983; Koder, Brodaty, & Anstey, 1996; Wilkinson, 1997). The distinction between treatment modifications that include adjustments to enhance outcomes (such as slowed pace of treatment due to sensory deficits) and adaptations where treatment elements may be altered significantly or abandoned (for example in response to cognitive impairment) can be important when working with older adults (Zeiss & Steffen, 1996). The reviews by Zeiss and Steffen (1996) and Laidlaw (2001) conclude that it should not be assumed that adaptations are necessary in every case. Given that older adults demonstrate a variety of abilities, and that cognitive therapy allows for flexible implementation, an understanding of the idiosyncratic nature of a presenting problem would include an understanding of any age-related modifications that are necessary, and evidence based treatments should be offered to this population. Despite this suggestion, there are few empirical studies that examine the clinical features that indicate difficulty utilising cognitive therapy techniques, and suggest a need for modification or adaptation of this approach.

Cognitive flexibility represents a particularly important aspect of executive functioning that declines with older age and may be associated with the ability to learn cognitive restructuring skills. Cognitive flexibility refers to the ability to disengage from, or inhibit the current cognitive set (Rende, 2000). The disengagement and inhibition processes are a part of the executive function system. Cognitive flexibility reflects the processes involved in disengaging from a cognitive set, and is assessed by a person's ability to produce a large number of diverse ideas and to switch cognitive sets, often using verbal fluency or set-switching tasks. This requires the person to navigate through classes of acquired knowledge without becoming fixated. Cognitive flexibility also refers to the inhibition process, and refers to the ability to inhibit a habitual response in preference for an alternative response in order to negotiate a situation (Rende, 2000).

Theoretical models of anxiety and depressive disorders often implicate executive function processes in the development and maintenance of these disorders (e.g., Beck, Emery, & Greenberg, 1985; Beck, Rush, Shaw, & Emery, 1979; Butler & Mathews, 1983), and empirical studies suggest impairments in executive function domains. Studies of older adults with anxiety disorders show impaired processing speed, set-shifting, inhibitory skills, short-term memory and delayed memory compared with non-anxious controls (Beaudreau & O'Hara, 2009; Mantella et al., 2007). Research with younger adults supports a link between low mood and executive dysfunction, in particular with depressed younger adults showing increased perseveration and problems effectively utilising feedback (Channon, 1996). The research into the cognitive effects of late-life depression is less consistent, with effects ranging from impaired executive functioning skills to almost intact functioning (Baudic, Tzortzis, Dalla Barba, & Traykov, 2004). There is a suggestion that a distinct depression-executive dysfunction syndrome may be more common amongst those with late-onset depression than those with a lifelong history of depressive episodes (Lockwood, Alexopoulos, Kakuma, & Van Gorp, 2000; Rapp et al., 2005). The combination of executive dysfunction and depression in older people is associated with increased levels of disability, poorer treatment response and an increased risk of relapse (Alexopoulos, Kiosses, Klimstra, Kalayam, & Bruce, 2002), making the identification of executive dysfunction an important clinical marker.

There is some evidence that cognitive flexibility may be related to treatment outcome. Mohlman and Gorman (2005) assessed the impact of reduced executive function on CBT treatment response in late-life GAD. On measures of anxiety, they found that those with intact executive functioning skill prior to treatment improved following the CBT intervention while those with reduced executive function skill prior to treatment did not improve. A third group emerged who demonstrated reduced executive function prior to

treatment, but improved on measures of both executive functioning and anxiety over the course of treatment. The authors concluded that while some older adults with impaired executive function do not benefit from treatment, those with intact executive functioning do benefit and further that CBT may be involved in improving executive function skills in some participants (Mohlman & Gorman, 2005). In a separate study, Mohlman (2008) compared a CBT intervention for late-life anxiety, to a CBT intervention supplemented with cognitive remediation training and found that participants who received CBT plus cognitive remediation had greater treatment response than those who received CBT alone. Due to the broad nature of these studies it is uncertain which aspects of the intervention were ineffective among those with poorer executive functioning, nor which aspects of treatment were enhanced by the addition of cognitive remediation.

A recent study assessed the differential impact of verbal and non-verbal executive functioning skills on a range of clinical outcomes, including cognitive restructuring ability in an elderly sample with GAD (Mohlman, 2013). This study found that depressive symptoms and verbal (but not non-verbal) executive functioning skills were related to the number of pieces of disconfirmatory evidence collected during cognitive restructuring when practiced for the first time in therapy. Mohlman also found that both verbal and nonverbal skills were related to reduction in subjective units of distress (SUDs) ratings, supporting the idea that executive functioning skills appear to be important for the successful use of cognitive restructuring. In a similar study, Johnco, Wuthrich and Rapee (2012) examined the impact of one component of executive functioning, cognitive flexibility, on non-clinical older adults' ability to learn cognitive restructuring skills. This study found that most older adults were able to effectively acquire some cognitive restructuring skills within a brief training session as indicated by ratings from an independent coder but poorer cognitive flexibility was associated with poorer cognitive

restructuring skill acquisition (Johnco et al., 2013). In particular, this study found that higher error ratio scores (indicative of poorer cognitive flexibility) on the Ruff Figural Fluency Test (RFFT; Ruff, 1988), increased perseverative errors (indicative of poor cognitive flexibility) on the Wisconsin Card Sorting Test (WCST; Heaton & PAR Staff, 2003) and lower general cognitive functioning scores were all associated with poorer quality cognitive restructuring skill acquisition. This study indicated that impaired cognitive flexibility (particularly increased perseveration) and executive function skills may make it difficult for some older adults to be able to complete good quality cognitive restructuring, however it is unclear how these results generalize to a clinical sample in which executive functioning deficits would be expected to be greater, or impact on CBT outcomes.

While there is emerging evidence that impaired executive functioning skills can impede the efficacy of CBT, and specifically cognitive restructuring skill acquisition, more research is needed to better understand the impact of age-related cognitive changes on the ability to learn and implement cognitive restructuring. The present study extends the previous investigation in non-clinical older adults to a clinical sample with comorbid anxiety and depression. We investigated whether anxiety and depression and cognitive flexibility impacted significantly on cognitive restructuring skill acquisition. In particular we were interested in cognitive restructuring quality and ability to reduce subjective distress. Following from previous research, we hypothesised that higher levels of anxiety and depression would be associated with poorer cognitive restructuring quality and smaller reductions in SUDs, and that cognitive flexibility would explain (mediate) this relationship. We also hypothesised that cognitive flexibility would be a moderator of cognitive restructuring skills, where the interaction of psychopathology and cognitive

inflexibility would have a synergistic effect, negatively impacting cognitive restructuring quality and reduction in SUDs.

Method

Participants

A sample of older clinical participants and control participants (aged over 60 years) were recruited for this study. Clinical participants (N = 48, female = 54.2%, age range 61-85 years, *M* = 67.19, *SD* = 5.11) were recruited from the CBT arm of a larger randomized-controlled study for the treatment of comorbid anxiety and depression in older people at a university-based treatment clinic. Clinical participants were assessed prior to treatment using the Anxiety Disorders Interview Schedule for DSM-IV (ADIS, Di Nardo et al., 1994) and met DSM-IV criteria for an anxiety disorder and a mood disorder, with either diagnosis being the primary disorder. Clinical participants reporting self-harm, bipolar disorder, psychosis or active suicidality were excluded. Of the clinical sample, 60.4% had a primary anxiety disorder diagnosis (the most common was GAD, 35.4%), and 39.6% had a primary mood disorder (the most common was Major Depressive Disorder, 25%). Participants had a mean clinician severity rating of 5.92 out of 8 (*SD* = 1.11) for the primary diagnosis and 4.87 (*SD* = 1.104) for the secondary diagnosis. Clinician severity ratings were derived from structured interview and based on symptom severity and life interference caused by the disorder. Participants had a mean number of 3.38 DSM-IV diagnoses (*SD* = 1.27).

A non-clinical control sample (N = 53, female = 73.6%, age range 60 – 86 years, *M* = 67.49, *SD* = 6.08) was recruited from advertisements in local newspapers. Participants were screened over the phone to exclude those experiencing clinically significant mental health problems using semi-structured questions assessing low mood, anxiety and

psychotic symptoms, (e.g., “Have you been worrying about things lately?”, “Have you been feeling anxious/nervous/stressed lately?”, “Have you been feeling down/flat/blue lately?”, “Have you found that you are not enjoying things the way you used to?”). A subset (N = 40) of this control sample was included in a previous study (Johnco et al., 2013). Participants completed a demographics questionnaire detailing their age, gender, education, marital and work status, income, country of origin, as well as identifying if they experienced a range of 18 common health problems using a yes/no/not sure format, and reported any additional health conditions. The total number of health problems was calculated by totalling the number of health problems endorsed. Demographic information for the samples is included in Table 1. The number of health problems was calculated by totalling the number of medical conditions endorsed

Table 1

Sample demographics

	Clinical (N=47)		**Non-Clinical (N=53)**		**Group Comparison Statistics**
CHARACTERISTIC	*M*	*SD*	*M*	*SD*	*t*
Age	66.81	4.43	67.49	6.08	.65
Education *(years)*	13.96	3.19	14.55	3.17	.93
Number of Physical Health Conditions	4.7	3.01	3.70	4.37	-1.32
Geriatric Depression Scale	17.15	4.96	2.37	2.93	-17.81**
Geriatric Anxiety Inventory	10.75	4.55	0.60	1.38	-14.70**
	N	***% of sample***	***N***	***% of sample***	**Chi-sq**
Female	25	53.2	39	73.6	4.50*
Region of birth					7.0
Australia	37	78.7	37	69.8	
UK/Europe	7	15.0	12	22.6	
Asia	1	2.1	2	3.8	
America	0	0	2	3.8	
Africa/South Africa	1	2.1	0	0	
New Zealand	1	2.1	0	0	
Marital status					3.17
Never Married	0	0	2	3.8	
De Facto	1	2.1	2	3.8	
Married	28	59.6	28	52.8	
Divorced	13	27.7	12	22.6	
Widowed	5	10.6	9	17.0	
Employment Status					6.02
Employed Full-time	4	8.5	3	5.7	
Unemployed	0	0	2	3.8	
Full-time Home Duties	1	2.1	2	3.8	
Semi-retired	14	29.8	20	37.7	
Retired	28	59.6	26	49.1	
Annual Gross Income ($AUS)					8.46
<$25,999	16	34.0	18	34.0	
$26,000 - $62,399	20	42.5	20	37.7	
$62,400 - $103,999	7	14.9	10	18.8	
$104,000 – $134,999	2	4.2	2	3.8	
Refused to answer	2	4.2	3	5.7	
Psychotropic medication use					15.51**
Benzodiazepines Only	5	10.42	1	1.89	
SSRI Only	4	8.33	1	1.89	
SNRI Only	2	4.17	0	0	
MAOI Only	1	2.08	0	0	
Atypical Antipsychotics Only	1	2.08	1	1.89	
Benzodiazepines and SNRI	1	2.08	0	0	
Benzodiazepines and SSRI	3	6.25	0	0	
SSRI and atypical antipsychotic	1	2.08	0	0	

Note. $*p < .05$, $**p < .001$

Materials

Diagnostic Clinical Interview

Anxiety Disorders Interview Schedule (ADIS-IV; Di Nardo, Brown, & Barlow, 1994): The ADIS is a semi-structured interview used for diagnosing anxiety and related disorders according to DSM-IV criteria. Clinician-rated severity of disorders is coded from 0-8, with higher ratings reflecting greater severity and ratings of ≥ 4 indicative of clinical severity. The ADIS was administered by graduate psychology students with specialist training to use the ADIS who attended weekly supervision with the study's authors. Only the clinical participants completed the ADIS and it was conducted prior to commencing treatment.

Symptom Measures

Geriatric Anxiety Inventory (GAI; Pachana et al., 2007): The GAI is a brief 20-item self-report measure of anxiety symptoms severity for use with older people. The measure is scored out of a possible 20, with scores above 8 indicating clinical levels of anxiety with sensitivity of 73% and a specificity of 80% (Pachana & Byrne, 2012). This measure shows sound psychometric properties for use with community, residential aged care and psychogeriatric samples (Pachana & Byrne, 2012; Pachana et al., 2007). The internal consistency in this study was good for the total sample (Cronbach's alpha = .944), clinical sample (Cronbach's alpha = .837) and non-clinical sample (Cronbach's alpha = .730).

Geriatric Depression Scale (GDS; Yesavage et al., 1982): The GDS is a 30-item self-report measure designed to assess the severity of depressive symptoms in older people. The scale uses a forced choice format, with scores of 11 or more (out of 30) indicating of clinical levels of depression (Brink et al., 1982). This measure has demonstrated good

reliability and validity for use with older people (Yesavage et al., 1982). The internal consistency for this study was good for the total sample (Cronbach's alpha = .946), clinical and non-clinical samples (Cronbach's alpha = .751 and .791 respectively).

Cognitive Status

Addenbrooke's Cognitive Examination – Revised (ACE-R; Mioshi, Dawson, Mitchell, Arnold, & Hodges, 2006): This brief test is sensitive to the early stages of dementia and capable of differentiating between subtypes of dementia. It incorporates five sub-domain scores (orientation/attention, memory, verbal fluency, language and visuo-spatial) and incorporates the Mini-Mental State Exam, a widely used gross measure of cognitive functioning. The ACE-R shows good reliability and validity, and is a valid dementia screening test, sensitive to early cognitive dysfunction (Mioshi et al., 2006). The total score is out of 100 with scores under 82 indicative of dementia (Mioshi et al., 2006).

Neuropsychological Measures of Cognitive Flexibility

Wisconsin Card Sorting Test- Computer Version 4 (WCST-C4; Heaton & PAR Staff, 2003): The WCST-C4 is a computerized neuropsychological test that assesses abstract reasoning and ability to shift cognitive strategies in response to environmental changes (Heaton, Chelune, Talley, Kay, & Curtiss, 1993). The test requires participants to sort cards into four piles without explicit sorting instructions. The participant must determine the current matching rule (color, shape or number) based on feedback to their previous sorts. This task requires strategic organization and planning, the ability to effectively utilize feedback to shift cognitive set and the ability to modulate impulsive responding (Spreen & Strauss, 1998). Recommended age and education adjusted normative data from Heaton et al. (1993) was used was used to score participants'

responses. Scoring focused on the perseverative errors given this is an important index of cognitive flexibility. All variables were corrected for age and education.

Trail Making Test Part B (TMT-B; Reitan & Wolfson, 1985): TMT-B is a pencil and paper task that requires alternating between numbers and letters in consecutive order. It measures mental flexibility, set shifting, visual processing and psychomotor speed (Spreen & Strauss, 1998). Mistakes increase the time taken to complete the task as the participant is required to correct the mistake before proceeding with the task. Greater completion time indicates poorer set-shifting ability. Normative data corrected for age and education was used from the Mayo's Older American's Normative Studies to score the task (MOANS; Ivnik, Malec, Smith, Tangalos, & Petersen, 1996).

Controlled Oral Word Associations Test (COWAT; Benton & Hamsher, 1976): The COWAT is a widely used test of verbal fluency that requires the participant to generate a list of words beginning with a specified letter during a one-minute interval. The standard letters (F, A and S) were used (Strauss, Sherman, & Spreen, 2006). Proper nouns and repetitions were excluded from the total score. MOANS normative data corrected for age and education was used to score this task (Ivnik et al., 1996).

Stroop Color-Word Test (Golden, 1978): The Stroop Color-Word Test is a test used to assess inhibitory control, cognitive flexibility and selective attention (Strauss et al., 2006). The Color-Word Trial requires participants to name the ink color of color-incongruent words. This task requires the ability to inhibit the tendency to read the word in order to correctly name the color of the ink. Lower scores reflect poorer inhibitory control (Strauss et al., 2006). MOANS normative data corrected for age and education was used to score this task (Ivnik et al., 1996). The Stroop Color-Word test demonstrates good reliability and validity (Golden, 1978; Strauss et al., 2006).

Ruff Figural Fluency Test (RFFT; Ruff, 1988): The RFFT is a measure of design fluency that requires participants to generate unique designs by connecting patterns of dots under a time constraint. The unique designs represent a measure of spontaneous cognitive flexibility, while the error ratio reflects the ability to maximising unique design generation while minimizing repetition. Recommended scoring corrected for age and education was used (Ruff, 1988).

Cognitive Restructuring Task

To assess cognitive restructuring (CR) skill acquisition, the cognitive restructuring task developed for an earlier study (Johnco et al., 2013) was used. The task took 60-90 minutes to complete, and was administered by a clinical psychologist with postgraduate training in CBT. The task consisted of 4 phases; an orientation phase, a learning phase, a practice phase and finally, a testing phase. In the orientation phase, the link between thoughts and feelings was demonstrated using a standardized example in which it was demonstrated that for the ambiguous situation where a strange noise is heard outside at night, different interpretations can elicit different emotional responses. In the learning phase, a completed example of a structured cognitive restructuring form was explained to participants in a standardized format and participants were encouraged to ask questions. The cognitive restructuring form was presented in the format 'situation – thought – feeling – SUDs rating' followed by demonstration of how disconfirmatory evidence could be elicited by using seven prompting questions to dispute the negative thought (e.g. "What would a friend tell you in this situation", "What has happened in the past?", "What is the evidence that contradicts these thoughts?" and "Is it really that bad?"). The last section of the form consisted of demonstrating how the evidence could be integrated into a more helpful

replacement thought and that when his helpful thought was used a lower SUDs rating would occur.

During the practice phase, participants completed the cognitive restructuring form from the perspective of a friend with the help of the experimenter. Participants were assisted to identify a stressful situation in a friend's life, likely unhelpful thoughts that their friend might have been thinking in this situation, and rate their friend's likely SUDs if they were thinking those thoughts. Then participants completed the rest of the cognitive restructuring form with assistance given by the experimenter as needed. In the final testing phase, participants selected a personal problem, and were assisted to identify the target unhelpful cognition. They then completed the remainder of the cognitive restructuring form unassisted. Only the final cognitive restructuring task was scored and each section of the cognitive restructuring form was given a score using the scoring criteria from Johnco et al. (2013), see Table 2. Scoring was completed by an independent clinical psychologist with postgraduate training in CBT and registration as a CBT therapist with the British Association for Behavioral and Cognitive Psychotherapies. To check reliability of scoring, 20% of the cognitive restructuring tasks were scored by the first author (CJ) and resulted in acceptable interrater reliability ($k > .80$).

