The effect of dysphoric rumination on executive function in young people

Rushe, Damien

Awarding institution: King's College London

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VOLUME I

MAIN RESEARCH PROJECT AND SERVICE EVALUATION PROJECT

DAMIEN RUSHE

Thesis submitted in partial fulfilment of the degree of Doctorate in Clinical Psychology
Institute of Psychiatry, King’s College London
May 2014
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Finally, I am most grateful to the young people who generously gave up their time to participate in this study.
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PART A
MAIN RESEARCH PROJECT

THE EFFECT OF DYSPHORIC RUMINATION ON EXECUTIVE FUNCTION IN YOUNG PEOPLE

Supervisors:
Dr Eleanor Leigh
Dr Patrick Smith
PREFACE

The current study was conducted in conjunction with another project also submitted in partial fulfilment of the degree of Doctorate in Clinical Psychology in 2014. Screening procedures were carried out jointly with the other researcher but the experimental phases were conducted separately with separate participants and with different research questions being posed in each.
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<tr>
<td>ACC</td>
<td>Anterior Cingulate Cortex</td>
</tr>
<tr>
<td>ADHD</td>
<td>Attention Deficit Hyperactivity Disorder</td>
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<td>ANOVA</td>
<td>Analysis of Variance</td>
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<td>ASD</td>
<td>Autistic Spectrum Disorder</td>
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<tr>
<td>C-RSQ</td>
<td>Children’s Response Styles Questionnaire</td>
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<td>CBT</td>
<td>Cognitive Behavioural Therapy</td>
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<td>CCT</td>
<td>Cognitive Control Therapy</td>
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<td>CNT</td>
<td>Concreteness Training</td>
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<td>DLPFC</td>
<td>Dorsolateral Prefrontal Cortex</td>
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<td>DSM</td>
<td>Diagnostic and Statistical Manual of Mental Disorders</td>
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<td>EEG</td>
<td>Electroencephalography</td>
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<td>EF</td>
<td>Executive Function</td>
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<td>fMRI</td>
<td>Functional Magnetic Resonance Imaging</td>
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<td>GAD</td>
<td>Generalised Anxiety Disorder</td>
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<td>ICD</td>
<td>International Classification of Diseases</td>
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<td>ID</td>
<td>Intellectual Disability</td>
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<td>MDD</td>
<td>Major Depressive Disorder</td>
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<td>MDE</td>
<td>Major Depressive Episode</td>
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<td>MFQ</td>
<td>Mood and Feelings Questionnaire</td>
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<td>NICE</td>
<td>National Institute for Health and Care Excellence</td>
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<td>OCD</td>
<td>Obsessive-Compulsive Disorder</td>
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<td>Prefrontal Cortex</td>
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<td>PTSD</td>
<td>Post Traumatic Stress Disorder</td>
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<td>R</td>
<td>Redundancy</td>
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<td>Random Number Generation</td>
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<td>Repetitive Negative Thinking</td>
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<td>RRS</td>
<td>Rumination Response Scale</td>
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<td>RSQ</td>
<td>Response Styles Questionnaire</td>
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<td>RST</td>
<td>Response Styles Theory</td>
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<td>SCARED</td>
<td>Screen for Child Anxiety Related Emotional Disorders</td>
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<td>TEA-Ch</td>
<td>Test of Everyday Attention for Children</td>
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<td>TPI</td>
<td>Turning Point Index</td>
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<td>VAS</td>
<td>Visual Analogue Scale</td>
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<tr>
<td>VLPFC</td>
<td>Ventrolateral Prefrontal Cortex</td>
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<tr>
<td>WCST</td>
<td>Wisconsin Card Sorting Test</td>
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<td>WISC</td>
<td>Wechsler Intelligence Scale for Children</td>
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ABSTRACT

Depression has consistently been associated with cognitive deficits, particularly on tasks involving executive function. Depression is also characterised by a self-focused, ruminative thinking style. It has been hypothesised that this ruminative thinking style may deplete limited executive resources, giving rise to inefficient cognitive regulation of emotion and behaviour. Previous research with adults has supported this hypothesis and indicated that, relative to non-depressed controls, those who are low in mood and are induced to ruminate demonstrate impairments in executive function. Whilst some research with adolescents has also supported this finding, this has mainly been correlational in nature. Adolescent-onset depressive disorders represent particularly insidious conditions because of their strong association with chronic and recurrent emotional problems in adulthood; thus, a detailed understanding of the cognitive processes underlying these disorders is essential.

The current study provides the first experimental investigation of the effects of engaging in a ruminative and a concrete processing style on executive function in dysphoric adolescents. The study was conducted with a school-based sample of 46 young people, who scored high or low on a measure of depressive symptoms. Participants completed two experimental conditions, rumination and concrete thinking, in counterbalanced order, as well as a measure of executive function (random number generation) at baseline, and again following each of the experimental conditions.

For the first time, results demonstrated that one facet of executive function (working memory updating) differed significantly at baseline, with dysphoric adolescents demonstrating significantly worse performance than non-dysphoric adolescents, and that this difference was maintained regardless of the thinking style inductions. Contrary to the study’s hypotheses, inhibition ability of either group was not significantly affected by either of the processing style inductions. Potential explanations for these results are discussed, as well as methodological limitations, clinical implications, and potential directions for future research.
LITERATURE REVIEW

Depression in Children and Adolescents

Epidemiology and aetiology. Depressive disorders are among the most common types of psychopathology (Kessler et al., 2003). These disorders are associated with significant psychosocial impairment across multiple domains of functioning including work, family, and social functioning (Kessler et al., 2003; Stein, Torgrud, & Walker, 2000). A recent review conducted by the King’s Fund in 2006 to estimate mental health expenditure, including depression, in England for the next 20 years (McCrone, Dhanasiri, Patel, Knapp, & Lawton-Smith, 2008) found that the total cost of services for depression in England in 2007 was estimated to be £1.7 billion, while lost employment increased this total to £7.5 billion.

One reason these disorders are so costly to individuals and to society is that they are often chronic and recurrent conditions (Judd, 1997). When these conditions strike early in adolescence, they are even more likely to be associated with chronicity and relapse over the life span (Fombonne, Wostear, Cooper, Harrington, & Rutter, 2001). Adolescents, who have experienced a major depressive episode (MDE), experience a high risk for relapse in adulthood, with an estimated recurrence rate for major depression of 62% (Fombonne et al., 2001). Similarly, the majority of adults who develop major depression have previously experienced problems with anxiety and depressive disorders in adolescence (Pine, Cohen, Gurley, Brook, & Ma, 1998). As such, adolescent-onset depressive disorders represent particularly insidious conditions because of their strong association with chronic and recurrent emotional problems in adulthood.

Unfortunately depression is quite common in young people, and is associated with a range of adverse psychosocial consequences including substance abuse, academic difficulties, high-risk sexual behaviour and interpersonal difficulties (Angold & Costello, 1993; Birmaher, Ryan, Williamson, Brent, & Kaufman, 1996; Hammen & Compas, 1994; Weissman et al., 1999). Point prevalence estimates for major depression among adolescents range from about 0.7% (Fergusson, Horwood, & Lynskey, 1993) to 3.4% (Feehan, McGee, Raja, & Williams, 1994). Several studies have reported lifetime prevalence in adolescents, with estimates ranging from 9.3% (Wittchen, Nelson, &
Lachner, 1998) to 24.0% (Lewinsohn, Hops, Roberts, Seeley, & Andrews, 1993). A recent large scale epidemiological study conducted in the United States reported an estimated lifetime prevalence of 11.7% for major depression or dysthymia among adolescents (Merikangas et al., 2010).

Epidemiological studies have documented that the prevalence of depression in developed countries is nearly twice as high among adult females as adult males (Kessler et al., 1993). Among pre-adolescents, community studies generally report no sex differences in depression (e.g., Hankin et al., 1998). During adolescence and young adulthood, however, depression becomes more common among females than males (e.g., Costello, Mustillo, Erkanli, Keeler, & Angold, 2003), with this difference typically emerging in early adolescence around 12-14 years of age. (Nolen-Hoeksema & Girgus, 1994). Although depression increases among both males and females during the middle adolescent years, incidence among females is far greater than among males (Hankin et al., 1998). Many different explanations for this gender difference in depression have been offered, but more recent research has focused on differences between men and women in reactivity to stress, including biological responses to stress, self-concept, and coping styles (Nolen-Hoeksema, 2001). One particular coping style, rumination, has been particularly well-researched, and involves focusing inward on feelings of distress and personal concerns rather than taking action to relieve distress (Nolen-Hoeksema, 1991). By adolescence, girls appear to be more likely than boys to respond to distress with rumination, and this difference is maintained throughout adulthood (Nolen-Hoeksema, 2001). Ruminative response styles are discussed in more detail in a later section.

The vast majority of MDEs in young people arise in children and adolescents with long-standing psychosocial difficulties, such as family or marital disharmony, divorce and separation, domestic violence, physical and sexual abuse, and school difficulties, including bullying, exam failure, and social isolation (Goodyer, 2001). There are numerous aetiological theories to account for depression, including genetic, biochemical and endocrine, psychological, social and socioeconomic. None has gained widespread acceptance, although a pragmatic model, integrating the various theories (the ‘Stress-Vulnerability’ model; Nuechterlein & Dawson, 1984) has broad clinical utility and is widely subscribed to. In this approach, young people (or adults) will, to varying degrees, have a vulnerability to depression rooted in genetic, endocrine and early family factors, for example emotional deprivation or physical abuse. This
vulnerability will interact with current social circumstances, such as poverty, social adversity or family discord, with stressful life events acting as the trigger for an episode of depression (Harris & Molock, 2000).