Table 2

Cognitive Restructuring Task Scoring Criteria

Situation	
0	Missing of irrelevant responses that fail to specify the situation or context in which the distressing emotion is experienced e.g. "I feel upset".
1	Marginal descriptions of the problem situation, or descriptions that are confounded with one's automatic thoughts e.g. "My neighbour purposely ignored me when they were watering the garden".
2	Reasonably complete and "objective" descriptions of a specific situation triggering a negative emotion, e.g. "My husband is three hours late returning from the meeting without phoning me in advance".
Target Cognition	
0	Missing responses, or responses that are merely restatements of problem situation or emotional reactions, e.g. "He's late again. I feel so lonely".
1	Vague interpretations, or rhetorical questions that obscure the dysfunctional belief that has been activated, e.g. "Putting myself down", "Why does this keep happening to me?"
2	Clear identification of the mental imagery or stream of consciousness that sustains the specified emotion, e.g. "This just proves what a failure I am" "You can never really trust a man".
Emotion	
0	Missing responses, or responses that specify automatic thoughts rather than feelings, e.g. "I can't take it anymore".
1	Vague emotional descriptions (e.g. "bad" "lousy"), or specific emotions (e.g. "anxious" "sad") unaccompanied by ratings of intensity of feeling.
2	Accurate identification and ratings of specific feelings uncontaminated by automatic thoughts (e.g. "guilty, 75").
Evidence Against the Thought	
0	Evidence is irrelevant to the automatic thought, missing, or is evidence that supports the thought "e.g. last week I forgot to pay the electricity bill too".
1	Weak attempt to challenge the automatic thought, or only 1 or 2 pieces of evidence generated that would be unlikely to reduce negative affect.
2	Reasonable attempt to challenge that negative thought. Several pieces of evidence generated that question the validity of the thought, and would reasonably reduce negative affect.
3	Strong attempt to challenge the negative thought. At least 3 pieces of strong evidence which would directly challenge the validity of the thought and would result in a reduction in negative affect.
Replacement Thought/Rational Response	
0	Missing or inappropriate responses that fail to challenge the automatic thoughts identified, e.g. "I shouldn't feel this way".
1	Problem solving statements or problem solving responses with no direct challenging of the cognitions (e.g. in response to challenging a cognition about having no-one to talk to at a social function - "try to avoid future situations like this", or challenging a cognition about having a heart attack - "be brave, drink water and pray")
2	Weak attempts to dispute or disprove automatic thoughts, or responses that specify no clear adaptive perspective or behaviour (e.g. "Maybe it won't happen", "Hang in there", "You're just catastrophizing").
3	Realistic attempts to seek evidence that disputes the validity of automatic thoughts, or

	developing an adaptive alternative interpretation of the situation (e.g. "Just because my child got a divorce doesn't mean I'm a failure as a parent". "His behaviour stems from his alcoholism, and I can't take the blame for that").
Outcome	
0	Missing response or vague statement of a different feeling, other than those identified in Emotions column, e.g. "Better".
1	Specification of emotional outcome, but unaccompanied by rating of intensity (e.g. "still somewhat fearful").
2	Clear specification of previous emotion, with rating of its present level of intensity (e.g. fearful, 25).

Procedure

Ethical approval for the study was gained by the Macquarie University Human Research Ethics Committee. All participants provided informed written consent prior to participating. Non-clinical participants contacted the researcher in response to advertisements in local newspapers, and were briefly screened over the phone for current clinically significant mental health problems. Clinical participants were recruited from a larger study for treatment of comorbid anxiety and depression and participated before beginning group CBT. Participants completed the questionnaire tasks at home and returned them at the testing

session. To reduce fatigue, all participants completed the neuropsychological tasks first, had a ten-minute break, and then completed the cognitive restructuring task.

Results

Descriptive Statistics

The clinical group reported significantly higher levels of anxiety and depression and higher rates of psychotropic medication use than the non-clinical sample, and had a higher proportion of men than the non-clinical group; however, the groups did not differ on any other demographic variables (see Table 1). Due to the group differences in gender, gender was controlled in all analyses. Descriptive data for the groups on the

neuropsychological measures are shown in Table 3. Three clinical participants (6.3%) fell within the range indicative of dementia (ACE-R≤ 82). Independent samples t-tests partially supported the hypothesis that clinical levels of anxiety and depression are associated with cognitive flexibility performance, with the clinical sample performing worse than the non-clinical sample on the ACE-R Total score, ACE-R Memory subscale, ACE-R Fluency subscale, Stroop, TMT-B and COWAT, but not the RFFT Unique score or error ratio, or the WCST perseverative errors.

Table 3

Descriptive Statistics for Symptom Measures and Neuropsychological Measures

	Clinical (N=47)		**Non-Clinical (N= 53)**		**Group Comparison Statistics**
Measure	***Range***	***M (SD)***	***Range***	***M (SD)***	***t***
Addenbrooke's Cognitive Examination - Revised Total	82-100	92.23 (4.89)	84-100	95.06 (3.79)	3.25**
- Attention and Orientation subscale	15-18	17.87 (.49)	17-18	17.96 (.192)	1.17
- Memory subscale	17-26	22.81 (2.71)	20-26	24.28 (1.70)	3.22**
- Fluency subscale	4-14	11.21 (2.32)	9-14	12.32 (1.33)	2.88**
- Language subscale	21-26	24.85 (1.23)	21-26	25.04 (1.32)	.73
- Visuospatial subscale	12-16	15.49 (.98)	12-16	15.45 (.89)	-.20
	Percentile range	***M(SD)***	***Percentile range***	***M(SD)***	
Stroop Color-Word Test	1-99	42.00 (27.33)	2-99.6	67.46 (28.26)	4.45***
Trail Making Test – Part B	2-99	47.57 (28.21)	5-99	60.43 (28.55)	2.22*
Controlled Oral Word Association Test	1-99	49.51 (31.62)	1-99.6	73.09 (25.53)	3.95***
Ruff Figural Fluency Test Unique Designs	4.5-98.9	55.11 (28.17)	16.9-100	63.86 (24.67)	1.66
Ruff Figural Fluency Test Error Ratio	3.40-93.30	44.03 (23.47)	3.4-96.6	46.31 (28.09)	.39
Wisconsin Card Sorting Test - Perseverative Errors	4-99	53.17 (31.39)	2-99	56.98 (29.34)	.58

Note. $*p < .05$, $**p < .01$, $***p < .001$

Cognitive Restructuring Quality Score

Each section of the cognitive restructuring form was scored for quality. Similar to Johnco et al. (2013), there was variability of scores only in the evidence generation and

replacement thought sections of the cognitive restructuring form. This is likely because the experimenter assisted participants to generate good quality cognitions and to identify the appropriate emotion, and so variability in the scores for these sections was limited. Therefore analyses focused on the Evidence and Replacement Thought categories which best captured independent cognitive restructuring skills. These two categories (Evidence and Replacement Thoughts) were combined to form a total score that ranged from 0 - 6. An analysis of covariance (ANCOVA) comparing the groups and controlling for gender indicated that the clinical group demonstrated poorer quality cognitive restructuring skills than the non-clinical group (M = 3.66, SD = 1.70 and M = 4.94, SD = 1.53 respectively; F (1, 96) = 13.76, p<.001).

Cognitive Restructuring Reduction in Distress Score

Similar to Mohlman (2013) we assessed the reduction in SUDs by examining the difference between the initial SUDs rating and the SUDs rating following participant's independent completion of the cognitive restructuring task. The clinical group demonstrated a smaller reduction in SUDs compared with the non-clinical group (M = 28.38, SD = 20.65 and M = 42.25, SD = 18.58 respectively; F (1, 96) = 11.48, p = .001).

Cognitive Flexibility Composite Score

A composite score of cognitive flexibility was calculated to address the limitations of using individual measures as predictors. It is not uncommon for patients to score in the impaired range on a single neuropsychological test (Binder, Iverson, & Brooks, 2009; Brooks & Iverson, 2010; Brooks, Iverson, & White, 2007; Palmer, Boone, Lesser, & Wohl, 1998), and thus creating a composite score reduces the Type 1 error rate. To create the composite score, an exploratory factor analysis was conducted with all the measures of cognitive

flexibility. Initial results from the diagonal values in the anti-image correlation matrix showed a correlation far less than the recommended .7 for the RFFT Error ratio (r = .411), suggesting that the RFFT Error Ratio did not load on the same factor as the remaining variables (r = .411). An exploratory factor analysis using the remaining variables was conducted (Stroop, COWAT, TMT-B, RFFT Unique Designs and WCST Perseverative Errors). The Kaiser–Meyer–Olkin Measure of Sampling Adequacy (KMO) was .751, above the recommended level of .6, and Bartlett's test of sphericity was significant (χ^2 = 120.054, p < .001). The diagonal values in the anti-image correlation matrix supported the use of all indexes in the factor analysis (r > .7). Examination of the scree plot and eigenvalues suggested a one factor solution that explained 40.33% of the variance. Therefore, a cognitive flexibility composite score was formed using unit-weighted z-scores of the five tests to provide a more stable measure of cognitive flexibility. Based on this index, the clinical group showed poorer cognitive flexibility on this index after controlling for gender (F (1, 96) = 11.663, p<.001). Because the RFFT Error Ratio z-score did not form part of this composite score it was entered separately to the cognitive flexibility composite score in the regression analysis.

Bivariate Correlations

To assess the impact of demographic variables (age, gender, years of education, and number of health problems) bivariate correlations were conducted with cognitive flexibility measures and cognitive restructuring quality and reduction in SUDs. Results are summarised in Table 4. Despite normative data correcting for age and education, age showed a moderate correlation with the cognitive flexibility composite score (r = .328, p = .001), and increased years of education showed a weak correlation with increased cognitive flexibility on the RFFT error ratio z-score (r = -.279, p = .005). The total number of health

problems were not associated with any index of cognitive flexibility, cognitive restructuring quality or subjective distress reduction (p >.05).

To assess the impact of symptom measures, bivariate correlations were conducted between measures of anxiety and depression, cognitive flexibility measures and cognitive restructuring quality. Results are summarised in Table 4. Anxiety and depression showed significant negative correlations with cognitive restructuring quality (r = -.325, p = .001 and r = -.415, p < .001 respectively), and with poorer cognitive flexibility on the composite score (r = -.275, p = .006 and r = -.367, p < .001), but not the RFFT-Error Ratio z-score (r = -.067, *ns* and r = -.030, *ns*). Anxiety and depression also showed significant negative relationships with reduction in subjective distress (r = -.293, p = .003 and r = -.340, p = .001 respectively).

Better cognitive flexibility on the composite score was associated with better cognitive restructuring quality and greater reduction in subjective distress (r = .405, p < .001 and r = .406, p < .001 respectively), but the RFFT Error ratio was not (r = -.179, *ns* and r = -.075, *ns*).

Table 4

Bivariate correlations between demographic factors, symptom measures, cognitive flexibility measures and cognitive restructuring outcomes

	Age	Education (years)	Number of health problems	GAI	GDS
Cognitive Flexibility Composite	.328**	-.126	-.054	-.275**	-.367***
RFFT Error Ratio z-score	.104	-.279**	.119	-.067	-.030
Cognitive restructuring quality	.070	.091	-.123	-.325**	-.415***
SUDs reduction	.073	.069	.027	-.293**	-.340**

Note. *p < .05, **p < .01, ***p < .001, GAI = Geriatric Anxiety Inventory, GDS = Geriatric Depression Scale, SUDs = subjective units of distress.

Cognitive Restructuring Quality

A regression analysis was used to assess whether the relationship between anxiety and depressive symptoms and cognitive restructuring quality was moderated by cognitive flexibility, controlling for age, gender and education. Group, cognitive flexibility, RFFT Error Ratio z-score, age, education, gender, and the interaction between group and the cognitive flexibility composite score and the interaction between group and RFFT Error Ratio were entered into the regression. The overall model was significant, $F(8, 90) = 4.25$, $p<.001$, $R^2 = .274$, 95% CI = .139 - .409. As summarised in the regression table (Table 5) the cognitive flexibility composite score and group (clinical/non-clinical) were significant predictors of cognitive restructuring quality. None of the interactions terms were significant.

Table 5

Regression summary table for predictors of cognitive restructuring quality

Predictor	**B**	**SE(B)**	***β***	***t***	***p***
Constant	3.579	2.419		1.480	.142
Group	-.821	.373	-.239	-2.201	.030
Cognitive Flexibility	.136	.064	.300	2.116	.037
RFFT Error Ratio	-.484	.245	-.238	-1.997	.051
Group*Cognitive Flexibility	.004	.091	.006	.050	.960
Group*RFFT Error Ratio	.381	.396	.116	.963	.338
Age	-.002	.032	-.007	-.070	.945
Gender	.235	.340	.066	.690	.492
Education	.047	.054	.086	.873	.385

Note. RFFT=Ruff Figural Fluency Test.

A mediation analysis was conducted using bootstrapping in AMOS (Arbuckle, 1983-2010) using 2000 bootstrap samples to assess whether cognitive flexibility mediated the relationship between group and cognitive restructuring quality, controlling for age, gender and education. Results are summarized in Figure 1 and suggest that the cognitive

flexibility composite score, but not the RFFT Error Ratio partially mediated the relationship between group and cognitive restructuring.

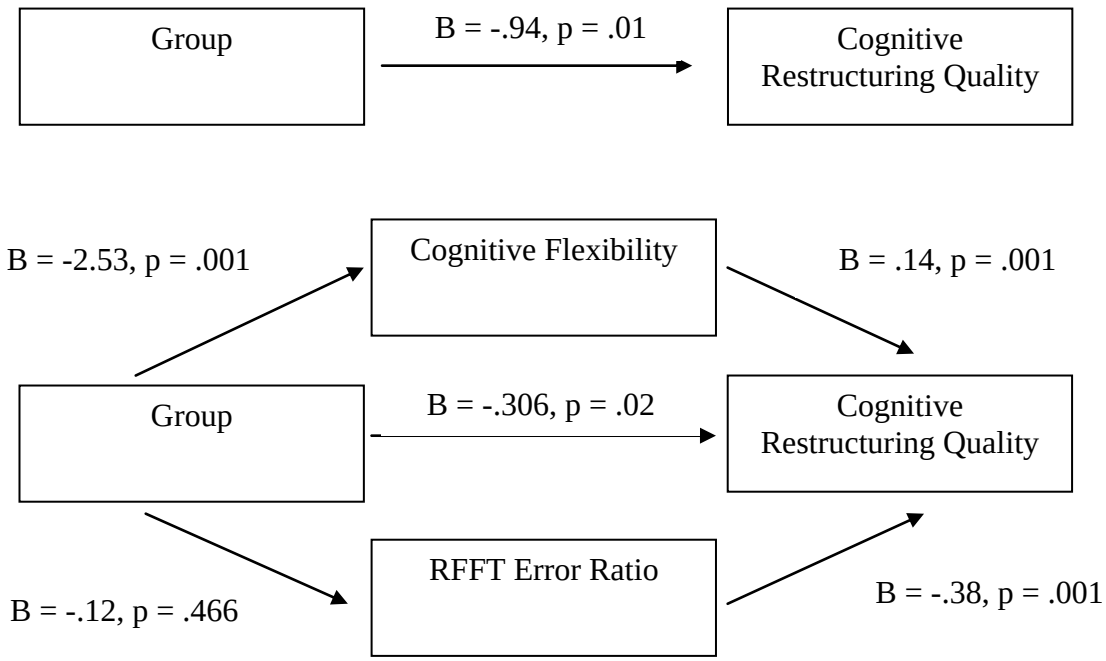

Figure 1. Mediation analysis results between group and cognitive restructuring quality.

Reduction in Subjective Units of Distress

A regression was conducted to assess whether the relationship between anxiety and depression, and reduction in subjective ratings of distress was moderated by cognitive flexibility, controlling for age, gender and education. The overall model was significant, F (8, 90) = 4.87, p<.001, R^2 = .302, 95% CI = .166 - .438. The regression table is summarised in Table 6 and shows that the cognitive flexibility composite score and the interaction between group and RFFT Error Ratio were significant predictors of SUDS reduction, and group was marginally significant (p = .05). The significant interaction

indicated that the effect of RFFT Error Ratio performance on reduction in SUDs was stronger in the clinical group compared to the non-clinical group.

Table 6

Linear regression summary table for predictors of magnitude of reduction in subjective distress ratings

Predictor	**B**	**SE(B)**	***β***	***t***	***p***
Constant	62.793	28.430		2.209	.030
Group	-8.709	4.386	-.211	-1.986	.050
Cognitive Flexibility	2.617	.755	.481	3.465	.001
RFFT Error Ratio	4.484	2.877	.184	1.559	.123
Group*Cognitive Flexibility	-.680	1.065	-.079	-.639	.525
Group*RFFT Error Ratio	-14.666	4.649	-.371	-3.155	.002
Age	-.461	.373	-.120	-1.237	.219
Gender	-.517	4.001	-.012	-.129	.897
Education	.303	.633	.046	.479	.633

Note. RFFT=Ruff Figural Fluency Test.

A mediation analysis was conducted using bootstrapping in AMOS using 2000 bootstrap samples to assess whether cognitive flexibility mediated the relationship between group and SUDs reduction, again controlling for age, gender and education. Given the interaction between group and RFFT Error Ratio was a significant predictor of SUDs reduction, a moderated mediation analysis was assessed for this relationship. Results are summarized in Figure 2 and suggest that the cognitive flexibility composite score, but not the moderation of group and RFFT Error Ratio partially mediated the relationship between group and SUDs reduction.

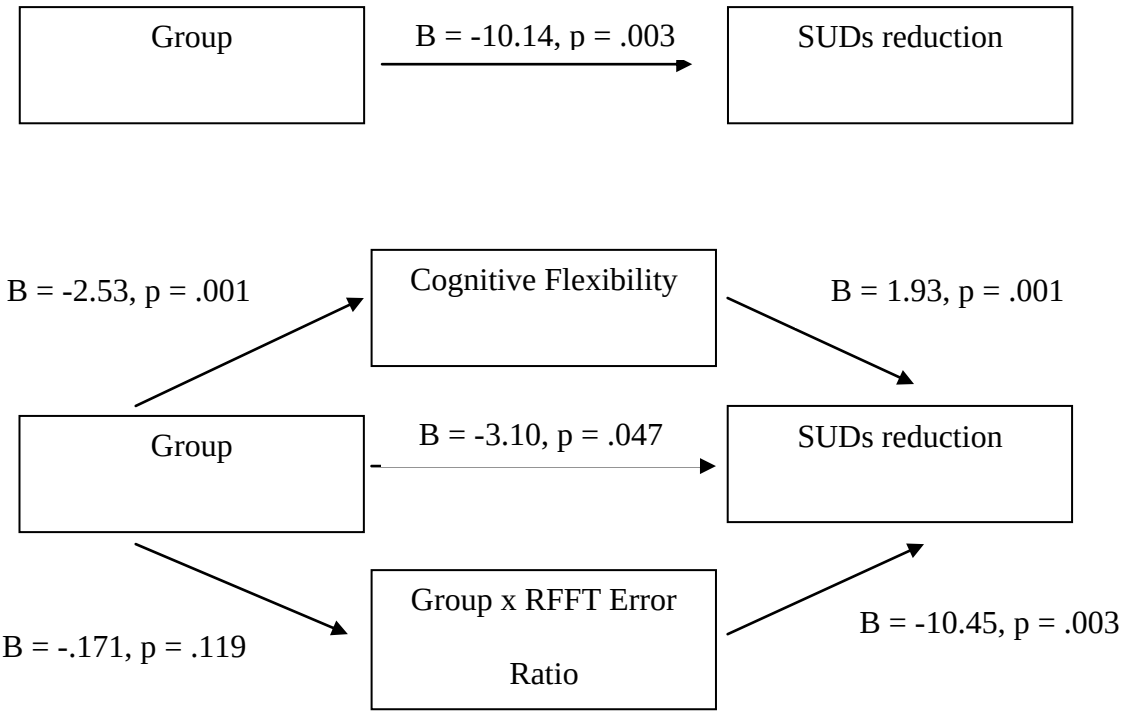

Figure 2. Mediation analysis results between group and SUDs reduction.