As will be discussed later, psychological processes, such as ingrained patterns of thinking, may also increase a young person’s vulnerability to depression. For example, the tendency to negative thinking about oneself at times of low mood, and, as already mentioned, the characteristic of ruminating or perseverating on these negative thoughts, in the presence of psychosocial adversity, are known to increase the risk for a depressive episode (Kelvin, Goodyer, Teasdale, & Brechin, 1999; Lyubomirsky & Nolen-Hoeksema, 1995; Park, Goodyer, & Teasdale, 2004). Individuals who possess both these cognitive characteristics appear to be particularly vulnerable to becoming depressed (Nolen-Hoeksema, 2000; Spasojevic & Alloy, 2001).

**Comorbidity, outcomes and recovery rates.** Large-scale clinical studies with adults have revealed very high levels of comorbidity for depression and other Axis I disorders, particularly post-traumatic stress disorder (PTSD), generalised anxiety disorder (GAD), obsessive-compulsive disorder (OCD), and social anxiety disorder (Brown, Campbell, Lehman, Grisham, & Mancill, 2001). Community studies with children and adolescents also consistently show a high level of comorbidity for depression and other psychological disorders. (Angold, Costello, & Erkanli, 1999; Merikangas & Angst, 1995; Nottelmann & Jensen, 1995). These studies reveal that depression is associated with a significantly elevated risk of anxiety, behaviour, eating, and substance use disorders (e.g., Gotlib & Hammen, 1992; Lewinsohn, Hops, Roberts, Seeley, & Andrews, 1993; Simonoff et al., 1997). Depression and anxiety disorders are the most common concurrent conditions in youth, with median prevalence estimates of more than 39% for anxiety among young people with depression (Angold, Costello, & Erkanli, 1999). Community samples also yield high estimates of concurrent comorbidity between depression and conduct disorder, with a median prevalence of 27.3% for conduct disorder among children and adolescents with depression (Angold, Costello, & Erkanli, 1999).

The median length of a depressive episode during adolescence is nine months, and evidence suggests that young people who have experienced a MDE have a high risk of recurrence within a few years (Kovacs, 1996; Lewinsohn et al., 1993). One study indicated a cumulative probability of recurrence of 40% by two years and 70% by five
years (Birmaher et al., 1996), indicating that depression is inherently a relapsing and remitting disorder. The most common adverse consequences associated with depression in childhood and adolescence include impairment in school and work performance, in relationships with family and friends, and in cognitive functioning (Kessler & Walters, 1998; Reinherz et al., 1993). Depression during adolescence is also associated with poor outcomes in adulthood, including increased stressful life events, loss of social support, low satisfaction in life roles, low income levels, low educational aspirations, early marriage, early parenthood, and low marital satisfaction (Franko et al., 2004; Gotlib, Lewinsohn, & Seeley, 1998; Rao et al., 1995). The most severe consequence of depression in adolescents is suicide. In one large-scale US study, 21% of young people with depression reported a previous suicide attempt (Kessler & Walters, 1998). Findings regarding the adverse consequences of depression in childhood and adolescence have been replicated in investigations of clinical, community, cross-cultural and ethnically diverse samples (Angold & Costello, 1993; Ruchkin et al., 2006).

Clinical characteristics and diagnosis. There is no clear-cut consistency in how depressed children and young people present to healthcare services. Thus, the clinical picture varies in ways that are poorly understood, with levels of severity, personal impairment and developmental age. Traditional developmental theory (e.g., Rie, 1966) posited that young children were too cognitively and emotionally immature to experience depression. In contrast, more recent research using new and age-appropriate methods has indicated that depression conforming to adult diagnostic criteria can be identified even in preschoolers (Luby, Xuemei, Belden, Tandon, & Spitznagel, 2009). As mentioned previously, however, the peak increase in overall rates of depression in children and young people occurs in middle to late adolescence (Hankin et al., 1998). Continuity of the presentation of the disorder from adolescence into adulthood is recognised, but there is less certainty as to whether the same underlying biological and cognitive processes explain depression across the life span (e.g., Hammen, 1992; Kovacs, 1996).

Clinically, the term depression refers to a group of symptoms and behaviours clustered around three core alterations in experience: changes in mood, in thinking and in activity, sufficient to cause impairment in personal and/or social functioning. Mood changes typically include sadness and/or irritability accompanied by a loss of pleasure, even in previously cherished interests. Cognitive changes generally lead to
concentration problems and dysfunctional beliefs, usually with a pronounced self-critical focus. Physically, depressed people become less active, although this may be concealed by the presence of anxiety or agitation. While the clinical and diagnostic features of the disorder are broadly similar in adolescents and adults, there may be some important developmental differences. For example, some young people with depression may deny feeling sad but will admit to feeling ‘down’, others will admit to feeling ‘grumpy’ or ‘irritable’ (Goodyer & Cooper, 1993). Similarly, in primary care settings around 2 to 10% of children at any one time complain of aches and pains such as headaches and stomach aches, limb pain, and somewhat less frequently tiredness or fatigue (Campo et al., 2004), and a certain proportion of these will in fact be experiencing depression. For some depressed children and adolescents the presenting features may be behavioural consequences of their internal mental state. Self-harm, disinterest in general appearance, withdrawal and loss of interest may all reflect an emerging or current depressive disorder (Goodyer & Cooper, 1993).

The main classification systems used in the diagnosis of depression, the tenth edition of the International Classification of Diseases (ICD-10; World Health Organisation, 1994) and the recently released fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013), provide comparable definitions of depression. However, given some of the developmental differences discussed above, the DSM-5 makes an exception for children and adolescents allowing irritability rather than depressed mood as a core diagnostic symptom. DSM-5 criteria for diagnosis of major depressive disorder (MDD) are presented in Table 1. MDD is diagnosed when the individual is experiencing a MDE that is not better accounted for by schizoaffective disorder, or psychotic disorder and if the individual has never experienced a manic or hypomanic episode. Although research findings collectively support the application of adult diagnostic criteria to young people, it is recognised that insufficient attention to developmental differences may lead to under identification of the disorder in young people (Abela & Hankin, 2008). Researchers have highlighted that depression in young people remains undetected more often than amongst adults due to the prominence of reactive mood and irritability alongside increased fluctuation in the presentation of symptoms in young people (Thapar, Collishaw, Pine, & Thapar, 2012). In addition, depression in young people may remain unnoticed if the primary presenting difficulties include unexplained physical symptoms, disrupted eating behaviour, and difficulties in the school setting.
such as decline in academic performance or a refusal to attend school (Thapar et al., 2012). Given these findings, improving early identification of depression among children and young people was one of the key recommendations of the most recent guidelines from the UK National Institute for Health and Care Excellence (NICE; 2005).
Table 1. DSM-5 diagnostic criteria for MDD

A. Five (or more) of the following symptoms have been present during the same 2-week period and represent a change from previous functioning; at least one of the symptoms is either (1) depressed mood or (2) loss of interest or pleasure.

1. Depressed mood most of the day, nearly every day, as indicated by either subjective report (e.g., feels sad, empty, hopeless) or observation made by others (e.g., appears tearful). (Note: In children and adolescents, can be irritable mood.)
2. Markedly diminished interest or pleasure in all, or almost all, activities most of the day, nearly every day (as indicated by either subjective account or observation).
3. Significant weight loss when not dieting or weight gain (e.g., a change of more than 5% of body weight in a month), or decrease or increase in appetite nearly every day. (Note: In children, consider failure to make expected weight gain.)
4. Insomnia or hypersomnia nearly every day.
5. Psychomotor agitation or retardation nearly every day (observable by others, not merely subjective feelings of restlessness or being slowed down).
6. Fatigue or loss of energy nearly every day.
7. Feelings of worthlessness or excessive or inappropriate guilt (which may be delusional) nearly every day (not merely self-reproach or guilt about being sick).
8. Diminished ability to think or concentrate, or indecisiveness, nearly every day (either by subjective account or as observed by others).
9. Recurrent thoughts of death (not just fear of dying), recurrent suicidal ideation without a specific plan, or a suicide attempt or a specific plan for committing suicide.

B. The symptoms cause clinically significant distress or impairment in social, occupational, or other important areas of functioning.

C. The episode is not attributable to the physiological effects of a substance or to another medical condition.
   Note: Criteria A-C represent a major depressive episode.

D. The occurrence of the major depressive episode is not better explained by schizoaffective disorder, schizophrenia, schizophreniform disorder, delusional disorder, or other specified and unspecified schizophrenia spectrum and other psychotic disorders.

E. There has never been a manic episode or a hypomanic episode.
Executive Function and Depression

Theories of executive function. As can be seen above, one of the criteria for MDD in DSM-5 is the presence of impairment in concentration. Indeed, patients with depression also often show executive dysfunction as part of a broader pattern of cognitive impairment (Elliott, 1998). Many theories have posited nonspecific impairments in cognitive function associated with MDD, such as low motivation leading to difficulty with effortful tasks (e.g., Weingartner, Cohen, Murphy, Martello, & Gerdt, 1981), depleted cognitive resources in general (e.g., Mathews & MacLeod, 1994), difficulty initiating efficient cognitive strategies (e.g., Hertel & Gerstle, 2003), and slowed processing speed (e.g., den Hartog, Derix, van Bemmel, Kremer, & Jolles, 2003; Nebes et al., 2000).