Discussion

This study aimed to assess firstly, whether older adults with anxiety and depression showed poorer cognitive flexibility compared to older adults without anxiety and depression; secondly, to understand whether cognitive flexibility impacted older adults' ability to learn and implement cognitive restructuring, and thirdly to see whether cognitive flexibility mediated or moderated the relationship between anxiety and depression and cognitive restructuring skill acquisition.

The results supported the first hypothesis, with the clinical sample showing poorer fluency, inhibitory skills and set shifting compared to the non-clinical sample, although perseveration was not significantly different between the groups. When using the composite score of cognitive flexibility, higher levels of anxiety and depression were

associated with poorer cognitive flexibility overall. Although not specifically tested in this study, cognitive flexibility tends to naturally decline in older age and the effect of older age and anxiety and depression are likely to be synergistic. Deficits in cognitive flexibility skills are likely to have implications for the development and maintenance of anxiety and depressive disorders, especially when compounded with age-related declines, and the individual may have trouble identifying ways of solving problems, shifting away from ineffective strategies or stopping themselves from impulsively responding rather than taking time to consider ways of successfully negotiating a challenging situation. It may be that age-related reductions in cognitive flexibility place people at an increased risk of developing anxiety or depressive disorders due to increased difficulty in flexibly shifting away from ineffective coping strategies or problems generating new ways to negotiate life challenges (e.g., changes in health or finances). Alternately, it may be that those who develop an anxiety or depressive disorder become entrenched in maladaptive ways of thinking and behaving and that this creates a more pervasive attention bias and reduction in cognitive flexibility.

Our findings of poorer cognitive flexibility in those with anxiety and depression are consistent with the literature suggesting impairments in set-shifting and inhibitory control skills in anxious patients (Beaudreau & O'Hara, 2009; Mantella et al., 2007), and variable effects of late-life depression on executive functioning skills ranging from impaired to almost intact (Baudic et al., 2004). This study is one of the first to examine the effect of comorbid anxiety and depressive symptoms on cognitive flexibility in older age, and represents an important domain given the high rates of comorbidity between these disorders in this population (Beekman et al., 1998).

The capacity for older adults to engage with cognitive therapy has been a controversial clinical and empirical issue. Our results found poorer quality cognitive

restructuring skills and a smaller reduction in subjective distress in the clinical sample compared to the non-clinical sample, and that this was partially mediated by poorer cognitive flexibility skills. These results are consistent with previous findings suggesting poorer cognitive restructuring skill acquisition and treatment outcome among those with worse cognitive flexibility or executive functioning skills (Johnco et al., 2013; Mohlman, 2013; Mohlman & Gorman, 2005). Unhelpful negative or catastrophic thinking styles are one of the processes that maintain both anxiety and depressive disorders (e.g., Beck et al., 1985; Beck et al., 1979; Butler & Mathews, 1983), and cognitive therapy is one of the key treatment strategies employed to teach flexible reappraisal of situations. However meta-analyses show that CBT is less effective for older adults compared with younger adults (Gould et al., 2012), and results from the current study suggest that this may be partly due to the negative impact of cognitive flexibility on the ability to learn and benefit from cognitive restructuring. Although there are a number of studies examining the efficacy of CBT with older adults with anxiety and depression, there are currently no dismantling studies, and there are few studies examining pre-treatment predictors of outcome. As such, the assumption that cognitive restructuring is a necessary component for the successful amelioration of symptoms during CBT is currently untested.

Poorer cognitive flexibility appears to be an important marker to suggest therapeutic adaptations in older age. It is notable that although the clinical group showed poorer cognitive restructuring skill acquisition than the non-clinical group, more than a third (36%) were able to demonstrate reasonable to good quality cognitive restructuring skills after only a brief intervention. Clearly some older adults are able to learn and benefit from standard cognitive therapy, and modifications and adaptions should not be considered necessary in all cases (Laidlaw, 2001). However poorer cognitive flexibility skill is one of the first empirically tested clinical markers to indicate the need for modifications or

adaptations to brief interventions. Modifications and adaptions may consist of increased numbers of examples, a slowed pace of learning, increased repetition and feedback from therapists, or may indicate the need for a different therapeutic approach that does not rely on cognitive flexibility skills.

It is important to note the limitations of the experimental design used in this study. The cognitive restructuring task used in this study involved assistance from a psychologist to generate an appropriate target cognition. This process is often a complex skill for clients to learn during therapy, and the applicability of these findings to independent use of cognitive restructuring, including the identification of cognitions is uncertain. This study assessed cognitive flexibility taught in a brief pre-treatment session, and may not reflect older adults' ability to learn cognitive restructuring over longer-term treatment with increased repetition and practice. The comorbid sample used in this study prevented a clear examination of the independent relationship between cognitive flexibility and anxiety and depression, however given the high rate of comorbid mood and anxiety disorders in older populations (Beaudreau & O'Hara, 2009; Beekman et al., 2000; De Beurs et al., 1999) these results are likely to be more representative of clinical practice where comorbid presentations are overwhelmingly common. While the use of factor analysis to generate a composite score of cognitive flexibility measures provides an empirical basis for combining variables, this method is limited when using a small sample and needs replication, In addition, a causal relationship cannot be assumed between anxiety and depression and cognitive flexibility, and as such the reported mediation analyses should be considered quasi-mediational in nature. Future research would benefit from examining whether older adults with anxiety and depressive disorders are able to learn and benefit from cognitive restructuring over longer-term therapy, and whether cognitive flexibility impacts this longer term skill acquisition. It would also be important to assess the

feasibility and utility of pre-treatment cognitive flexibility as a predictor of post-treatment cognitive restructuring skill acquisition and treatment outcome.

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PAPER 3. Reliability and validity of two self-report measures of cognitive flexibility

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Abstract

Neuropsychological testing currently represents the gold-standard in assessing cognitive flexibility. However, this format presents some challenges in terms of time and skills required for administration, scoring and interpretation. Two self-report measures of cognitive flexibility have been developed to measure aspects of cognitive flexibility in everyday settings, although neither has been validated in an older sample. This study investigated the psychometric properties of two self-report measures of cognitive flexibility, the Cognitive Flexibility Inventory (Dennis & Vander Wal, 2010) and the Cognitive Flexibility Scale (Martin & Rubin, 1995) against neuropsychological measures of cognitive flexibility in a clinical sample of 47 older adults with comorbid anxiety and depression, and a non-clinical sample of 53 community-dwelling older adults. Internal consistency was good for the CFS and CFI in all samples. The factor structure of both measures was supported in an older sample. The clinical sample reported poorer cognitive flexibility than the non-clinical sample on self-report measures, and performed more poorly on some neuropsychological measures. There was evidence of convergent validity between the two self-report measures, but little relationship between the self-report and neuropsychological measures of cognitive flexibility, suggesting that self-report measures assess a different aspect of cognitive flexibility to neuropsychological testing. Divergent validity was weak from measures of anxiety and depression in the combined and non-clinical samples, but acceptable in the clinical sample. Results suggest that these measures are suitable for use with an older adult sample, but do not assess the same aspects of cognitive flexibility as that assessed by neuropsychological assessment.

Introduction

Cognitive flexibility is one component of executive functioning that refers to the ability to freely shift cognitive sets in order to perceive or respond to situations in a different way (Rende, 2000). It is also one aspect of cognitive functioning that declines over the age-span. Research into the moderating potential of cognitive flexibility on treatment outcome and engagement in psychological treatment techniques is emerging (e.g., Johnco, Wuthrich, & Rapee, 2013), hence there is an increasing need to effectively measure performance in this domain to inform treatment decisions. Historically, cognitive flexibility has been assessed using neuropsychological tests, although there is increasing potential for the use of self-report measures to aid assessment, especially with older people who experience a great deal of anxiety with neuropsychological testing. However there is little research evaluating the relationship between self-report measures of cognitive flexibility against neuropsychological assessment.

Neuropsychological tasks that are commonly used to assess cognitive flexibility include verbal fluency and design fluency tasks, where the individual must generate unique verbal or non-verbal responses, with smaller amounts of unique item generation and perseverative responses representing cognitive rigidity (Rende, 2000). Set-switching tasks are another commonly used measure of cognitive flexibility, with tasks such as the Trail Making Test Part B (Reitan & Wolfson, 1985), a pencil and paper task that required alphanumeric sequencing assessing a person's ability to flexibly switch between competing cognitive sets. Other commonly used tasks include concept learning and inhibitory control tasks, such as the Wisconsin Card Sorting Test (Heaton, Chelune, Talley, Kay, & Curtiss, 1993) and Stroop Color-Word task (Golden, 1978), that both assess the ability to show flexible responses given changing environmental contingencies (Rende, 2000). The WCST is a concept learning task that measures abstract reasoning ability, and the ability to shift

cognitive strategies in response to feedback. The Stroop Color-word test is an inhibitory control task that requires the ability to suppress a habitual reading response in order to correctly name the ink colour of a colour-incongruent word. Both of these tasks require the ability to inhibit habitual responding in order to alter thinking and behavior appropriately.

Some practical issues limiting the use of neuropsychological assessment in routine practice include the time needed for administration of multiple measures, specialist clinician training in administration, scoring and interpretation, and the psychological distress often experienced by those undergoing neuropsychological assessment, especially in those older adults suffering from an emotional disorder or those who already worry about their memory or cognition. In order to overcome these limitations, self-report measures have been developed that propose to measure cognitive flexibility. These self-report measures have potential value within treatment practice, given they are brief, can be completed in the absence of the therapist, and can be quickly scored and interpreted. Self-report formats are likely to induce less distress than neuropsychological assessment in older adults, and quickly give the therapist useful information about the clients' cognitive flexibility. This information may be used to indicate the clients' potential to engage with treatment strategies such as cognitive restructuring that require flexibility in thinking (Johnco et al., 2013). However, these self-report measures have not been adequately compared to neuropsychological measures of cognitive flexibility, and so further assessment of relationships between these measures, particularly in older adults is warranted.

Only a small number of self-report measures of cognitive flexibility have been developed to date. The most promising for clinical use are the Cognitive Flexibility Scale (CFS; Martin & Rubin, 1995) and the Cognitive Flexibility Inventory (CFI; Dennis & Vander Wal, 2010). The CFS is a 12-item self-report measure of cognitive flexibility

designed to assess flexibility in interactions and communication style. This measure assesses awareness of alternative ways of communicating, willingness to adapt responding style to the circumstance, and self-efficacy to be flexible (Martin & Rubin, 1995). Patients with anorexia nervosa demonstrate poorer cognitive flexibility on the CFS compared to healthy controls; however, when comparing scores on the CFS to scores on a neuropsychological measure of concept formation and set-shifting, there was no relationship in the anorexia nervosa or healthy control samples (Lounes, Khan, & Tchanturia, 2011). Based on significant correlations between the CFS and measures of depression, the authors suggested that CFS may be influenced more by low mood than actual deficits in cognitive function (Lounes et al., 2011). Despite the widespread use of this scale, its psychometric properties have not been examined in an older adult sample, nor against a battery of neuropsychological measures of cognitive flexibility.

The CFI is a 20-item self-report measure of cognitive flexibility comprised of two subscales: the Alternatives subscale that assesses an individuals' ability to identify alternative explanations in a situation and to generate multiple solutions, and the Control subscale that assesses a person's ability to perceive difficult situations as controllable (Dennis & Vander Wal, 2010). This measure was designed to assess the type of cognitive flexibility that is proposed to be relevant to cognitive behavioral therapy (CBT). An unpublished study examined the relationship between the two self-report measures, the CFS and CFI, and three neuropsychological measures, Trail Making Test (Reitan & Wolfson, 1985), Emotional Card Sorting Test (Deveney & Deldin, 2006), and Finger Tapping Test (Reitan, 1979) in a young student sample and found significant correlations between the two self-report measures, but no significant relationships with the neuropsychological measures (Dennis, 2009). While this might indicate a lack of convergent validity, the neuropsychological measures used in this study were unlikely to

provide a comprehensive examination of cognitive flexibility and therefore a more thorough assessment is warranted. Further, given that this study used a young non-clinical student sample, the generalizability to older or clinical samples is limited, and more specific testing in older populations is needed.

This study aimed to investigate the factor structure, reliability and validity of two self-report measures of cognitive flexibility (CFI and CFS) against neuropsychological measures in a normal older adult sample, and in a cognitively intact clinical sample of older adults with comorbid anxiety and depressive symptoms.

Method

Participants

All participants were aged over 60 years (Mean = 67.17, SD = 5.35, range = 60 to 86 years). Community participants were recruited via advertisements in local papers and screened for mental health problems over the phone. A proportion (75%) of the non-clinical sample was drawn from a previous study assessing the relationship between cognitive flexibility and cognitive restructuring ability (Johnco et al., 2013). Participants in the clinical group were recruited from a randomized controlled trial evaluating group psychological treatment of anxiety and depression in older adults via a university-based treatment clinic (Wuthrich, Rapee, Kangas, & Perini, 2013). Clinical participants were screened prior to participating in the group treatment program using the Anxiety Disorders Interview Schedule for DSM-IV (ADIS; Di Nardo, Brown, & Barlow, 1994) and were diagnosed with both a DSM-IV anxiety disorder and unipolar mood disorder. Demographic information and descriptive statistics for all measures are provided in Table 1.

Table 1

Demographics and descriptive statistics

	Clinical (N=47)		Non-Clinical (N= 53)		Comparison Statistics
	M	***SD***	***M***	***SD***	***t***
Age	66.81	4.43	67.49	6.08	.65
Education *(years)*	13.96	3.19	14.55	3.17	.93
	N	***% of sample***	***N***	***% of sample***	**Chi-sq**
Region of birth					7.0
Australia/New Zealand	38	80.8	37	69.8	
UK/Europe	8	17.1	12	22.6	
Asia	1	2.1	2	3.8	
America	0	0	2	3.8	
Marital status					3.17
Married/De Facto	29	61.7	30	56.6	
Widowed	5	10.6	9	17.0	
Divorced/Single	13	27.7	14	26.4	
Employment Status					6.02
Employed Full-time	4	8.5	3	5.7	
Semi-retired	14	29.8	20	37.7	
Retired	29	61.7	30	56.7	
Annual Gross Income ($AUS)					8.46
<$25,999	16	34.0	18	34.0	
$26,000 - $62,399	20	42.5	20	37.7	
$62,400 - $134,999	9	19.1	12	22.6	
Refused to answer	2	4.2	3	5.7	
	M	***SD***	***M***	***SD***	***t***
Geriatric Depression Scale	17.15	4.96	2.37	2.93	-17.81**
Geriatric Anxiety Inventory	10.75	4.55	0.60	1.38	-14.70**
Cognitive Flexibility Scale	49.94	7.92	58.13	7.12	5.45**
CFI - Total Score	95.04	13.52	114.51	12.51	7.48**
CFI - Alternative subscale	65.62	10.66	74.19	8.90	4.38*
CFI - Control subscale	29.43	6.25	40.32	7.27	7.98**
	Range	***M (SD)***	***Range***	***M (SD)***	**t**
ACE-R Total score	82-100	92.23 (4.89)	84-100	95.06 (3.79)	3.25**
Attention and Orientation	15-18	17.87 (.49)	17-18	17.96 (.192)	1.17
Memory	17-26	22.81 (2.71)	20-26	24.28 (1.70)	3.22**
Fluency	4-14	11.21 (2.32)	9-14	12.32 (1.33)	2.88**
Language	21-26	24.85 (1.23)	21-26	25.04 (1.32)	.73
Visuospatial	12-16	15.49 (.98)	12-16	15.45 (.89)	-.20
Stroop Color-Word Test	25-73	47.11 (10.08)	30-77	56.25 (10.40)	4.45***
Trail Making Test – Part A	32-70	49.17 (9.46)	33-73	53.09 (9.89)	2.02*
Trail Making Test – Part B	30-72	49.17 (9.26)	33-75	53.38 (9.60)	2.22*
COWAT	27-72	49.65 (11.06)	25-77	58.09 (10.27)	3.95***
RFFT Unique Designs	33.5-71.9	51.98 (9.56)	40.4-75	55.08 (8.99)	1.66
RFFT Error Ratio	32.40-65.20	47.86 (7.37)	32.4-68.6	48.52 (9.26)	.39
WCST Perseverative Errors	32-80	51.66 (11.58)	30-80	53.00 (11.46)	.58

Note. Neuropsychological test scores are reported in t-scores. ACE-R = Addenbrooke's Cognitive Examination – Revised; COWAT = Controlled Oral Word Association Test; RFFT = Ruff Figural Fluency Test, WCST = Wisconsin Card Sorting Test

*$p < .05$, **$p < .01$, ***$p < .001$

Materials

Cognitive Flexibility Inventory (CFI; Dennis & Vander Wal, 2010): This 20-item self-report scale consisting of two subscales, the Alternatives and Control subscale (discussed earlier), that measure the type of cognitive flexibility targeted in CBT interventions on a 7-point Likert scale (strongly disagree to strongly agree). The CFI showed high internal consistency for all subscales in a student sample (Cronbach's alpha = .90-.91, .91 and .84-.86 for the Total score, Alternatives subscale and Control subscale respectively), adequate test-retest reliability over a 7-week period (CFI total score: *r*=.81; Alternatives subscale: *r*=.75; Control subscale: *r*=.77), good convergent validity with other self-report measures of cognitive flexibility, including the CFS, and good concurrent criterion validity as evidenced by a significant negative correlation with measures of depression (Dennis & Vander Wal, 2010).

Cognitive Flexibility Scale (CFS; Martin & Rubin, 1995): The CFS is a 12-item self-report scale that measures aspects of cognitive flexibility considered relevant for effective interactions and communication on a 6-point Likert scale (strongly disagree to strongly agree). Each item on the questionnaire consists of a statement dealing with beliefs and feelings about behaviour. The CFS was developed using a student sample, and demonstrated high internal consistency (Cronbach's alpha= .76-.77), good concurrent and construct validity with measures of interaction and communication flexibility and high test–retest reliability (*r*=.83) over a two week interval (Martin & Rubin, 1995).

Geriatric Anxiety Inventory (Pachana et al., 2007): The GAI is a 20-item self-report measure designed to assess the severity of anxiety symptoms in the elderly. This measure shows good internal consistency, acceptable test-retest reliability, and good convergent validity with other self-report and diagnostic measures of anxiety, however

divergent validity from depression measures is poor (Pachana & Byrne, 2012; Pachana et al., 2007).