More recently, it has been proposed that executive function (EF) may be particularly impaired in individuals with MDD and that problems in other domains, such as memory, attention, and problem solving, may arise because these abilities rely heavily on the limited resources of EF (Levin, Heller, Mohanty, Herrington, & Miller, 2007; Nitschke, Heller, Imig, McDonald, & Miller, 2001). Although EF has been defined in different ways, these definitions all share the idea that EFs are higher level cognitive processes, which control and regulate lower level processes (e.g., perception, motor responses) to effortfully guide behaviour toward a goal, especially in non-routine situations (e.g., Alvarez & Emory, 2006; Banich, 2009). For example, EFs allow us to break out of habits, make decisions and evaluate risks, plan for the future, prioritise and sequence actions, and cope with novel situations, among many other things. Thus, EFs are essential for successfully navigating nearly all of our daily activities, and impairments in EF can have serious and diffuse consequences, which may be as important to quality of life and functional outcomes as affective symptoms.

One influential model of EF, the three-component model (Baddeley, 1992; Friedman et al., 2008; Miyake et al., 2000), describes three key aspects of EF: (a) working memory updating (adding relevant and removing no longer relevant information from working memory), (b) shifting between tasks or mental sets, and (c) inhibiting prepotent responses, as well as a common EF component tapped by all EF tasks (and which may subsume inhibition; Friedman et al., 2008). Multiple studies have found that although aspects of EF are moderately correlated (i.e., share a common EF component), they are separable (i.e., have unique components; e.g., Fisk & Sharp, 2004; Friedman et al., 2006; Hedden & Yoon, 2006; Huizinga, Dolan, & Van der Molen,
Although working memory updating, shifting, and inhibition are important aspects of EF, this model in no way posits that these are the only components. Indeed, several other EF domains have been well defined in the literature, including verbal and visuospatial working memory, planning, and verbal fluency (Snyder, 2013). In each domain, studies using latent variable and correlational approaches have provided support for the existence of correlated but separable EF components, and confirmed that tasks posited to tap each aspect of EF are related to one another (Snyder, 2013).

Both theoretical perspectives and empirical evidence suggest that along with these specific components of EF, there is also a common mechanism across EFs (e.g., Duncan & Owen, 2000; Engle, Tuholski, Laughlin, & Conway, 1999; Friedman et al., 2008; Miyake et al., 2000), which is separable from perceptual speed and fluid intelligence (Friedman et al., 2008). This common mechanism is hypothesised to be the ability to maintain goal and context information in working memory (Miyake et al., 2000). This view is compatible with accounts of EF that view the central role of the frontal lobes to be active maintenance of goals, plans, and other task-relevant information in working memory (e.g., Engle, Tuholski, Laughlin, & Conway, 1999; Hazy, Frank, & O’Reilly, 2007). Thus, the ability to keep task-relevant information active in working memory may be essential for all aspects of EF (Miyake et al., 2000).

“Frontal lobe tasks” and EF are often used synonymously in the literature, and indeed EF relies heavily on prefrontal cortex (PFC), although EF tasks also recruit broader neural networks, including posterior cortical and subcortical areas, and connectivity between these regions. Neuroimaging methods (i.e., functional magnetic resonance imaging [fMRI] and positron emission tomography) provide powerful, non-invasive measures of brain function during EF tasks, by measuring hemodynamic correlates of neural activity. Although many neural areas have been implicated in EF, across multiple theories and empirical studies, three main subdivisions of PFC emerge as key for EF: dorsolateral PFC (DLPFC), ventrolateral PFC (VLPFC) and anterior cingulate cortex (ACC). For many different EF tasks, there is joint recruitment of these regions (e.g., Duncan & Owen, 2000). Developmental changes in EF abilities, as well as associated neural networks, are discussed in the following section.

**Development of executive function.** Much of the research into the development of EF has focused on the study of atypical development, notably attention deficit
hyperactivity disorder (ADHD) and autism (Hughes & Graham, 2002). Recently, as attention has shifted toward normal EF development, a disproportionate amount of this research has investigated the age during the preschool years at which specific components of EF emerge, to the neglect of their later developmental course towards complete maturation (Best, Miller, & Jones, 2009). While it is undoubtedly important to study EF development in young children, there are also good reasons to assess EF development in school-age children and adolescents. Firstly, examining a broader age range helps to clarify certain issues about EF as a construct, specifically, whether EF should be viewed as a unitary process or as a set of multiple, distinct component processes. Second, significant improvements in EF tasks occur during the school years (Romine & Reynolds, 2005). By excluding school-age children, much of the developmental picture of EF is omitted, specifically, the distinct developmental trajectories of each EF component (e.g., working memory updating, inhibition, shifting) during middle childhood and adolescence. A third reason to study children older than preschool age is that entry into middle childhood means entry into a new set of experiences, and thus new questions can be asked about the uses of EF in everyday life. For example, the relationship between EF and various aspects of schooling (e.g., academic achievement, time-management skills, and school-related behaviour) can be examined. Developmental changes in each of the key aspects of the three-component model of EF (inhibition, working memory updating, and shifting) are briefly discussed below.

In terms of inhibition, research documents rapid improvements in early childhood on tasks measuring this ability (e.g., Carlson & Moses, 2001; Hughes, 1998; Sabbagh, Xu, Carlson, Moses, & Lee, 2006). Although improved inhibition during the preschool years is striking, significant improvements also occur later, particularly between ages 5 and 8 (Romine & Reynolds, 2005). Several studies have found continued improvements in middle childhood on motor and oculomotor inhibition tasks (e.g., Klenberg, Korkman, & Lahti-Nuuttila, 2001; Luna, Garver, Urban, Lazar, & Sweeney, 2004) and simple response inhibition tasks (e.g., Brocki & Bohlin, 2004; Davidson, Amso, Anderson, & Diamond, 2006; Huizinga, Dolan, & Van der Molen, 2006; Lehto, Juujärvi, Kooistra, & Pulkkinen, 2003; Simpson & Riggs, 2005). There appears to be limited further improvement during adolescence and adulthood (Romine & Reynolds, 2005). However, Huizinga et al. (2006) found continued improvement on several measures of inhibition (including a Stroop-like task) until age 21, indicating the
gradual maturation of cognitive inhibition through adolescence and even early adulthood (e.g., Leon-Carrion, Garcia-Orza, & Perez-Santamaria, 2004). Complex cognitive inhibition tasks appear to be more sensitive to the subtle improvements in performance than simpler conflict or motor inhibition tasks. Unlike the fundamental changes during preschool (e.g., acquisition of the ability to inhibit a prepotent response consistently), changes during adolescence mainly consist of refinements in speed and accuracy. These behavioural improvements in inhibition appear to be paralleled by refinements in the underlying brain activity in the PFC and in networks that include the PFC. For example, Durston et al. (2002, 2006) suggested that brain activation (measured via fMRI) during inhibition tasks transitions from being diffuse to being focalised during development. In particular, school-age children show diffuse activation of regions in the PFC (e.g., DLFPC and VLPFC regions) and in the parietal cortex as compared to adults. Only activation in the ventral frontal area (which positively correlated with task performance) increased after childhood.

Regarding the development of working memory, Gathercole, Pickering, Ambridge, and Wearing (2004) found a linear increase in performance from age 4 to 15 for a battery of working memory tasks of varying complexity (except for a visual patterns task, which levelled off around age 11). As with inhibition tasks, there is evidence that task complexity affects performance on working memory tasks. For example, Luciana, Conklin, Hooper, and Yarger (2005) examined non-verbal working memory tasks of varying complexity, ranging from a nonverbal face task (least complex) to a spatial self-ordered search (most complex). As predicted, the age-related changes in performance depended on the complexity of the particular task. From age 9 to 20, there were no performance differences on the simple face recognition task; there were steady improvements, however, on the most difficult self-ordered search until age 16. In both these studies (Gathercole et al. 2004; Luciana et al. 2005), the use of qualitatively different tasks to manipulate task complexity potentially introduces confounds (e.g., differences in EF and non-EF recruitment between tasks) that influence age-related variation in performance not directly related to working memory demands. To eliminate potential confounding variables, Luciana and Nelson (1998) utilised a self-ordered search that varied in complexity only in a quantitative manner (i.e., the number of locations the child may search for tokens ranging from 2 to 8). For the least demanding condition, performance was equivalent among children ages 4-8, adolescents (mean age = 16.87), and adults (mean age = 23.06). Age-related
performance differences did emerge as the number of search locations increased: For three search locations, performance levelled off at age 6, for four search locations, performance levelled off around age 17, and for six and eight search locations, performance differences were observed among all groups. This study suggests that even young, preschool age children can hold a couple of items in mind simultaneously and that only by increasing the memory load do developmental differences emerge. Thus, working memory development apparently continues through adolescence, and easier working memory tasks are mastered before more complex ones. Neuroimaging studies also point to continued changes in brain activity associated with working memory through childhood and adolescence (e.g., Scherf, Sweeney, & Luna, 2006). Paralleling findings on inhibition, this research suggests that the large improvements in working memory in early childhood, along with qualitative changes in brain recruitment, are followed by more subtle refinements consisting of quantitative changes in activation and focalisation of brain regions related to working memory, such as the DLPFC and ACC.