Geriatric Depression Scale (GDS; Yesavage et al., 1982): The 30-item GDS is a self-report measure designed to assess the severity of depressive symptoms in older adults. This measure demonstrates good convergent validity with other self-report and diagnostic measures of depression, high internal consistency and good validity for use with older people (Yesavage et al., 1982).

Addenbrooke's Cognitive Examination – Revised (ACE-R; Mioshi, Dawson, Mitchell, Arnold, & Hodges, 2006): This test was administered to screen for global cognitive functioning. It incorporates five sub-domain scores (orientation/attention, memory, verbal fluency, language and visuospatial) and incorporates the Mini-Mental State Exam, a widely used measure of general cognitive functioning. The ACE-R shows good reliability and validity, and is sensitive to early cognitive dysfunction (Mioshi et al., 2006). All participants in this study scored above the cut-off suggesting dementia (82/100).

Wisconsin Card Sorting Test: Computer Version 4 (WCST-C4; Heaton & PAR Staff, 2003): The WCST-C4 is a commonly used computerized neuropsychological test that requires test takers to sort decks of cards into four piles based on varying characteristics. The participant must independently determine the matching rule (color, shape or number) based on feedback to their previous sorts. This test assesses ability to shift cognitive strategies in response to environmental feedback and abstract reasoning ability. Recommended scoring and normative data corrected for age and education were used (Heaton et al., 1993). Scoring focused on the number of perseverative errors made (WCST perseverative errors).

Trail Making Test Part A and Part B (TMT-A and TMT-B; Reitan & Wolfson, 1985): TMT-A requires numeric sequencing and primarily assesses psychomotor speed.

TMT-B requires alphanumeric sequencing, and assesses mental set shifting and flexibility in addition to psychomotor speed. For both parts, greater completion time indicates poorer functioning. Normative data was used to score the task from the Mayo's Older American's Normative Studies (MOANS; Ivnik, Malec, Smith, Tangalos, & Petersen, 1996).

Controlled Oral Word Associations Test (COWAT; Benton & Hamsher, 1976): The COWAT is a test of verbal fluency that involves the participant generating words beginning with a specified letter during a one-minute interval, excluding proper nouns. The standard letters were used (F, A and S). MOANS normative data was used.

Stroop Color-Word Test (Golden, 1978): The Stroop Color-Word Test is used to assess inhibitory control, specifically measuring how well the participant can suppress a habitual response in preference for a less familiar one. The Color-Word Trial requires participants to name the color of the ink that color-incongruent words are printed in. Thus the participant must inhibit the tendency to read the word in order to correctly name the ink color. MOANS normative data was used.

Ruff Figural Fluency Test (RFFT; Ruff, 1988): The RFFT is a non-verbal measure of design fluency that requires participants to draw sequences of unique designs by connecting dots under a time constraint. The error ratio is the ratio of perseverative errors to unique designs, and reflects the participant's ability to minimize repetition while maximising unique design generation.

Results and Discussion

Compared to the non-clinical group the clinical group had a significantly higher proportion of men (46.8% compared to 26.4%) and were more likely to be taking psychotropic medication (10.42% compared to 1.89%) with most taking benzodiazepine or SSRI medication. As expected, the clinical group reported significantly higher anxiety and

depression than the non-clinical group (see Table 1). Similar to previous findings, results indicated that the clinical sample had decreased cognitive flexibility on self-report measures, and some (ACE-R fluency, ACE-R Memory, Stroop, TMT-A, TMT-B and COWAT), but not all neuropsychological measures of cognitive flexibility (RFFT Unique Designs, RFFT Error Ratio, WCST Perseverative Errors) compared with the non-clinical sample (see Table 1; Baudic, Tzortzis, Dalla Barba, & Traykov, 2004; Beaudreau & O'Hara, 2008).

Given the development of the CFI and CFS in younger populations, internal consistency calculations were conducted to assess the reliability of scores in the combined sample and separately in the clinical and non-clinical samples. Internal consistency was good for the CFI Total score, Control subscale and Alternative subscale in the combined sample (Cronbach's alpha = .906, .874 and .913 respectively), non-clinical sample (.862, .839 and .899), and clinical sample (.859, .746 and .897). Internal consistency was adequate for the CFS, with Cronbach's alpha for the combined sample .855, clinical (alpha=.810) and non-clinical samples (alpha=.827).

An exploratory factor analysis was conducted using principal axis factoring with direct oblimin rotations. The modest sample size is a limitation of this study and prevented separate factor analyses for the subsamples, thus a factor analysis was conducted using the combined sample only. For the CFS, the Kaiser–Meyer–Olkin Measure of Sampling Adequacy (KMO) was .831, above the recommended level of .6, and Bartlett's test of sphericity was significant (χ^2 = 411.415, p < .001). Examination of the scree plot and eigenvalues supported the one factor solution that explained 34.80% of the variance. The KMO for the CFI verified that the correlations between items were adequate for factor analysis using the combined sample (KMO=.868; Bartlett's test of sphericity χ^2 = 1164.319, p < .001). The data suggested a two factor solution, with the first factor

explaining 36.22% of the variance and the second factor explaining 13.94%. The CFI item loadings were broadly consistent with the Alternatives and Control subscales suggested by Dennis and Vander Wal (2010), with the exception of item 1 that loaded more strongly on the Control subscale than the Alternatives subscale (see Table 2).

Table 2

Factor loadings for the Cognitive Flexibility Scale and Cognitive Flexibility Inventory using the Combined sample (N=100)

	CFS		**CFI**		
	Factor 1: Total score		Factor 1: Alternatives	Factor 2: Control	Dennis and Vander Wal (2010) subscale loading
Q1	.550	Q1	.171	.463	Alternatives
Q2	-.596	Q2		.698	Control
Q3	-.547	Q3	.612		Alternatives
Q4	.725	Q4		.705	Control
Q5	-.555	Q5	.735		Alternatives
Q6	.620	Q6	.661		Alternatives
Q7	.582	Q7		.865	Control
Q8	.559	Q8	.536		Alternatives
Q9	.444	Q9		.665	Control
Q10	-.558	Q10	.504		Alternatives
Q11	.538	Q11		.693	Control
Q12	.728	Q12	.593		Alternatives
		Q13	.854		Alternatives
		Q14	.759		Alternatives
		Q15		.576	Control
		Q16	.734		Alternatives
		Q17		.698	Control
		Q18	.718		Alternatives
		Q19	.684		Alternatives
		Q20	.853		Alternatives

Note: Factor loadings <.3 are suppressed.

Partial correlations controlling for gender were conducted to assess the convergent validity firstly between the self-report measures of cognitive flexibility (CFI Total Score, CFI Alternatives Subscale, CFI Control Subscale and CFS) and neuropsychological measures of cognitive flexibility (TMT-B, COWAT, WCST perseverative errors, Stroop, RFFT Unique Designs, RFFT Error Ratio and the ACE-R fluency subscale score). See Table 3 for detailed results. Starting with the convergent validity between the self-report measures, the CFS and CFI total scores were moderately to strongly correlated and the CFI total score was highly correlated with the CFI Alternatives subscale and CFI Control subscale in all three samples (Combined, Clinical and Non-clinical), suggesting that these self-report measures are measuring a similar construct. However, while the CFI Alternatives and Control subscales were significantly correlated in the combined and non-clinical samples, they were not in the clinical sample, suggesting that the CFI total score may not be valid in a clinical sample as the subscales measure weakly related concepts. For example, the CFI Alternatives subscale refers to the consideration of multiple solutions (e.g., "I consider multiple options before making a decision" and "I look at difficult situations from many difference angles") compared with the Control subscale which seems to assess more self-efficacy based beliefs (e.g., "I am capable of overcoming difficulties in life", "I have no power to change things").

Consistent with previous findings (e.g., Lounes et al., 2011), the CFS demonstrated poor convergent validity with all of the neuropsychological measures of cognitive flexibility in both the clinical and non-clinical samples with all correlations non-significant, and only showed a weak relationship with measures in the combined sample (r = .2-.3). Hence the CFS demonstrated poor convergent validity with neuropsychological measures of cognitive flexibility and appears to assess a different construct or at least a different type of cognitive flexibility (see Table 3 for detailed results).

Table 3

Partial correlations between self-report measures of cognitive flexibility, and neuropsychological measures controlling for gender

		CFI Total	CFI Alternatives	CFI Control	CFS
Combined sample	CFI Total	-			
	CFI Alternatives	.884***	-		
	CFI Control	.813***	.446***	-	
	CFS	.795***	.663***	.695***	-
	Stroop	.430***	.364***	.371***	.362***
	TMT-B	.306**	.271**	.248*	.253*
	COWAT	.411***	.304**	.408***	.308
	RFFT Unique Designs	.253*	.199	.236*	.216*
	RFFT Error Ratio	.009	.073	-.073	.028
	WCST Perseverative Errors	.227*	.221*	.160	.197
	ACE-R Fluency	.261**	.192	.260**	.285**
Clinical Sample	CFI Total	-			
	CFI Alternatives	.888***	-		
	CFI Control	.637***	212	-	
	CFS	.792***	.645***	.602***	-
	Stroop	.229	.244	.077	.264
	TMT-B	.108	.182	-.076	.120
	COWAT	.160	.155	.080	.033
	RFFT Unique Designs	.277	.224	.213	.232
	RFFT Error Ratio	.029	.033	.005	.045
	WCST Perseverative Errors	.284	.197	.275	.187
	ACE-R Fluency	.001	.007	-.010	.036
Non-clinical Sample	CFI Total	-			
	CFI Alternatives	.872***	-		
	CFI Control	.734***	.307*	-	
	CFS	.640***	.493***	.560**	-
	Stroop	.178	.160	.123	.038
	TMT-B	.283*	.190	.285*	.165
	COWAT	.212	.091	.285*	.102
	RFFT Unique Designs	.096	.057	.108	.085
	RFFT Error Ratio	-.060	.081	-.229	-.029
	WCST Perseverative Errors	.179	.225	.035	.187
	ACE-R Fluency	.193	.122	.206	.225

Note. ACE-R Fluency = Addenbrooke's Cognitive Examination – Revised Fluency subscale, CFI Alternatives= Cognitive Flexibility Inventory Alternatives subscale, CFI Control= Cognitive Flexibility Inventory Control subscale, CFI Total = Cognitive Flexibility Inventory Total Score, CFS=Cognitive Flexibility Scale, COWAT = Controlled Oral Word Associations Test, RFFT = Ruff Figural Fluency Test, Stroop = Stroop Colour-Word Test, TMT-B = Trail Making Test Part B, WCST = Wisconsin Card Sorting Test
*$p < .05$, **$p < .01$, ***$p < .001$

There was slightly stronger evidence of convergent validity between scores on the CFI and neuropsychological measures in the combined sample, but not in either the clinical or non-clinical samples separately. The combined sample showed a significant and moderate relationship between each CFI index and scores on the Stroop, TMT-B, and COWAT, along with a significant but small relationship between the CFI total score and CFI Control subscale with the RFFT Unique designs and ACE-R fluency subscale. Additionally there was a significant weak relationship between the CFI Alternatives subscale and WCST perseverative errors in the combined sample. The non-clinical sample showed weak evidence of a relationship between self-report and neuropsychological scores, with a weak significant correlation between the CFI Control subscale with TMT-B and COWAT performance and between the CFI Total score and TMT-B performance, but not with any other measure. There was no significant relationship between scores on the CFI indices and neuropsychological measures in the clinical sample. Overall, results for the clinical and non-clinical samples were generally consistent with previous findings (Dennis, 2009), and suggest that scores on the CFI measure a different aspect of cognitive flexibility compared with the type of cognitive flexibility assessed by neuropsychological testing.

To assess divergent validity, partial correlations were calculated between self-report measures of cognitive flexibility and symptom measures (GDS and GAI), along with non-flexibility-related neuropsychological tests (ACE-R visuospatial, ACE-R language and ACE-R attention/orientation subscales, and TMT-A), controlling for gender (see Table 4). The CFS showed moderate correlations with the GAI and GDS in the combined and non-clinical samples, and a moderate relationship with depression in the clinical sample. This latter relationship may be seen as evidence of convergent validity, given the poorer cognitive flexibility associated with high levels of anxiety and depression.

Conversely however, the stronger relationship with anxiety and depression than with neuropsychological measures of cognitive flexibility might be seen as indicative of poor divergent validity. Similarly, the CFI showed poor divergent validity from symptom measures in the combined sample, with moderate to strong correlations between GAI and GDS scores and all three CFI indices.

Table 4

Partial correlations between self-report measures of cognitive flexibility and symptoms measures, and divergent neuropsychological measures controlling for gender

		CFI Total	CFI Alternatives	CFI Control	CFS
Combined sample (N=100)	GAI	-.598***	-.379***	-.672***	-.513***
	GDS	-.662***	-.494***	-.665***	-.594***
	TMT-A	.302**	.304**	.199*	.235*
	ACE-R Attention and Orientation	.038	-.065	.153	.006
	ACE-R Visuospatial	.030	.058	-.015	-.050
	ACE-R Language	.114	.058	.146	.108
Clinical Sample (N=47)	GAI	-.214	-.081	-.319*	-.282
	GDS	-.239	-.242	-.102	-.296*
	TMT-A	.110	.226	-.145	.115
	ACE-R Attention and Orientation	-.129	-.215	.087	-.155
	ACE-R Visuospatial	.038	.008	.066	-.064
	ACE-R Language	.019	.013	.019	.051
Non-clinical Sample (N=53)	GAI	-.356*	-.267	-.321*	-.404**
	GDS	-.379**	-.264	-.381**	-.541***
	TMT-A	.305*	.245	.252	.157
	ACE-R Attention and Orientation	.135	.080	.151	.142
	ACE-R Visuospatial	.064	.145	-.076	-.034
	ACE-R Language	.114	.010	.208	.055

Note. ACE-R Attention and Orientation = Addenbrooke's Cognitive Examination – Revised Attention and Orientation subscale, ACE-R Visuospatial = Addenbrooke's Cognitive Examination – Revised Visuospatial subscale, ACE-R Language = Addenbrooke's Cognitive Examination – Revised Language subscale, CFI Alternatives= Cognitive Flexibility Inventory Alternatives subscale, CFI Control= Cognitive Flexibility Inventory Control subscale, CFI Total = Cognitive Flexibility Inventory Total Score, CFS=Cognitive Flexibility Scale, GAI= Geriatric Anxiety Inventory, GDS=Geriatric Depression Scale, TMT-A=Trail Making Test - Part A.
*p < .05, **p < .01, ***p < .001

There were moderate correlations between the CFI total score and CFI Control subscale with scores on the GAI and GDS in the non-clinical sample, but no relationship between the CFI Alternatives subscale and GAI and GDS scores in the non-clinical sample. Divergent validity from anxiety and depression was mostly adequate in the clinical sample. Results suggest that the CFI and CFS are less affected by negative and anxious mood states in clinical settings compared with non-clinical populations, even though these measures do not assess the same construct as neuropsychological measures of cognitive flexibility. Divergent validity from non-flexible neuropsychological measures was mostly adequate in all samples. There was a weak to moderate relationship between the CFI indices and CFS with scores on TMT-A in the combined sample, and between the CFI Total score with TMT-A scores in the non-clinical sample, but not with any other measures. There was good divergent validity from other neuropsychological measures in the clinical sample.

It is possible that the variability in findings between the combined sample and separate clinical and non-clinical samples is due to the limited sample size in each subgroup, however given that the CFI and CFS appear to have slightly different psychometric properties in the clinical and non-clinical samples, it may be more appropriate to consider these groups separately rather than to use the results from the combined sample.

Overall, the results of this study suggest that scores on the CFS and CFI demonstrate suitable reliability and structure with older adults, but their validity as measures of cognitive flexibility is unclear. Findings suggest that the CFI and CFS are influenced by negative and anxious mood states in non-clinical settings, although this was not the case in a clinical population. Scores on the CFI and CFS showed poor convergent validity with neuropsychological measures in both the clinical and non-clinical

populations, suggesting that scores on this measure should not be used as a proxy for neuropsychological testing in older adults. The results indicate that the CFI and CFS measure different aspects of cognitive flexibility, for example the perception of difficult situations as controllable and openness and self-efficacy for adapting behaviour are concepts tapped by the self-report measures that seem different to neuropsychological performance. Further testing is needed to examine the relationship of self-report cognitive flexibility measures to flexibility in thinking as needed for psychological treatment to better understand the usefulness of these measures.

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PAPER 4. The influence of cognitive flexibility on treatment outcome and cognitive restructuring skill acquisition during cognitive behavioural treatment for anxiety and depression in older adults: Results of a pilot study

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Abstract

There is some evidence that cognitive flexibility negatively impacts cognitive restructuring skill acquisition with brief training; however, there is little understanding of how this relates to learning cognitive restructuring over the course of a therapy program, and how it relates to overall treatment outcome. This study assessed the impact of cognitive flexibility on cognitive restructuring skill acquisition following group CBT, and on treatment outcome, along with changes in cognitive flexibility over treatment. 44 older participants with anxiety and depression completed self-report and neuropsychological tests of cognitive flexibility and a clinical interview at pre and post-treatment. Qualitative and quantitative measures of cognitive restructuring were completed at post-treatment. Pre-treatment cognitive flexibility was not related to the quality of cognitive restructuring at post-treatment or overall treatment outcome. However, it did predict reduction in subjective units of distress from using cognitive restructuring and therapist ratings of cognitive restructuring ability at post-treatment. Few participants showed changes in cognitive flexibility over treatment. Those with poorer cognitive flexibility may not find cognitive restructuring as useful to alleviate emotional distress as those with better cognitive flexibility. However, those with poorer cognitive flexibility can still benefit from standardised CBT, even if their use of cognitive restructuring is less effective.

Introduction

Although there are a number of studies and meta-analyses demonstrating the efficacy of cognitive behavioural therapy (CBT) for late-life anxiety and depression (Goncalves & Byrne, 2012; Gould, Coulson, & Howard, 2012; Hendriks, Voshaar, Keijsers, Hoogduin, & van Balkom, 2008; Pinquart & Duberstein, 2007; Samad, Brealey, & Gilbody, 2011; Thorp et al., 2009), older adults experience normal age-related cognitive changes that may have the potential to impact their ability to engage and use particular treatment techniques. Executive functioning skills broadly, and cognitive flexibility more specifically, appears to be important for the ability to utilise certain treatment techniques, but requires further investigation given that it naturally declines with age. To date, little research has examined whether declines in cognitive skills impact on either overall treatment outcomes, or on specific therapy skill acquisition. Given the ageing of the world's population, it is important that more research is focused on understanding the impact of age-related cognitive changes in older adults on the treatment of mental health problems.

CBT represents a collaborative form of therapy that requires active participation and skill acquisition by clients, and in particular, the practice and use of skills outside of the therapy session to improve clients' ability to utilise more adaptive ways of thinking and behaving (Beck, Rush, Shaw, & Emery, 1979; Burns & Spangler, 2000; Kazantzis & Lampropoulos, 2002). Older adults are a heterogeneous age group with varying health status, cognitive and functional abilities, and despite high levels of acceptability and preference for psychological interventions for mental health, older adults have predominantly received medication treatment as a first line intervention for mental health problems (Landreville, Landry, Baillargeon, Guerette, & Matteau, 2001; Mohlman, 2012; Olfson & Marcus, 2009; Unützer et al., 2003). Improving the potential for older adults to

receive evidence-based and client-preferred treatment also involves understanding and examining some of the barriers faced by clinicians. Cognitive therapy has presented a particularly controversial issue for clinicians working with older adults. There have been suggestions that older adults are not able to effectively engage in cognitive restructuring given the requirements for abstract reasoning skills and that cognitive restructuring may need to be altered or abandoned with this age group (Church, 1983; Koder, Brodaty, & Anstey, 1996; Wilkinson, 1997). Others have suggested that modification and adaptations should not be considered necessary with all older people but might be for some (Laidlaw, 2001; Laidlaw & McAlpine, 2008; Laidlaw, Thompson, Dick-Siskin, & Gallagher-Thompson, 2003; Zeiss & Steffen, 1996). However there is little empirical guidance regarding clinical features that might indicate the need for a change to treatment as usual.

There is some evidence that executive functioning may be one of the factors involved in poorer treatment outcome for some older adults. Two studies with late-life Generalized Anxiety Disorder (GAD) have found that although pre-treatment executive functioning skills did not predict treatment outcome, changes in executive functioning over treatment did (Mohlman, 2013; Mohlman & Gorman, 2005). These studies found that older adults with executive functioning skills that fell in or below the low-average range at both pre and post-treatment showed a poorer treatment response compared with those who had intact executive skills at pre and post-treatment. In addition, those who showed an improvement from pre to post-treatment in executive functioning showed the greatest reduction in anxiety symptoms (Mohlman, 2013; Mohlman & Gorman, 2005). Another study found that CBT supplemented with an executive skills training program targeting sustained, alternating, selective, and divided attention, improved treatment outcomes compared with standard CBT (Mohlman, 2008). While these studies suggest that executive functioning is involved in the ability to benefit from CBT, executive functioning represents

a broad range of skills and it is unclear what specific aspect of executive functioning is important. Given that CBT interventions incorporate a number of different treatment techniques, it is also unclear which treatment components were negatively affected by executive dysfunction in these studies.

The skills required for cognitive restructuring closely map those involved in cognitive flexibility. Cognitive flexibility is one aspect of executive functioning that represents the mental ability to consider multiple ideas, flexibly switch cognitive sets and inhibit habitual responses to adopt a more adaptive or functional behaviour or understanding (Rende, 2000; Scott, 1962). These processes seem important for the successful implementation of cognitive restructuring where the individual is required to identify a negative automatic thought, generate evidence that contradicts that thought, and subsequently generate a more adaptive or helpful way of interpreting the situation (Beck, 1976; Beck et al., 1979). The measurement of cognitive flexibility is complex. In general, this aspect of executive functioning is assessed via neuropsychological measures, although there have been several self-report measures developed that propose to assess cognitive flexibility. Previous studies have indicated that self-report measures of cognitive flexibility show poor convergent validity with neuropsychological measures of cognitive flexibility, suggesting that they assess a qualitatively different construct (Dennis, 2009; Johnco, Wuthrich, & Rapee, 2013b). Self-report measures are limited by insight into cognitive functioning, and may be subject to reporting biases, although they may be a useful adjunct to neuropsychological assessment when assessing cognitive flexibility more broadly.

In a series of studies, cognitive flexibility has been shown to be important for cognitive restructuring skill acquisition in older clinical and non-clinical samples (Johnco, Wuthrich, & Rapee, 2013a, 2013c). For instance, in a non-clinical older sample, poorer cognitive flexibility was associated with reduced ability to learn cognitive restructuring

with brief training in an experimental session (Johnco et al., 2013c). Similarly, when a clinical sample of older adults with anxiety and depression was compared to a non-clinical sample, cognitive flexibility was found to partially explain poorer cognitive restructuring skill acquisition in the clinical older adults compared to the non-clinical older adults (Johnco et al., 2013a). In these studies, cognitive restructuring skill acquisition was assessed by rating the individual's ability to apply cognitive restructuring to a personally distressing situation and unhelpful thought by generating good quality disconfirmatory evidence, generating a more adaptive thought, and experiencing a significant reduction in subjective distress as a result of the cognitive restructuring process.

In a similar study, Mohlman (2013) examined the effects of executive functioning on a range of clinical outcomes including cognitive restructuring ability. She found that verbal executive functioning skills were related to the amount of disconfirmatory evidence generated by older adult participants with GAD applying cognitive restructuring for the first time in therapy. In addition, both verbal and non-verbal executive functioning skills were related to the efficacy of cognitive restructuring to reduce subjective distress ratings. These studies together suggest that impaired cognitive flexibility and executive functioning skills negatively impact the implementation of cognitive restructuring among older adults (Johnco et al., 2013c; Mohlman, 2013). However, because these results are from brief cognitive restructuring interventions, either during the first in-session practice of cognitive restructuring or in an experimental paradigm, it is unclear whether cognitive flexibility and executive functioning impacts the ability to learn cognitive restructuring over the duration of therapy in which cognitive restructuring is regularly practiced, and corrected by a therapist. Understanding whether these findings extend to post-treatment skill acquisition is important to better determine whether reduced cognitive flexibility or executive

functioning is a pre-treatment factor that would indicate the need to adapt or eliminate cognitive restructuring with some older clients.

This study aimed to extend previous findings by assessing firstly, whether cognitive flexibility can be used as a pre-treatment indicator of post-treatment cognitive restructuring skill acquisition; secondly, whether pre-treatment cognitive flexibility is predictive of overall treatment outcome; and thirdly, whether cognitive flexibility performance changes over the course of CBT. Based on previous findings, we hypothesized that those with poorer pre-treatment cognitive flexibility would show poorer cognitive restructuring skill acquisition, and poorer treatment response. We also expected that cognitive flexibility would improve from pre to post-treatment, as anxiety and depressive symptoms improved.

Method

Participants

A clinical sample of older adults (aged over 60 years) with comorbid anxiety and depression (N = 44, female = 52.3%, age range 61-78, M = 66.73, SD = 4.42) were recruited from the CBT treatment arm of a larger randomized control trial for the treatment of anxiety and depression in late life (Wuthrich, Rapee, Kangas, & Perini, 2013). All participants had participated in a related study prior to treatment in which cognitive flexibility and the ability to learn cognitive restructuring in an experimental session was examined (Johnco et al., 2013a). They were invited to participate in this follow-up study, after receiving 11 sessions of CBT, to look at longitudinal results and the impact of treatment on cognitive flexibility and cognitive restructuring skill. Drop-out rate was low from pre to post-treatment (N = 4). Three participants dropped out of treatment and therefore were unsuitable for follow-up testing due to a lack of cognitive restructuring practice, and one participant declined to attend the post-treatment testing session due to

carer responsibilities. Only the data for participants who attended both experimental sessions (pre and post treatment) were included in this study (N = 40). Demographic details for the sample are presented in Table 1.

Table 1

Sample demographics

	Sample (N = 44)	
CHARACTERISTIC	***Range***	***M (SD)***
Age	61-78	66.73 (4.42)
Education *(years)*	9-20	14.18 (3.17)
Number of Physical Health Conditions	0-17	4.84 (3.00)
	N	***% of sample***
Female	23	52.3
Region of birth		
Australia	34	77.3
UK/Europe	7	15.9
Asia	1	2.3
Africa/South Africa	1	2.3
New Zealand	1	2.3
Marital status		
De Facto	1	2.3
Married	26	59.1
Divorced	13	29.5
Widowed	4	9.1
Employment Status		
Employed Full-time	4	9.1
Semi-retired	13	29.5
Retired	27	61.4

All participants met DSM-IV (American Psychiatric Association, 2000) diagnostic criteria for both an anxiety and mood disorder (61% were diagnosed with a primary anxiety disorder and 39% with a primary mood disorder) at pre-treatment as assessed using the Anxiety Disorders Interview Schedule for DSM-IV (ADIS, Di Nardo et al., 1994) at the entry point to the treatment study. Participants had a mean baseline severity score (see below) of 5.95 (SD = 1.06) for the primary diagnosis and 4.91 (SD = 1.10) for their

secondary diagnosis out of a possible severity score of 8, where scores of 4 and above are considered clinical.

Materials

Anxiety Disorders Interview Schedule (ADIS-IV; Di Nardo, Brown, & Barlow, 1994): The ADIS is a structured interview designed to assess and diagnose anxiety disorders according to DSM-IV criteria, and to assess a range of commonly comorbid conditions including mood disorders, somatoform and substance use disorders. Each diagnosis receives a clinician severity rating (CSR) from 0-8, indicating the clinical and functional severity of the disorder, with ratings ≥ 4 indicating that full diagnostic criteria were met. Participants were assessed by graduate level students who received training in the use of the instrument and regular supervision by an experienced Clinical Psychologist. Reliability coding was conducted on 25% of ADIS interviews in the RCT from which the clinical sample was drawn, with acceptable interrater reliability (kappa = .70 for mood disorder and .72 for anxiety disorders).

Geriatric Anxiety Inventory (GAI; Pachana et al., 2007): The GAI is a 20-item self-report measure designed to assess the severity of anxiety symptoms in the elderly. Items have a forced-choice yes/no format and are all scored in a single direction. Scores above 8 (out of 20) are indicative of diagnostic levels of anxiety (Pachana & Byrne, 2012). This measure has demonstrated good reliability and validity in a range of geriatric settings (Pachana & Byrne, 2012; Pachana et al., 2007).

Geriatric Depression Scale (GDS; Yesavage et al., 1982): The GDS is a 30-item self-report scale designed to assess the severity of depressive symptoms in the elderly. This scale has a yes/no format, and studies indicate that scores above 11 (out of 30) are indicative of diagnostic levels of depression (Brink et al., 1982). The measure has

demonstrated good reliability and validity for use with older people (Yesavage et al., 1982).

Cognitive Flexibility Inventory (CFI; Dennis & Vander Wal, 2010): The CFI is a 20-item self-report scale designed to measure flexibility in terms of understanding and responding to the world. The Alternatives subscale reflects a person's ability to generate multiple solutions to difficult situations and perceive multiple alternative explanations for events. The Control subscale reflects a person's tendency to perceive difficult situations as controllable. Higher scores on this measure indicate greater cognitive flexibility. The Alternative and Control subscale were not correlated in an older clinical sample, suggesting that the total score is not appropriate to use, and these subscales assess different constructs. The Alternative subscale assesses the consideration of multiple solutions (e.g., "I consider multiple options before making a decision" and "I look at difficult situations from many different angles") while the Control subscale assesses more self-efficacy based beliefs about being flexible (e.g., "I am capable of overcoming difficulties in life", "I have no power to change things"). This measure demonstrated good internal consistency and convergent construct validity with the Cognitive Flexibility Scale (CFS; Martin & Rubin, 1995) in a student sample, older clinical sample and older non-clinical sample (Dennis & Vander Wal, 2010; Johnco et al., 2013b), however the convergent validity with neuropsychological measures of cognitive flexibility was poor, suggesting that this scale measures a different aspect of cognitive flexibility compared with neuropsychological testing (Johnco et al., 2013b).

Cognitive Flexibility Scale (CFS; Martin & Rubin, 1995) The CFS is a 12-item self-report scale that assesses the aspects of cognitive flexibility considered relevant for effective communication: awareness of communication alternatives, willingness to adapt to the situation and self-efficacy in responding flexibly (Martin & Rubin, 1995). Each item on

the questionnaire consists of a statement dealing with beliefs and feelings about behaviour. The CFS demonstrates adequate internal consistency and high, 1-week test–retest reliability in a student sample (Martin & Rubin, 1995). This measure has shown adequate internal validity in an older sample and convergent validity with the CFI, although has poor convergent validity with neuropsychological measures of cognitive flexibility (Johnco et al., 2013b).

Addenbrooke's Cognitive Examination – Revised (ACE-R; Mioshi, Dawson, Mitchell, Arnold, & Hodges, 2006)*:* The ACE-R is a brief cognitive screening test sensitive to mild cognitive impairment and dementia. The ACE-R includes a Mini-Mental State Examination score and five sub-domain scores (attention and orientation, memory, verbal fluency, language and visuospatial ability). The total score ranges from 0 to 100, with higher scores reflecting better functioning. Scores under 82 are indicative of dementia (Mioshi et al., 2006).

Wisconsin Card Sorting Test- Computer Version 4 (WCST-C4; Heaton & PAR Staff, 2003): The WCST-C4 is a computerized neuropsychological test of cognitive flexibility and set-shifting in response to changing environmental contingencies (Heaton, Chelune, Talley, Kay, & Curtiss, 1993). Participants are presented with four stimulus cards and required to sort the remaining cards by matching to the stimulus cards, but not given instructions on the matching principle (colour, number or shape). Participants must determine the sorting rule based on feedback following each sort. This task requires organization and planning, the ability to effectively utilize feedback to shift cognitive set and the ability to modulate impulsive responding (Spreen & Strauss, 1998). Normative data adjusted for age and education was used (Heaton et al., 1993). The perseverative errors index was used in analyses given its relevance to cognitive flexibility.

Trail Making Test Part B (TMT-B; Reitan & Wolfson, 1985): TMT-B is a pencil and paper task that requires alphanumeric sequencing. This task measures cognitive flexibility mental set shifting, visual processing and psychomotor speed (Spreen & Strauss, 1998). Greater completion time indicates poorer cognitive flexibility. Normative data corrected for age and education was used from the Mayo's Older American's Normative Studies to score the task (MOANS; Ivnik, Malec, Smith, Tangalos, & Petersen, 1996).

Controlled Oral Word Associations Test (COWAT; Benton & Hamsher, 1976): The COWAT is a commonly used verbal fluency task that requires the participant to generate as many words as possible in a sixty-second interval beginning with a specified letter. The standard letters (F, A and S) were used (Strauss, Sherman, & Spreen, 2006). Recommended scoring was used and excluded proper nouns and repetitions from the total score. MOANS normative data corrected for age and education was used to score this task (Ivnik et al., 1996).

Stroop Color-Word Test (Golden, 1978): The Stroop color-word is a commonly used measure of inhibitory control, and requires participant to name the ink color of a color-incongruent word (e.g., correctly naming the ink color red when the printed word says "BLUE"). This task requires the participant to inhibit an automatic reading response in favour of a less familiar color-naming response. Data was normed using MOANS norms corrected for age and education (Ivnik et al., 1996).

Ruff Figural Fluency Test (RFFT; Ruff, 1988): The RFFT is a pencil and paper task that measures design fluency. Participants are presented with a series of dot patterns, with and without distractors present in the task, and are required to generate a series of unique designs. Scoring assesses the number of unique designs generated under a time constraint, along with the ratio of perseverative responses to unique designs (called the Error Ratio). Scoring was corrected for age and education (Ruff, 1988).

Treatment

Participants completed a manualised group cognitive-behavioural therapy program (Wuthrich, 2009) delivered by graduate students in clinical psychology given regular supervision. Treatment consisted of 11 sessions of two hours duration over a 12 week period. Treatment components included psychoeducation, mood monitoring, activity scheduling, identification of thoughts, cognitive restructuring, problem solving, sleep strategies, graded exposure, assertiveness training and dealing with grief and bereavement. During CBT participants practiced cognitive restructuring as outlined in the group treatment manual (Wuthrich, 2009) and for homework using the program's structured form. The form instructs participants to rate the intensity of their subjective units of distress (SUDs) following the identification of the triggering situation, cognition and emotion on a scale from 0-100. Prompting questions are provided to assist participants to generate a range of disconfirmatory evidence, such as: "what alternatives are there to this situation?" and "how likely is it that this will really happen?." Participants use this evidence to produce an adaptive thought and re-rate their SUDs. This group program has demonstrated in a randomized controlled trial to be an effective treatment for comorbid anxiety and depression in older adults (Wuthrich & Rapee, 2013). Participants for this study were recruited from 7 consecutive CBT groups, with each group consisting of 5-8 members.

Treatment Outcome Assessment: Treatment outcome was examined in a categorical and continuous way. First, participants were categorically classified as treatment responders using a reliable change index (Jacobson & Truax, 1991) to assess whether change in primary diagnostic severity was clinically significant. Participants were classified as treatment responders if the change in their primary diagnosis exceeded the 90% confidence interval (RCI ± 1.645). Second, a difference score was calculated between

pre and post-treatment ADIS primary diagnosis CSR to assess reduction in disorder severity over treatment.

Post-treatment Cognitive Restructuring Assessment: In a post-treatment experimental session, participants were asked to demonstrate their ability to complete a cognitive restructuring form in the way that they had been practicing in treatment. They were directed to think of a recent or current distressing situation and then complete the form unassisted. Their ability to do this was scored for quality by an independent clinical psychologist accredited in CBT using existing coding criteria focusing on the ability to generate good quality evidence and a suitable replacement thought (see Johnco et al., 2013c for more information). In addition the reduction in SUDs ratings within the cognitive restructuring task was calculated as a measure of the efficacy of cognitive restructuring to decrease emotional distress.

Therapist-rated Cognitive Restructuring: The therapist that facilitated each group program rated each participant at the end of the 11-week program on the extent to which they felt the participant was able to successfully implement cognitive restructuring to manage personal challenges at the conclusion of therapy. Ability was rated on the 0-3 scale shown in Table 2. Given participants were part of a group program and are often invited to assist in cognitive restructuring examples for other group members, therapists received the following instructions:

"Please provide a rating of this client's cognitive restructuring skills at the end of therapy. Please consider how well the client was able to independently use cognitive restructuring to manage their negative cognitions. This may be evident from their discussion of homework, and in-session examples and contributions. When rating this skill acquisition, please consider how well the client can apply this skill to their own thoughts and situation rather than how well they can challenge other people's negative thoughts."

Table 2

Therapist-rated Cognitive Restructuring

Score	Description
0	Irrelevant or missing responses to negative cognitions. For example, client fails to challenge the validity of the cognition, provides only information that supports the negative cognition (e.g. last week I forgot to pay the electricity bill), or does not use the technique independently.
1	Poor cognitive restructuring skills. Elicits only problem solving responses to negative cognitions, with no direct challenging of the cognitions (e.g. in response to challenging a cognition about having no-one to talk to at a social function – "try to avoid future situations like this", or challenging a cognition about having a heart attack – "be brave, drink water and pray").
2	Weak attempts to dispute or disprove automatic thoughts, or responses that specify no clear adaptive perspective or behaviour (e.g. "Maybe it won't happen", "Hang in there", "You're just catastrophizing"). Client demonstrates rudimentary skills but has problems effectively using cognitive restructuring to effectively manage negative automatic thoughts.
3	Strong cognitive restructuring skills. Client is able to independently implement this skill and shows realistic attempts to seek evidence that disputes the validity of automatic thoughts, or develop an adaptive alternative interpretation of the situation (e.g. "I can negotiate with him further about my needs", "Just because my child got a divorce doesn't mean I'm a failure as a parent". "His behaviour stems from his alcoholism, and I can't take the blame for that".)