In terms of the final aspect of the three-component model, the ability to shift between more complex task sets, each with more numerous and complex rules, improves with age, typically until early adolescence (e.g., Anderson, 2002; Cepeda, Kramer, & Gonzales de Sather, 2001; Crone, Somsen, Zanolie, & Molen, 2006; Huizinga & van der Molen, 2007; Huizinga et al., 2006; Somsen, 2007). Although 3- and 4-year-olds can reliably shift between two simple, contextualised response sets in which the rules are clearly discernible (Hughes, 1998), on a more complex shifting task (shifting between responding to either lines or shapes on a computer screen) further improvement occurs between ages 5 and 6 (Luciana & Nelson, 1998). This change was not in shifting per se, but in the ability to apply the set rules to new examples of lines and shapes – that is, to generalise the rules to new, unseen objects. Moreover, with increasing age, there was a steady increase in the proportion of children who successfully completed all stages of the task. Shifting ability also may be measured in terms of shift cost, which is the difference either in response time or accuracy between shift trials and non-shift trials. Huizinga et al. (2006) found that the shift cost (measured in terms of response time) was significantly greater for 7- and 11-year-olds than for 15-year-olds, who showed shift cost equivalent to the young adult group (mean age = 20.8). Davidson et al. (2006) calculated a separate switch cost for accuracy and response time. While the switch cost in accuracy declined between 9- and 13-year-olds, the response
time switch cost actually increased between six years of age and adulthood. The authors reason that a speed-accuracy trade-off is in effect, with older children as well as adults compromising their response times in order to ensure high accuracy. This increasing awareness of the relationship between speed and accuracy in childhood suggests the emerging presence of metacognition and its contributions to developmental differences in task performance. Assessments of brain activity using electroencephalography (EEG) show higher power values in the right frontal scalp regions by age 8 (Bell, Wolfe, & Adkins, 2007). In another study (Rubia et al., 2006), children aged 10-17 years were compared to adults aged 20-43. Both a group comparison (i.e., children compared to adults) and age correlation analyses indicated that, with age, activation increased in inferior frontal, parietal, and anterior cingulate regions. These findings support previous work that suggests that mature task shifting is related to inferior frontal and parietal regions as well as superior temporal regions in adults (Smith, Taylor, Brammer, & Rubia, 2004).

In summary, a large body of research documents that many specific domains of EF show improvement beyond the preschool years. Although the specifics of the developmental trajectory depend both on the complexity of the task and the scoring method, it appears that inhibition shows prominent improvement during the preschool years and less change later on. Working memory and shifting, on the other hand, appear to emerge in the preschool years but really improve the most afterwards in a more linear fashion.

**Executive function in adults with depression.** As discussed earlier, EF has been assessed in individuals with MDD using a variety of neuropsychological measures. However, evidence for EF impairments associated with MDD is mixed. For example, Grant, Thase, and Sweeney (2001) compared 123 adult outpatients with MDD to healthy control participants on a range of neuropsychological tests, including those examining EF. Although they observed some deficits in EF on the Wisconsin Card Sorting Test (WCST) in individuals with MDD, no differences were observed on several other measures of EF. These authors concluded that MDD in younger adults does not cause appreciable impairments in cognitive functioning. However, in a study supporting the link between MDD and impairment in EF, Porter, Gallagher, Thompson, and Young (2003) compared 44 adult outpatients with MDD who were medication-free with matched control participants. They found that individuals with MDD showed
significant impairment on nearly all measures of EF, and that, unlike tests of learning and memory, performance on tests of EF did not correlate with severity of depression. They conclude EF is significantly impaired in adults with MDD, irrespective of the severity of the depression. Several recent reviews have reported partial support for impairments across multiple aspects of EF, including shifting, inhibition, working memory updating, planning, and verbal fluency (DeBattista, 2005; Hammar & Årdal, 2009; Ottowitz, Dougherty, & Savage, 2002; Rogers et al., 2004).

One source of these mixed findings in the literature may be methodological factors, including low statistical power, the use of only one or a few neuropsychological tasks to assess EF, and failure to control for non-EF impairments. In order to compensate for some of these potential methodological flaws, a recent meta-analysis (Snyder, 2013) synthesised data from 113 previous research studies that had compared participants with MDD to healthy control participants on at least one neuropsychological measure of EF. Results of the meta-analysis demonstrated that MDD is reliably associated with impaired performance on neuropsychological measures of EF, with effect sizes ranging from 0.32 to 0.97. Although patients with MDD also have slower processing speed, motor slowing alone did not account for these results.