Procedure

The study was approved by the relevant Human Research Ethics Committee, and all participants provided informed written consent prior to participation. Participants who had previously attended an experimental testing session prior to starting treatment, attended a further experimental session immediately following the completion of the group treatment program. In this session, participants completed the self-report questionnaires, neuropsychological tasks and the post-treatment cognitive restructuring task. Therapist ratings of participants' cognitive restructuring ability were completed by the primary therapist immediately after the final treatment session. Coding of the post-treatment

cognitive restructuring task was completed by an independent clinical psychologist, not involved with neuropsychological testing or treatment. Therapists were blind to the outcome of neuropsychological testing.

Results

Preliminary Analyses

It is not unusual for cognitively intact older adults to score in the impaired range on one or two individual measures (Brooks & Iverson, 2010; Palmer, Boone, Lesser, & Wohl, 1998). This may be due to factors such as anxiety, fatigue or confusion over task demands. Therefore rather than focusing specifically on each of the cognitive tests used to examine cognitive flexibility we calculated a cognitive flexibility composite score at pre and post-treatment, similar to that used in Johnco et al. (2013a). A factor analysis using principal axis factoring was conducted using all the neuropsychological measures of cognitive flexibility (Stroop, COWAT, TMT-B, RFFT Unique Designs, RFFT Error Ratio and WCST Perseverative Errors) at post-treatment to confirm the suitability of the composite score structure found at pre-treatment. As found at pre-treatment (Johnco, et al., 2013), the anti-image correlation matrix showed that the RFFT Error Ratio correlated far below the recommendations of > .5-.7 (r = .309), suggesting that the RFFT Error Ratio was not appropriate to include in the factor analysis. Therefore a factor analysis using the remaining variables was conducted and it indicated a one factor solution for the remaining variables (Stroop, COWAT, TMT-B, RFFT Unique Designs and WCST Perseverative Errors) at post-treatment (KMO = .817, Bartlett's test of sphericity χ^2 = 62.807, $p < .001$ respectively). This factor explained 46.67% of the variance in post-treatment cognitive flexibility measures. As such, unit-weighted z-score composite scores were calculated to

represent cognitive flexibility at post-treatment. RFFT Error Ratio z-score was entered separately in analyses as it did not form part of the composite score.

Bivariate correlations were conducted between demographic factors (age, education, and number of health problems), cognitive flexibility factors (cognitive flexibility self-report measures and neuropsychological measures) cognitive restructuring outcome variables (cognitive restructuring quality, reduction in SUDS and therapist rated cognitive restructuring ability) and treatment outcome variables (reduction in ADIS severity score, reduction in GAI score and reduction in GDS score) and suggest that education was correlated with pre-treatment and post-treatment RFFT Error Ratio performance (r = -.361 and -.370 respectively), as well as with reduction in ADIS severity score (r = -.490). As such, education was entered as a covariate into regression analyses. Examination of the scatter plots suggested two outliers, one on the CFS scale and one on the cognitive flexibility composite score, and these were removed for all analyses.

Table 3 summarises descriptive statistics on measures of anxiety and depression, self-report and neuropsychological measures at pre at post-treatment. Paired t-tests showed improvement from pre to post-treatment on structured clinical interview severity ratings (ADIS CSR), self-report measures of anxiety and depression (GAI and GDS), self-report measures of cognitive flexibility (CFI Alternative and Control subscales and CFS), Stroop, COWAT, RFFT Unique Designs and WCST perseverative errors, as well as on the cognitive flexibility composite score. To assess the bivariate relationships between predictor and outcome measures, bivariate correlations were conducted between pre-treatment cognitive flexibility measures and cognitive restructuring and the reduction in ADIS CSR treatment outcome measure, and one-way ANOVAs were conducted for the relationship between cognitive flexibility measures and the treatment responders outcome measure (see Table 4).

Table 3

Pre and post-treatment questionnaires and neuropsychological measures

	Pre-treatment		**Post-treatment**		**Comparison Statistics**
Measure	***Range***	***M (SD)***	***Range***	***M (SD)***	***t***
ADIS Primary Disorder CSR	4-8	5.95 (1.06)	0-8	3.36 (1.79)	10.02***
Geriatric Anxiety Inventory	1-19	10.89 (4.60)	0-19	7.02 (5.86)	5.85***
Geriatric Depression Scale	9-30	17.30 (4.87)	0-28	11.23 (7.27)	6.69***
Addenbrooke's Cognitive Examination - Revised	82-100	91.98 (4.92)	74-100	92.14 (5.79)	-.194
- Attention and Orientation subscale	15-18	17.86 (.51)	15-18	17.68 (.71)	1.48
- Memory subscale	17-26	22.70 (2.76)	9-26	23.09 (3.53)	-.73
- Fluency subscale	4-14	11.16 (2.36)	5-14	11.55 (2.15)	-1.10
- Language subscale	21-26	24.8 (1.25)	21-26	24.55 (1.47)	1.19
- Visuospatial subscale	12-16	15.45 (1.00)	11-16	15.27 (1.15)	.75
Cognitive Flexibility Inventory – Alternatives subscale	40-85	65.80 (10.64)	51-90	69.51 (8.45)	-2.89**
Cognitive Flexibility Inventory – Control subscale	17-45	29.61 (6.27)	19-48	32.79 (6.40)	-3.19**
Cognitive Flexibility Scale	38-69	50.05 (7.90)	40-66	53.64 (6.08)	-3.19**
	Range	***M(SD)***	***Range***	***M(SD)***	***t***
Stroop Color-Word Test	2.56-17.44	9.21 (2.98)	5.00-17.00	10.45 (2.67)	-3.89***
Trail Making Test – Part B	4.72-14.93	9.92 (2.55)	5.00-18.00	10.23 (2.83)	-1.29
Controlled Oral Word Association Test	3.30-16.90	9.98 (3.23)	2.00-19.00	11.04 (4.04)	-3.25**
Ruff Figural Fluency Test Unique Designs	34.80-71.90	52.42 (9.44)	39.20-75.00	56.61 (10.01)	-5.66***
Ruff Figural Fluency Test Error Ratio	32.40-65.20	47.30 (7.24)	32.40-83.10	47.94 (9.64)	-.432
Wisconsin Card Sorting Test - Perseverative Errors	32.00-80.00	51.75 (11.89)	34.00-80.00	54.68 (11.23)	-2.194*

Note. *$p < .05$, **$p < .01$, ***$p < .001$, CSR = Clinician Severity Rating. Note: TMT-B, COWAT and Stroop performance are reported in MOANS standard scores, and Ruff Figural Fluency Unique Designs and Error Ratio indices along with WCST perseverative Errors are reported in t-score units.

Table 4

Relationship between pre-treatment cognitive flexibility measures and outcome measures

	CR quality	CR reduction in SUDS	CR therapist ratings	Reduction in ADIS severity rating	Treatment Responder (Y/N)
CFI – Alternatives subscale	.232	-.132	-.057	-.249	1.812
CFI – Control subscale	-.159	.391*	-.091	.073	.000
CFS	-.119	-.036	-.250	-.129	2.261
Stroop Color-Word Test	-.160	.227	.238	.060	1.143
Trail Making Test – Part B	-.119	-.001	.160	-.087	.391
Controlled Oral Word Association Test	.026	.221	.373*	-.161	.975
Ruff Figural Fluency Test Unique Designs	-.011	.192	.310*	-.275	5.959*
Ruff Figural Fluency Test Error Ratio	-.251	-.134	-.133	-.013	.013
Wisconsin Card Sorting Test Perseverative Errors	-.099	.167	.254	.111	.324
Cognitive flexibility composite score	-.101	.252	.397**	-.094	1.660

Note. $*p < .05$, $**p < .01$, $***p < .001$, CFI = Cognitive Flexibility Inventory, CFS = Cognitive Flexibility Scale, CR = Cognitive restructuring, CSR = Clinician Severity Rating, SUDS = subjective units of distress.
Statistics reported for treatment responder status are one-way ANOVA results (F statistics). All other statistics are bivariate correlations.

Cognitive flexibility as a predictor of post-treatment cognitive restructuring skill acquisition

Separate multiple regressions examined predictors of SUDs reduction and cognitive restructuring quality, and a logistic regression evaluated prediction of therapist ratings. Pre-treatment neuropsychological measures and self-report measures of cognitive flexibility (cognitive flexibility composite score, RFFT Error ratio z-score, CFI Alternatives subscale, CFI Control subscale and CFS score) were entered into each multiple regression, together with the participant's level of education. The overall model predicting reduction in SUDs scores across the cognitive restructuring task was significant ($F(6, 35) = 3.474$, $p = .008$, $R^2 = .373$). The cognitive flexibility composite score and CFI Control subscale were significant independent predictors of SUDs reduction ($\beta = .290$, $t = 2.05$, $p = .048$ and $\beta = .554$, $t = 3.36$, $p = .002$ respectively). The model predicting cognitive restructuring quality ratings was not significant ($F(6, 35) = 1.824$, $p = .123$).

An ordinal regression was conducted to assess whether pre-treatment cognitive flexibility predicted therapist-rated cognitive restructuring skill acquisition at post-treatment, controlling for education. The overall model was significant ($\chi^2(6) = 15.05$, $p = .020$, Nagelkerke $R^2 = .332$). The cognitive flexibility composite score, along with the CFS were significant predictors of therapist rated cognitive restructuring skill acquisition (B = .336, $\chi^2(1) = 9.21$, $p = .002$ and B = -.137, $\chi^2(1) = 4.17$, $p = .041$ respectively).

Cognitive flexibility as a predictor of treatment outcome

A logistic regression was conducted to assess whether pre-treatment cognitive flexibility predicted treatment responder status. Pre-treatment cognitive flexibility measures and education were entered into the model. The overall model was significant

($\chi^2(6) = 15.48$, $p = .017$, Nagelkerke $R^2 = .411$) and education was the only significant predictor of treatment response (B = -.415, $\chi^2(1) = 7.93$, $p = .005$).

A regression was conducted to assess whether cognitive flexibility at pre-treatment predicted the change in ADIS CSR from pre-treatment to post-treatment. Pre-treatment cognitive flexibility and education were entered into the regression. The overall model was significant (F (6, 35) = 3.00, $p = .018$), and education was the only significant predictor of reduction in ADIS CSR ($\beta = -.554$, $t = -3.73$, $p = .001$).

Change in cognitive flexibility over treatment

The third aim of this study was to assess whether cognitive flexibility performance changed over the course of treatment. Given that neuropsychological measures are often subject to practice effects, an adapted version of the classic reliable change index (Jacobson & Truax, 1991) method that corrects for measurement error and practice effects on neuropsychological tasks by including a constant based on group-level average change (Heaton et al., 2001; Woods et al., 2006), was adopted using the formula outlined in Parsons, Notebaert, Shields, and Guskiewicz (2009). Participants were considered to have shown reliable improvement when they exceeded the 90% confidence interval (RCI ± 1.645). Table 5 summarises the percentage of participants who obtained scores above or below the 90% confidence interval for each cognitive flexibility index. There was limited reliable change on measures of cognitive flexibility, with less than 10% showing a reliable improvement and less than 5% showing decline in cognitive flexibility skills over treatment.

Table 5

Percentage of sample showing reliable change on cognitive flexibility measures

	Reliable Change	
	Improved (%)	*Declined (%)*
Stroop Color-Word Test	7	2
Trail Making Test – Part B	5	5
Controlled Oral Word Association Test	9	0
Ruff Figural Fluency Test Unique Designs	2	2
Ruff Figural Fluency Test Error Ratio	7	0
Wisconsin Card Sorting Test -Perseverative Errors	5	2
Cognitive Flexibility Composite Score	7	2

Discussion

There is an increasing body of evidence to suggest that cognitive flexibility and executive functioning skills may be implicated in poorer cognitive restructuring skill acquisition and treatment outcome for some older adults. The first aim of this study was to examine whether reduced cognitive flexibility prior to treatment would impede the learning of cognitive restructuring skills over treatment. While previous studies have suggested a link between cognitive flexibility or executive functioning and poorer early attempts at cognitive restructuring skills (Johnco et al., 2013a, 2013c; Mohlman, 2013) we were particularly interested in whether this impacted on individuals' ability to learn cognitive restructuring over a standard therapy intervention in which there was opportunity to practice the skill repeatedly. In this study, we measured cognitive restructuring ability in three different ways and found differences in how cognitive flexibility predicted cognitive restructuring performance based on the different scoring methods. First we examined cognitive restructuring ability by using a quality rating derived from independent scoring that coded ability according to the significance of the evidence collected. Second we examined cognitive restructuring skill based on changes in SUDS ratings given by participants themselves, thus gauging emotional change from the client perspective. Finally

we examined cognitive restructuring skill based on therapists' impressions of the participant's ability to use cognitive restructuring on their problems.

Similar to previous findings (e.g., Johnco et al., 2013a), we found better cognitive flexibility was associated with a greater reduction in self-reported emotional distress (SUDS) from using cognitive restructuring, and that cognitive flexibility was related to better therapist-rated cognitive restructuring skills. The failure to find a significant relationship between pre-treatment cognitive flexibility and post-treatment cognitive restructuring quality was unexpected given our previous findings demonstrating that cognitive flexibility was associated with the ability to learn cognitive restructuring skills (quality ratings) in one session. There are two possible interpretations of this finding. Given the modest sample size in comparison to our previous study involving a clinical sample, our power was limited in terms of being able to detect what is likely a small effect. If this is the case, it may be that poorer cognitive flexibility does negatively impact on technical use of cognitive restructuring, in addition to overall therapist ratings and reduction in emotional distress, although we were unable to detect this effect. Alternatively, it may be that although cognitive flexibility and executive functioning appear to hinder cognitive restructuring skill acquisition with brief interventions or early in therapy (Johnco et al., 2013a, 2013c; Mohlman, 2013), it does not prevent successful technical skill acquisition over longer term interventions due to continued repetition of the skill. In other words, given sufficient practice, even older adults with poor flexibility might eventually "catch up" in learning the technique, even though they do not seem to benefit as much from the strategy overall.

The best way to measure cognitive restructuring skill remains unclear, and each of our outcome measures is likely to have assessed a different aspect of cognitive restructuring skill acquisition. It is likely that clients' self-rated change in SUDS ratings

and therapist ratings of cognitive restructuring ability reflect more of an overall measure of how well clients were able to use this skill to assist with reductions in emotional distress, but may not reflect specific technical or procedural ability within a cognitive restructuring form. Most participants showed moderate to good quality cognitive restructuring skills in a procedural sense, and cognitive flexibility did not predict this. However, accurate technical use of a cognitive restructuring form may not be necessary for older adults to experience a benefit from cognitive restructuring. There may be some idiosyncratic adaptations that older adults make to this skill as they progress through therapy, such as key questions that prompt a more helpful thought that reduces distress, but that does not necessarily challenge the evidence for each of the unhelpful thoughts. The overall therapist rating and SUDS reduction from using cognitive restricting is likely to capture these more individual ways that people use cognitive restructuring over time, and indicates that although those with poor cognitive flexibility may be able to learn cognitive restructuring in a procedural way, they do not experience as much benefit from using this technique as those with better cognitive restructuring. It is possible that there are weaknesses in using the quality coding criteria. For example, generating one good piece of disconfirmatory evidence would not be sufficient to score high on technical ability, but may reflect a clinically significant shift in emotional distress. Anecdotally, some older adults often report that it is sufficient for them to identify that a thought is unhelpful in order to generate a more adaptive way of understanding and responding to a situation. Again, while this would be scored lower in terms of technical ability, the emotional impact or being able to disengage from this unhelpful thought process may be sufficient for symptom relief, and would be rated positively by therapists.

Given that self-report measures of cognitive flexibility appear to assess a qualitatively different aspect of flexible thinking, these measures were included in the

current study. There was little evidence of a relationship between self-report measures and cognitive restructuring ability, and no significant relationship with treatment outcome. The CFI control subscale was a significant predictor of reduction in SUDs as a result of cognitive restructuring. This subscale assesses the tendency to perceive difficult situations as controllable, and is most probably a measure of self-efficacy rather than cognitive flexibility per se (Johnco et al., 2013b). These results suggest that increased self-efficacy or perception of control over situations at pre-treatment was related to greater ability of cognitive restructuring skill to reduce subjective distress at post-treatment. The CFI alternatives subscale assesses the ability to generate multiple solutions, and more closely maps onto the construct of cognitive flexibility, however it did not significantly predict any cognitive restructuring outcome measure, suggesting little utility of self-report measures of cognitive flexibility to predict cognitive restructuring skill acquisition or treatment outcome. The CFS assesses flexibility in communication styles and was a significant predictor of therapist ratings of cognitive restructuring, although this was a negative relationship. This effect was particularly small and since it is inconsistent with theoretical predictions and with the other results, warrants replication in larger samples. These findings indicate that neuropsychological assessment of cognitive flexibility shows a relationship with post-treatment cognitive restructuring skill acquisition but self-report measures do not. These results are consistent with previous findings that suggest that self-report measures assess a different construct to neuropsychological measure of cognitive flexibility (Dennis, 2009; Johnco et al., 2013b).

The second aim of this study was to assess whether pre-treatment cognitive flexibility predicted overall treatment outcome. Somewhat surprisingly, cognitive flexibility did not predict treatment outcome. These results are consistent with previous studies that found that pre-treatment executive functioning did not predict treatment

outcome (Mohlman, 2013; Mohlman & Gorman, 2005). Therefore, it appears that CBT can still be beneficial for older adults, even if they show poor cognitive flexibility. CBT treatment programs include several treatment techniques other than cognitive restructuring. It is not clear whether those with poorer cognitive flexibility gained some advantage from cognitive restructuring that facilitated overall treatment outcome, or whether they failed to get any benefit from cognitive restructuring, but gained sufficient benefits from other techniques in the treatment which compensated for this and supported symptom improvements. Dismantling studies that look at the influence of individual therapeutic techniques in isolation might be able to address these possibilities.

The third aim of this study was to assess whether cognitive flexibility changed over the course of treatment. Using the reliable change method, less than 10% of participants showed a reliable change on cognitive flexibility measures and less than 5% showed a decline, suggesting that overall, participants' cognitive flexibility skills were maintained over time regardless of improvements in anxiety and depression over treatment. While there was a significant improvement using t-tests, the lack of change using a reliable change index suggests that any improvement may reflect practice effects on neuropsychological tasks, or a loss of power when switching to a dichotomous measure of improvement. These findings differ from previous studies that found common changes in executive functioning skills over treatment (Mohlman, 2013; Mohlman & Gorman, 2005), although the method used to calculate change in these studies was based on whether performance was above or below the low-average range on a number of tasks, rather than reliable change indices, and may not represent a valid method of assessing changes in cognitive functioning. Given that changes in neurological structures are likely to take longer than changes in behaviour or emotional reactivity, it is possible that the lack of change may be due to the short space between the two assessment intervals (approximately

three months). Alternatively, it may be that cognitive flexibility is a more stable construct in older age, declining gradually, or that a program based on teaching emotional management strategies might not affect neuropsychological processes. It is possible that changes in cognition are more general, with improvements in more general executive functioning as found by Mohlman and Gorman (2005) and Mohlman (2013) rather than in cognitive flexibility as a specific executive functioning skill.

There were a number of limitations to this study that need to be considered. First, our sample represents a relatively young sample, with high levels of education. Although recruitment for the treatment outcome study from which these participants were drawn was widespread, the reality is that participants attended a university clinic which was situated in a middle class and above metropolitan area. Second, while the overall findings were consistent, studies of pre-treatment factors often fail to demonstrate significant prediction due to limited power caused by small samples. Our analyses were exploratory and aimed to identify potential avenues of study into treatment mediators and moderators within larger treatment trials. It is likely that the small sample size limited the power to detect some smaller effects. Although using factor analysis to generate a composite score of cognitive flexibility supported the loadings identified previously, similarly, this method is limited when using a small sample and needs replication in larger samples, The best way to measure cognitive restructuring ability remains a complex issue and although we used three different measures, there may be alternative ways of assessing cognitive restructuring. Given the different findings between different outcome measures of cognitive flexibility, our findings should be replicated in larger samples, perhaps incorporating more regular assessment of cognitive restructuring skill to allow examination of rates of skill acquisition for cognitive restructuring abilities and factoring in homework compliance and amount of feedback on cognitive restructuring tasks from therapists.

It would be clinically relevant for future studies to assess whether there was a relationship between cognitive flexibility and the ability to maintain treatment gains at longer follow-up periods after the cessation of active treatment. It may be that those who are more flexible are able to continue to utilise treatment techniques independently, while those who are more rigid need additional support to successfully adapt to new problems. The suggestion that CBT might improve cognitive flexibility skills is an important one, and although not established in this study, further research should focus on this issue as improvements in cognitive flexibility might have the added benefit of reducing risk for dementia, for which anxiety and depression are risk factors (Diniz, Butters, Albert, Dew, & Reynolds, 2013; Jorm, 2000). Further research could also explore the benefit of adding cognitive remediation training in addition to CBT to improve treatment outcome in those with poorer cognitive skills, as the initial research is promising (e.g., Mohlman, 2008).

Findings about the necessity of cognitive therapy for positive treatment outcomes are inconsistent, with some studies that suggesting that cognitive therapy skills improves CBT treatment outcome (e.g., Mattick & Peters, 1988), and that stronger cognitive therapy skills help maintain treatment gains and decrease the risk of relapse (e.g., Neimeyer and Feixas, 1990; Strunk, DeRubeis, Chiu, & Alvarez, 2007), while meta-analytic and component analyses have suggested that including cognitive restructuring skills in CBT treatment does not improve treatment outcome (Fedoroff & Taylor, 2001; Feske & Chambless, 1995; Longmore & Worrell, 2007), This study extends previous findings, suggesting that poorer cognitive flexibility negatively impacts the ability to use cognitive restructuring in a way that reduces emotional distress. However, poorer cognitive flexibility does not necessarily prevent older adults from being able to learn a formal cognitive restructuring technique over the course of treatment, or to benefit from an overall CBT program. Given that a dismantling study has not been conducted with older adults, it is not clear whether

cognitive therapy is a necessary treatment component. While cognitive flexibility may be a useful clinical marker to indicate the potential utility of implementing cognitive restructuring with some individuals to relieve emotional distress, it should not be used as a rationale to avoid implementing cognitive therapy altogether as a substantial proportion of older adult clients were able to successfully implement and benefit from this skill. Contemporary models of CBT with older adults (Gallagher-Thompson, Steffen, & Thompson, 2010; Laidlaw, 2001; Laidlaw et al., 2003), highlight the collaborative nature of CBT and allow for idiosyncratic differences in skill acquisition and implementation. Cognitive flexibility may be one of the pre-treatment factors to consider during case formulation and treatment planning with older adults.

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Thesis Discussion

There is emerging evidence that impairments in executive functioning skills negatively impacts on cognitive behavioural therapy (CBT) outcome , however it has been unclear what aspect of executive function underlies this impact, and which treatment components are negatively affected. Cognitive flexibility includes the ability to generate diverse ideas, consider response options and modify behaviours (Rende, 2000), all of which appear to be important for using cognitive restructuring, where the individual must disengage from a negative automatic thought, generate disconfirmatory evidence, and subsequently adopt a more functional understanding and way of responding (Beck, 1976; Beck, Emery, & Greenberg, 1985; Beck, Rush, Shaw, & Emery, 1979; Evans, 2007; Wilkinson, 1997). Hence there is an intuitive relevance for cognitive flexibility skills in the successful use of cognitive restructuring; however this relationship has not been previously examined empirically. Given the controversy surrounding the implementation of cognitive therapy with older adults, this thesis sought to understand whether poor cognitive flexibility was one of the factors involved in difficulty in using and implementing cognitive restructuring among older adults, in addition to comparing methods for measuring cognitive restructuring and for measuring cognitive flexibility. Four studies were used to examined these relationships in both non-clinical and clinical populations.

Review of Thesis Papers and Outcomes

Paper 1: The role of cognitive flexibility in cognitive restructuring skill acquisition among older adults (Published in Journal of Anxiety Disorders)

Previous research indicated that deficits in executive functioning skills had implications for treatment outcome (Mohlman & Gorman, 2005); however, it was still unclear what aspect of executive functioning was important, and what CBT skills were

negatively affected. Therefore this study aimed to examine one aspect of executive functioning, cognitive flexibility, and its relevance to one core CBT skill, cognitive restructuring, in a non-clinical sample (N = 40) of community-dwelling older adults.

Participants completed neuropsychological measures of cognitive flexibility and were taught cognitive restructuring in a single experimental session. Their ability to complete cognitive restructuring after brief training was then coded for quality by an independent rater. The results indicated that most non-clinical older adults (77.5%) were able to learn cognitive restructuring effectively with brief training. However, those with poorer cognitive flexibility, especially increased perseveration of errors, had poorer cognitive restructuring skill acquisition. The results suggested that cognitive flexibility skills are involved in the ability to use cognitive restructuring, and that poorer cognitive flexibility skills in older adults may limit their ability to utilise or benefit from cognitive restructuring in therapy. However, given that this study used a non-clinical sample, it was unclear whether this relationship generalised to clinical samples. Further, given that anxiety and depressive symptoms are associated with impairments in cognitive flexibility, it was unclear whether the presence of anxiety and depression would further exacerbate the relationship between cognitive flexibility and cognitive restructuring skill acquisition. Finally, it was also unclear whether the negative impact of cognitive flexibility would be less severe if individuals were given further opportunity for repeated practice and learning of cognitive restructuring skills as is more typical in therapy.

Paper 2: Learning cognitive restructuring in later-life: The relationship between anxiety and depression, cognitive flexibility and cognitive restructuring skill acquisition in older adults (manuscript submitted for publication).

DISCUSSION

Having established a preliminary relationship between cognitive flexibility and cognitive restructuring ability in a non-clinical sample, paper 2 aimed to extend these findings to a clinical sample. In this paper, cognitive restructuring skill acquisition was compared in a clinical sample of older adults with anxiety and depression (N = 47) and a non-clinical sample (N = 53), and the role of cognitive flexibility as a mediator and moderator in this relationship was examined. In this study, cognitive restructuring skill was assessed via two methods. Firstly, by examining overall quality ratings as coded by an independent rater (as conducted in Paper 1), and secondly by the strength of the reductions in subjective units of distress (SUDs). The results indicated that the clinical sample showed poorer cognitive flexibility compared to the non-clinical sample on some individual measures of cognitive flexibility, and on the composite cognitive flexibility score. The clinical sample also showed poorer quality cognitive restructuring compared to the non-clinical sample, and reported smaller reductions in SUDs ratings as a result of this single episode of cognitive restructuring. Further, cognitive flexibility partially mediated both of these relationships, although was not a significant moderator. This study indicated that older adults with anxiety and depression had greater difficulty learning cognitive restructuring than the non-clinical sample, and that this was partially due to poorer cognitive flexibility. The implications of this study suggest that cognitive flexibility may be a relevant clinical marker to suggest therapeutic modifications with older clients. However given that cognitive restructuring was learnt during a single experimental session, it is unclear whether this is representative of the ability to learn cognitive restructuring during therapy, where it is practiced repeatedly and feedback and corrections are given by therapists (this was addressed later in Paper 4).

Paper 3: Reliability and validity of two self-report measures of cognitive flexibility (manuscript submitted for publication).

There are some practical limitations for administering neuropsychological tests in standard clinical practice, including the need for specialist clinician training, and the potential to induce distress in those undergoing neuropsychological assessment, especially in older adults suffering who commonly worry about their cognitive functioning. Two self-report measures have been developed to assess cognitive flexibility. Although self-report formats would provide some advantages in terms of administration and scoring, it is unclear whether these measures assess the same type of cognitive flexibility assessed by neuropsychological assessments. Thus, it was important to understand the psychometrics of these measures is important before using them in future research with older adults. The third paper compared neuropsychological and self-report methods for examining cognitive flexibility. The Cognitive Flexibility Scale (CFS; Martin & Rubin, 1995) and the Cognitive Flexibility Inventory (CFI; Dennis & Vander Wal, 2010) are two self-report measures of cognitive flexibility. These measures have been developed in younger populations and had been shown to be related to other self-report measures of cognitive flexibility and coping measures. The CFS is a measure of flexibility in interactions and communication style, and assesses an individuals' level of awareness of alternative ways of communicating, willingness to adapt response style to the circumstance, and self-efficacy to be flexible in their responses (Martin & Rubin, 1995). The CFI consists of two subscales; the Control subscale which assesses a person's ability to perceive difficult situations as controllable, and the Alternatives subscale which assesses the ability to generate multiple solutions to problems and to identify alternative explanations to situations (Dennis & Vander Wal, 2010). There was one study suggesting poor convergent validity between the CFS and a the Brixton Spatial Anticipation Test (Burgess & Shallice, 1997), a measure of concept

formation and set-shifting in a young sample of patients with Anorexia Nervosa (Lounes, Khan, & Tchanturia, 2011). Another study found poor convergent validity between the CFS and CFI with three neuropsychological measures, the Trail Making Test (Reitan & Wolfson, 1985), Emotional Card Sorting Test (Deveney & Deldin, 2006), and Finger Tapping Test (Reitan, 1979) in a young student sample. However, the relationship between these self-report measures and neuropsychological measures of cognitive flexibility in older adults was unknown.

In this paper the reliability and validity of the two self-report measures of cognitive flexibility were therefore compared to neuropsychological measures of cognitive flexibility in an older clinical and non-clinical sample (N = 100). The results of this study supported the factor structure of both of the self-report cognitive flexibility measures and suggested adequate internal reliability in the clinical and community samples. Although there was good convergent validity between the CFI and CFS, this study generally found poor convergent validity against neuropsychological measures of cognitive flexibility in both samples and some evidence of poor divergent validity with measures of anxiety and depression in the non-clinical sample.

These findings suggest that self-report measures assess a qualitatively different aspect of cognitive flexibility, and should not be used as a proxy measure for the type of cognitive function assessed by neuropsychological testing. Instead they may be used as an adjunct to neuropsychological testing to provide information on another aspect of cognitive flexibility. For example, the CFI and CFS may provide measures of an individuals' openness to adapting their behaviour, sense of agency or self-efficacy to be flexible in situations and their perception of control in solving difficult situations, all of which are qualitatively different aspects of cognitive flexibility compared with neuropsychological tasks. Although a person may perform well on behavioural tasks, their willingness to be

flexible and sense of self-efficacy to find a solution may hinder the application of these skills in real-world situations. Thus, assessing self-report measures may be a useful adjunct to neuropsychological testing, to assess a different aspect of cognitive flexibility, but should not be used as a substitute for it. The relationship between these self-report measures and cognitive restructuring ability has also not been examined previously, and was included in the next study.

Paper 4: The influence of cognitive flexibility on treatment outcome and cognitive restructuring skill acquisition during cognitive behavioural treatment for anxiety and depression in older adults: Results of a pilot study (manuscript submitted for publication)

The final paper integrated the findings from the previous papers with the aim of better understanding the treatment implications of these findings. This paper explored the impact of cognitive flexibility on cognitive restructuring skill acquisition following a group CBT intervention, and on treatment outcome, in a clinical sample of older adults with comorbid anxiety and depression. Given some preliminary research indicating that executive functioning ability might improve over the course of CBT, this paper also assessed changes in cognitive flexibility pre and post treatment to assess whether CBT also improved cognitive functioning. Given the findings that self-report measures assess a qualitatively different aspect of cognitive flexibility when compared with neuropsychological measures (study 3), and that it has been suggested that self-report measures assess the type of cognitive flexibility relevant to CBT (Dennis & Vander Wal, 2010), this study included both neuropsychological measures of cognitive flexibility, and self-report measures. Participants completed the self-report measures and neuropsychological battery at baseline, and repeated these measures at post-treatment, along with a cognitive restructuring task. Cognitive restructuring was coded for quality by

an independent rater, reduction in SUDs ratings and the primary group therapist rated each participant's overall ability to use cognitive restructuring. Treatment outcome was assessed via structured clinical interviews in two ways; whether participants were considered treatment responders (showed a reliable change in symptoms) and via reductions in clinician severity ratings at post treatment.

The results of this final study indicated that pre-treatment cognitive flexibility, assessed by neuropsychological measures and self-report, was not related to quality ratings of cognitive restructuring (as coded by an independent rater). This finding was in contrast to the finding that cognitive flexibility was related to cognitive restructuring quality in the experimental task in the non-clinical sample (paper 1) and clinical and non-clinical samples (paper 2). It is possible that this difference was due to limited statistical power to detect a relationship between cognitive flexibility and cognitive restructuring quality. Alternatively, it may reflect that those with poorer cognitive flexibility are able to learn cognitive restructuring in a procedural way with repeated practice, however they do not experience the same reduction in emotional distress as those with better cognitive flexibility skills or demonstrate an overall ability to use cognitive restructuring to shift away from unhelpful thinking patterns in their life. Neuropsychological assessment of cognitive flexibility was related to overall therapist ratings of cognitive restructuring ability and reductions in SUDs ratings, suggesting that although those with poorer cognitive flexibility may be able to "catch up" in their procedural use of cognitive restructuring, assessed via quality ratings, those with better cognitive flexibility experience greater emotional benefit from cognitive restructuring.

Somewhat surprisingly, cognitive flexibility did not predict treatment outcome, suggesting that CBT can still be effective for symptom reduction in those with poorer cognitive flexibility. It is not clear whether these results reflect that those with poorer

cognitive flexibility gained some advantage from using cognitive restructuring despite poorer emotional efficacy of this skill, or whether they failed to gain any benefit from cognitive restructuring specifically, but benefitted sufficiently from other CBT treatment components to produce symptom reduction.

Failing to replicate previous results, there was limited change in cognitive flexibility skills over the course of treatment, with less than 10% showing a reliable improvement and less than 5% showing a reliable decline in cognitive flexibility skills. There are several explanations for these findings. It is possible that the duration between assessments was too short to allow changes in neurological structures to occur or be manifested. Alternatively, it may be that cognitive flexibility is a more stable construct in older age, or that a psychological treatment program might not affect neuropsychological processes. A fourth possibility is that the findings in previous studies are unreliable given the methodology used. The changes found in executive function over treatment in previous studies was assessed by whether participants performance fell in (or below) the low-average range on tests (Mohlman, 2013; Mohlman & Gorman, 2005), but did not use a measure of reliable change that accounts for practice effects on repeated neuropsychological testing. It may be that previous results reflect practice effects rather than actual improvement, and that actual change in cognitive performance as a result of psychological treatment of emotional symptoms is less common.

In relation to the self-report measures of cognitive flexibility, there was a positive relationship between the CFI Control subscale and reduction in SUDs rated in the cognitive restructuring task. This subscale assesses the tendency to perceive difficult situations as controllable, and this relationship is likely to reflect higher levels of self-efficacy being related to greater reductions in distress, as opposed to cognitive flexibility per se. The CFI Alternatives subscale more closely resembles cognitive flexibility skills,

and assessed the ability to general multiple solutions, although this subscale was not related to any outcome measures. The CFS assesses flexibility in the ability to alter communication styles significantly predicted therapist ratings of cognitive restructuring in a negative direction. Given that this effect was very small and is inconsistent with the other results, this finding warrants replication in larger samples.

Overall, the results of this study suggest that those with poorer pre-treatment cognitive flexibility on neuropsychological testing experience less benefit from cognitive restructuring in terms of emotional symptom reduction, and are less able to implement this skill in their daily lives. However poorer cognitive flexibility does not prevent older adults from being able to learn cognitive restructuring in a procedural way or to benefit from treatments that include cognitive restructuring as well as other CBT components. Poorer cognitive flexibility prior to treatment may highlight the importance of including alternative CBT skills in treatment to aid cognitive and affective change, however, it should not be used as a rationale to avoid implementing cognitive therapy altogether given that there was a large proportion of the sample who were able to successfully implement and benefit from this skill.

Implications for cognitive restructuring with older adults

Within these four papers this thesis examined the relationship between cognitive flexibility and cognitive restructuring skill acquisition in a number of experimental and longitudinal ways. The results indicate that cognitive flexibility plays an important role in the ability to learn and implement specific cognitive restructuring skills within an individual session. Those with poorer cognitive flexibility skills have more difficulty utilising cognitive restructuring as a skill to alleviate emotional distress, even after repeated attempts during therapy, receiving feedback and corrections from therapists, and

sharing in other clients' attempts to challenge negative thoughts as part of the group therapy process. However it is important to note that poor cognitive flexibility does not limit the efficacy of an overall CBT package to reduce late-life anxiety and depression.

There is a body of research with younger adults examining whether cognitive restructuring need to be included in CBT programs. Meta-analyses and component analyses examining whether CBT that includes cognitive restructuring is superior to exposure therapy alone suggest no difference on outcome measures (Fedoroff & Taylor, 2001; Feske & Chambless, 1995; Longmore & Worrell, 2007). Although these studies suggest that including cognitive restructuring is not necessary for improved outcomes, this does not account for whether clients were actually able to use cognitive restructuring in a way that was beneficial. There are few studies examining whether the ability to successfully use and implement cognitive restructuring is related to treatment outcomes, assuming that some clients are able to implement this skill and others may have more difficulty. In a treatment trial for depression in younger adults, cognitive restructuring skill acquisition at post-treatment was not related to CBT treatment outcome, however it was associated with maintenance of treatment gains at six-months follow-up (Neimeyer & Feixas, 1990). This may suggest that while other non-specific therapeutic processes are present at post-treatment, including group support and increased socialization, specific skill acquisition may not be as important for emotional functioning as when these processes are no longer present. When these other factors are no longer present, the ability to use cognitive restructuring is likely to be important to facilitate ongoing coping with life events. Give that cognitive flexibility did affect cognitive restructuring skill acquisition, but not treatment outcome at post-treatment, it would be valuable for future research to consider whether the impact of cognitive flexibility on cognitive restructuring skills had

implications for the maintenance of treatment gains following the cessation of active treatment.

Cognitive therapy has been a controversial topic with older adults, with conflicting suggestions about older adults' capacity to engage with this skill. Despite a growing body of literature supporting the use of CBT with late-life anxiety and depression, there has been little focus on cognitive restructuring specifically. Results from this thesis would indicate that those with poor cognitive flexibility skills do not benefit from cognitive restructuring as much as those with greater cognitive flexibility skills, however these results would not provide a rationale to eliminate cognitive restructuring completely. Just because a treatment does not work as effectively with one population, that is not to say that it is completely ineffective, or that a treatment component should be withheld. Given that these older adults were still able to benefit from treatment, there appears to be some process within treatment that helps facilitate changes in emotional functioning, despite poorer ability to use cognitive restructuring, and it is unclear whether adjusting or eliminating cognitive restructuring with these individuals would impact treatment outcome. It is possible that older adults with poorer cognitive flexibility do still receive some more subtle benefit from learning this skill, such as internalising a more general understanding that their thoughts are not objective facts, sometimes there are alternative explanations for situations, or that there may be another way of understanding or dealing with a situation. While these subtle understandings may not be enough to achieve significant emotional change at the end of a cognitive restructuring form, or for therapists to notice a strong ability to adjust their thought patterns, they may nonetheless be meaningful for the individual, and facilitate overall symptom reduction in the context of other CBT skills.

An important potential avenue for future studies would be to understand whether there are greater benefits from using different methods of implementing cognitive

restructuring with this sub-group. While the cognitive restructuring form used in these studies was quite structured and provided prompts to facilitate the generation of evidence, it may be that there are alternative ways of implementing cognitive restructuring with these individuals that are more effective. For example, therapists are often more directive in challenging cognitions or generating alternative thoughts in patients with mild to moderate dementia, and treatments tend to include a range of alternative, more behavioural, means to achieve cognitive shifts (Snow, Powers, & Liles, 2006). Other studies have focused more heavily on teaching older adults to generate helpful coping statements either instead of or in addition to traditional cognitive restructuring (e.g., Stanley et al., 2013; Stanley, Diefenbach, & Hopko, 2004). This technique requires fewer cognitive resources and may be more helpful for cognitively intact older adults with cognitive flexibility deficits. Studies have found effective treatment of depressive symptoms in patients with dementia using behavioural therapy alone without cognitive restructuring strategies (Teri, Logsdon, Uomoto, & McCurry, 1997), and effective treatment of anxiety in younger adults using exposure therapy alone (Fedoroff & Taylor, 2001; Feske & Chambless, 1995; Longmore & Worrell, 2007) suggesting that formal cognitive restructuring may not be necessary in all cases. The results from this thesis suggest that therapists may need to adjust their expectations for change as a result of using cognitive restructuring with older adults with poorer cognitive flexibility skills and emphasise the importance of including other treatment strategies, potentially together with some alternative cognitive strategies such as behavioural experiments or helpful coping statements, to facilitate cognitive change. However, these findings do not provide a rationale to eliminate cognitive therapy entirely.

Older adults without anxiety and depression appear to be quite adept at noticing catastrophic or negative thoughts, disengaging from these, and finding more adaptive ways of understanding and responding to a situation. Models of anxiety and depression indicate

increased rumination and cognitive biases towards negative or maladaptive thought processes (Beck, 1976; Beck et al., 1985; Beck et al., 1979), and it is unclear whether this is a cause or consequence of the disorder. Given that non-clinical samples showed higher levels of cognitive flexibility compared to clinical samples, it may be that this cognitive function protects against developing mental health problems as these individuals are better able to disengage from maladaptive thought processes, or alternatively, that premorbid levels of cognitive flexibility are affected as a result of anxiety and depression symptoms. Alternatively, it may be that non-clinical populations have less belief in their unhelpful thoughts and thus find it easier to disengage from their thought process and consider alterative explanations.

One final issue to be considered is whether the relationship between cognitive flexibility and cognitive restructuring skill acquisition is restricted to older adults alone. There is evidence of deficits in cognitive flexibility in patients with anorexia nervosa (Holliday, Tchanturia, Landau, Collier, & Treasure, 2005; Lounes et al., 2011; Sato et al., 2013; Steinglass, Walsh, & Stern, 2006), autism spectrum disorders (Corbett, Constantine, Hendren, Rocke, & Ozonoff, 2009; Hill, 2004), schizophrenia (Levin, Yurgelun-Todd, & Craft, 1989; O'Carroll, 2000) and obsessive-compulsive disorder (Bannon, Gonsalvez, Croft, & Boyce, 2006; Chamberlain, Fineberg, Blackwell, Robbins, & Sahakian, 2006) to name a few. The length of illness does not fully explain the poorer cognitive flexibility in anorexic patients (Tchanturia et al., 2011), and functioning only improves slightly with weight restoration and long term-recovery (Tchanturia et al., 2004), suggesting that these cognitive deficits may pre-date any neuropsychological consequences of starvation. It has been proposed that poor cognitive flexibility is a trait marker for anorexia, with increased inflexibility found in anorexia patients prior to illness onset (Tchanturia et al., 2004), and impaired set shifting in healthy sisters of patients (Holliday et al., 2005). Similarly poor

cognitive flexibility is proposed as a trait marker for obsessive-compulsive disorder, with set-shifting deficits common after symptom remission (Bannon et al., 2006) and in healthy first-degree relatives (Chamberlain et al., 2007). Given cognitive flexibility deficits in these other disorders, it would be relevant for future research to examine whether this impacts on cognitive restructuring skill acquisition, as found in this thesis in older adult populations, and whether cognitive flexibility relates to treatment outcomes more broadly across a range of ages and disorders.

Similarly, there is some evidence that cognitive flexibility deficits can be improved with cognitive remediation therapy in patients with anorexia (Lock et al., 2013; Tchanturia, Davies, & Campbell, 2007) and schizophrenia (Delahunty, Morice, & Frost, 1993; O'Carroll, 2000) and this may be a promising research area to address deficits in cognitive flexibility for older adults. Conversely, given the preliminary evidence for the potential for adjunctive executive skills training to improve CBT outcomes (Mohlman, 2008) future studies could assess whether improving cognitive flexibility skills with cognitive remediation would impact on cognitive restructuring skill acquisition.

Implications for the measurement of cognitive restructuring

One of the interesting outcomes from this thesis is the findings regarding the different methods for examining cognitive restructuring skill acquisition, which evolved during the progression of these four studies. There is very limited research examining cognitive restructuring skill acquisition or how to measure it. Two studies have examined cognitive restructuring skill acquisition in younger adults with panic disorder and depression respectively (Neimeyer & Feixas, 1990; Strunk, DeRubeis, Chiu, & Alvarez, 2007). Strunk et al. (2007) utilised a therapist-rated measure from video recordings of therapy sessions, rating participants' ability to identify automatic thoughts and feelings,

examine disconfirmatory evidence, develop alternative explanations, examine realistic consequences, see things from a different perspective, evaluate the change in automatic thoughts, and ability to generate a rational response. Neimeyer and Feixas (1990) scored the quality of a completed cognitive restructuring form by rating the quality of each section of the form. Given the focus on quality ratings in both studies, the first paper utilised this technical aspect of skill acquisition. As the studies progressed, the second and fourth papers considered the different and idiosyncratic ways that clients use cognitive restructuring, and expanded the assessment of cognitive restructuring skill use to include the efficacy of skill use in reducing distress, a method also used by Mohlman (2013).

It is unlikely that most clients continue to use cognitive restructuring forms indefinitely in the pencil and paper format. Rather, they are more likely to develop some personally meaningful and effective ways of challenging maladaptive thoughts on an ongoing basis, such as challenging thoughts in their head, or coming up with one powerful piece of disconfirmatory evidence. This may or may not be consistent with precise technical use of the skill, but may result in equally effective emotional outcomes. Given the limitations of focusing on a single cognitive restructuring form for rating cognitive restructuring skill acquisition, and the clinical impressions that clients' begin to use cognitive restructuring in idiosyncratic and personally meaningful ways over time, the fourth study also considered therapist global ratings of participants' ability to use cognitive restructuring to manage their emotional distress in the final study. Hence the final study used a combination of measures of technical use, efficacy for reducing emotional distress, and overall ability to use cognitive restructuring in order to assess cognitive restructuring skill acquisition. The transition from formal practice of cognitive restructuring forms to personally meaningful variations is likely to be influenced more heavily by an individual's level of cognitive flexibility, and this was reflected in the results of the fourth study where

those with poor cognitive flexibility were able to procedurally use the cognitive restructuring form, but showed less reduction in distress, and poorer overall ability to shift unhelpful thoughts as assessed by therapists.

These different methods of assessment may target different aspects of cognitive restructuring skill use, and are likely to provide a more holistic understanding of cognitive restructuring skill acquisition. However it is likely that there are other ways of assessing this skill that could be explored in future research. This may include assessing more qualitative aspects of how clients use this skill in their daily lives, including whether they use this skill outside treatment, whether there are key questions that they ask themselves (e.g., "what is the worst that can happen"), or whether they use more helpful coping statements (e.g., "I will get through this") to shift negative thoughts. The best way to measure and assess cognitive restructuring skills should continue to be explored, and the use of these assessment measures should be replicated in other studies to establish the validity of these methods of measuring cognitive restructuring skill acquisition.

Implications for the measurement of cognitive flexibility

The traditional method of assessing cognitive flexibility has been with neuropsychological testing. However there have been several self-report measures developed that also purport to measure cognitive flexibility. The third paper in this thesis found, similar to other studies (Dennis, 2009; Lounes et al., 2011), that self-report measures of cognitive flexibility show poor convergent validity with neuropsychological measures of cognitive flexibility despite showing adequate internal reliability and factor structure with older adults. It is likely that these self-report measures assess a qualitatively different aspect of cognitive flexibility, such as a willingness to be flexible or a dispositional openness to trying new approaches. There was one finding in the final study,

suggesting that higher scores on the CFI control subscale at pre-treatment were related to cognitive restructuring skills, however further examination of this subscale indicates that it is likely to be the self-efficacy aspect of this scale that was important rather than cognitive flexibility per se. Cognitive restructuring aims to adjust inflated probability expectations, but also to increase perceptions of coping ability. Even if reappraising cognitions suggests a high likelihood of a negative outcome, increasing coping self-efficacy should decrease the negative effect of this thought process. Those higher in perceived coping self-efficacy at pre-treatment appear better able to use cognitive restructuring to alleviate emotional distress.

While the results do not support the use of self-report measures of cognitive flexibility as an alternative to neuropsychological assessment, it is possible that the CFI in particular, may serve as a useful adjunct to pre-treatment self-report measures to supplement clinical decision making about the potential efficacy of cognitive restructuring skills with a particular client.

Thesis Strengths

While there has been a proliferation of research establishing the efficacy of CBT with older adults, the research into treatment mediators and moderators with older adults is especially limited. Furthermore, research has established CBT as an efficacious treatment for late-life anxiety and depression, however there is little understanding of how well older adults are able to engage with specific CBT skills. These papers present the findings suggesting that cognitive flexibility appears to impact on the ability to learn and benefit from cognitive restructuring. These findings also suggest that although those with poorer cognitive flexibility have poorer cognitive restructuring skill acquisition, this does not necessarily result in poorer treatment outcomes for CBT treatments. Given there was no

previous research examining the relationship between cognitive flexibility and cognitive restructuring, this thesis was somewhat exploratory in nature, but represents an important transition into exploring factors that affect treatment efficacy. These findings warrant replication and further examination.

Given the complexity involved in the measurement of both cognitive flexibility and cognitive restructuring skill acquisition as a construct, these studies further elaborate on some of the measurement issues, highlighting the disparity between self-report and neuropsychological assessment of cognitive flexibility, and suggesting these methods assess qualitatively different aspects of cognitive restructuring. In addition, these studies highlight the multi-faceted nature of cognitive restructuring skill acquisition, and suggest a need to consider the different aspects of how this skill is used, including the reduction in emotional distress, technical ability, and idiosyncratic and personally relevant adaptations made by individuals.

Finally, there is evidence that some older adults with anxiety and depression experience executive functioning deficits, however there has historically been limited understanding about the impact of comorbid anxiety and depression on cognitive functioning. Given that anxiety and depression are commonly comorbid in later-life (Beekman et al., 2000; Byers, Yaffe, Covinsky, Friedman, & Bruce, 2010), examining the relationship between cognitive flexibility and cognitive restructuring skills in a comorbid anxiety and depression sample has better clinical utility and validity compared with study of either disorder in isolation.

Thesis limitations and directions for further study

There are a number of limitations to acknowledge with these studies, and these have been mentioned throughout. Overall, the sample size for the studies was modest, and

although the results between studies were generally consistent, these results warrant replication in larger samples. Some of the results were limited by statistical power to detect what are likely to be small effects. The samples were relatively young older adults, with mean ages in their late sixties, and relatively high levels of education. While the sample was not specifically selected for these characteristics, they are reflective of the sociodemographic status of older adults within the local area where the university clinic is situated, and the generalisability of these results to older and less educated samples is unclear. Replication of these findings in older samples, and with people from lower education groups is warranted.

The choice of neuropsychological measures of cognitive flexibility was based on theory and utilised commonly used measures, however these represent only a small sample of the possible measures. It is unclear whether the use of alternative measures of cognitive flexibility would affect the results, although given that a composite score was used to include a range of measures, this is unlikely. Neuropsychological assessment of cognitive flexibility has a number of limitations, including the need for measures to be administered by a trained individual, the time taken for administration and scoring, and the potential for testing to increase distress in older adults. These limitations are likely to limit the feasibility of using a neuropsychological battery to assess cognitive flexibility skills prior to CBT in most settings. Future studies with larger sample sizes may benefit from better understanding what individual measures show the greatest relationship with cognitive restructuring skill acquisition to aid clinical implementation of neuropsychological testing during assessment and treatment planning.

While cognitive flexibility appears to impact the acquisition of cognitive restructuring skill specifically, it was not related to treatment outcome. Given the proliferation in treatment outcome studies with older adults, it is important for these studies

to consider what other factors may be moderating or mediating treatment response overall to improve the efficacy of late-life interventions. It may be that cognitive change, rather than cognitive restructuring ability specifically, is a more relevant construct. CBT is proposed to work via changing cognitive processes, interpretations and biases, and this in turn affects symptom reduction (Driessen & Hollon, 2010). For example, changes in fear of negative evaluation was found to be important in treatment of social phobia (Mattick, Peters, & Clarke, 1989) and change in panic-related cognitions mediated change in panic disorder severity (Hofmann et al., 2007) rather than learning of specific treatment techniques. It would be important to assess changes in core cognitive processes in older adults as a mediator of skill acquisition and treatment outcome. Other potential moderating factors for treatment outcome that would be important to consider include antecedent life events, complex symptom presentations (including personality disorders), social isolation, functional independence versus dependence, and contextual factors including chronic physical health problems that disrupt activities of daily living and independent activities of daily living.

Conclusion

Although cognitive therapy with older adults has historically been a controversial topic, this has been based on clinical consensus rather than empirical support. These findings suggest that most older adults are able to learn and implement cognitive restructuring skills successfully. Those older adults with poorer cognitive flexibility skills appear to have more difficulty using and benefiting from cognitive restructuring techniques, and this does not improve with repetition and feedback. However, poorer cognitive flexibility does not appear to impact on treatment outcome, suggesting that alternative CBT techniques are effective in achieving emotional shifts in older adults with

poor cognitive flexibility and comorbid anxiety and depression, and perhaps these techniques should be preferenced during treatment with these individuals.

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APPENDIX

Appendix 1. Final Ethics Approval Letter

MACQUARIE UNIVERSITY

Carly Johnco < carly.johnco@mq.edu.au>

Ethics application reference- 5201000862- Final approval

Ethics Secretariat < ethics.secretariat@mq.edu.au> Thu, Aug 19, 2010 at 9:33 AM
To: Dr Viviana Wuthrich <viviana.wuthrich@mq.edu.au>, Ethics Secretariat <ethics.secretariat@mq.edu.au>
Cc: Prof Ron Rapee <ron.rapee@mq.edu.au>, Miss Carly Johnco <carly.johnco@mq.edu.au>

Dear Dr Wuthrich

Re: "The role of Cognitive Flexibility in the maintenance of Anxiety and Depression in Older Adults'

Thank you for your recent correspondence. Your response has addressed the issues raised by the Human Research Ethics Committee and you may now commence your research.

The following personnel are authorised to conduct this research

Dr Viviana Wuthrich- Chief Investigator/Supervisor
Miss Carly Johnco & Prof Ron Rapee- Co-Investigators

Please note the following standard requirements of approval

1. The approval of this project is conditional upon your continuing compliance with the National Statement on Ethical Conduct in Human Research (2007)

2. Approval will be for a period of five (5) years subject to the provision of annual reports. Your first progress report is due on 19th August 2011.

If you complete the work earlier than you had planned you must submit a Final Report as soon as the work is completed. If the project has been discontinued or not commenced for any reason, you are also required to submit a Final Report for the project

Progress reports and Final Reports are available at the following website

http://www.research.mq.edu.au/for/researchers/how_to_obtain_ethics_approval/human_research_ethics/forms

3. If the project has run for more than five (5) years you cannot renew approval for the project. You will need to complete and submit a Final Report and submit a new application for the project. (The five year limit on renewal of approvals allows the Committee to fully re-review research in an environment where legislation, guidelines and requirements are continually changing, for example, new child protection and privacy laws)

4. All amendments to the project must be reviewed and approved by the Committee before implementation. Please complete and submit a Request for Amendment Form available at the following website

http://www.research.mq.edu.au/for/researchers/how_to_obtain_ethics_approval/human_research_ethics/forms

5. Please notify the Committee immediately in the event of any adverse effects on participants or of any unforeseen events that affect the continued ethical acceptability of the project.

6. At all times you are responsible for the ethical conduct of your research in accordance with the guidelines established by the University This information is available at the following websites:

http://www.mq.edu.au/policy/

http://www.research.mq.edu.au/for/researchers/how_to_obtain_ethics_approval/human_research_ethics/policy

If you will be applying for or have applied for internal or externa funding for the above project it is your responsibility to provide the Macquarie University's Research Grants Management Assistant with a copy of this email as soon as possible. Internal and External funding agencies wil not be informed that you have final approval for your project and funds will not be released until the Research Grants Management Assistant has received a copy of this email

If you need to provide a hard copy letter of Final Approval to an externa organisation as evidence that you have Final Approval, please do not hesitate to contact the Ethics Secretariat at the address below

Please retain a copy of this email as this is your official notification of final ethics approval.

Yours sincerely
Dr Karolyn White
Director of Research Ethics
Chair, Human Research Ethics Committee