In terms of neuroanatomy, MDD is associated with structural and functional abnormalities in PFC, including DLPFC, VLPFC, and ACC (for reviews, see Levin, Heller, Mohanty, Herrington, & Miller 2007; Rogers et al., 2004), and a meta-analysis found that patients with depressive disorders had decreased DLPFC and ACC activation during a resting state (Fitzgerald, Laird, Maller, & Daskalakis, 2008). This prefrontal hypoactivity may be related to reduced levels of the main excitatory neurotransmitter, glutamate, associated with MDD (for a review, see Yüksel & Öngür, 2010). As discussed in the previous section, the PFC regions that are hypoactive in MDD are implicated in multiple aspects of EF. Thus, it has been posited that impaired PFC function in MDD may lead to broad impairment in EF (e.g., Davidson, Pizzagalli, Nitschke, & Putnam, 2002). Specifically, decreased PFC function may lead to decreased goal setting and ability to override established behaviours, and subsequent decreases in the formation of organisational strategies for action in patients with MDD (avolition; Nitschke & Mackiewicz, 2005). This theory is compatible with the view that common EF, conceptualised as maintaining task-relevant information in working memory, may be impaired in patients with MDD, leading to deficits across all aspects of EF.
Given that the clinical phenotype of MDD may be the end point of underlying dysfunction in neural networks and cognitive and emotional control processes (e.g., Clark, Chamberlain, & Sahakian, 2009), it is possible that deficits associated with MDD might also occur, perhaps in milder form, in those with subclinical dysphoria. Although there have been relatively few studies, there is some evidence that dysphoria in nonclinical samples is associated with impairments on neuropsychological measures of EF. Depressive symptoms have been associated with poorer performance on a composite EF score (Ganguli, Snitz, Vander Bilt, & Chang, 2009), the WCST (Channon, 1996), the Stroop and Simon tasks (Holmes & Pizzagalli, 2007), and verbal fluency (Baune, Suslow, Engelien, Arolt, & Berger, 2006). However, one study found no association between depression symptoms and a composite EF score (Bunce, Handley, & Gaines, 2008). Thus, there is preliminary but mixed evidence that dysphoria in nonclinical samples is associated with impairments on neuropsychological measures of EF, but more research is needed with a wider variety of tasks, and in samples screened for clinical disorders, to determine whether the widespread deficits associated with MDD extend to subclinical dysphoria.

**Executive function in young people with depression.** Although there have been several neuropsychological investigations of EF in adults with MDD, such as those described above, research into EF in young people with depression has been much more limited. However, the majority of research that has examined the association between EF and depression in adolescence has found at least partial evidence of EF deficits in those with MDD, specifically in sustained attention (Chantiluke et al., 2012; Han et al., 2012), response inhibition/impulsivity (Kavanaugh & Holler, 2012; Kyte, Goodyer, & Sahakian, 2005; Maalouf et al., 2011), attentional switching/set shifting (Wilkinson & Goodyer, 2006), working memory updating (Klimkeit, Tonge, Bradshaw, Melvin, & Gould, 2011; Matthews, Coghill, & Rhodes, 2008), verbal fluency (Klimkeit et al., 2011), and problem solving/planning (Kavanaugh & Holler, 2012; Maalouf et al., 2011). For example, Maalouf et al. (2011) compared EF performance among a group of 20 adolescents with an active diagnosis of MDD, 20 previously depressed adolescents in remission, and 17 healthy control participants. Compared to both control participants and those with remitted depression, the adolescents with active depression displayed deficits in EF, particularly in problem solving/planning and impulsive responding. However, both depression groups were also characterised by elevated anxiety.
symptoms, and it is unclear to what extent this might have affected performance on EF tasks. Kyte et al. (2005) assessed executive skills in 30 adolescents with major depression and other psychiatric comorbid conditions. The depressed adolescents showed impulsive tendencies in decision-making when compared to healthy controls. Holler, Kavanaugh, and Cook (2013) conducted a retrospective chart review of 155 adolescents who had previously attended a neuropsychological evaluation clinic. The sample was divided into four groups: those with DSM-IV defined MDD (n = 22), a group with either dysthymic disorder or depressive disorder not otherwise specified (n = 28), an inpatient control group (n = 73) and an outpatient control group (n = 33). Results revealed significantly poorer EF performance in both depression groups compared to the outpatient control group (but not the inpatient control group), providing some evidence for the presence of EF deficits within adolescent depression.

Alternatively, a smaller group of studies have found no evidence of EF deficits associated with adolescent depression (Favre et al., 2009; Frost, Moffitt, & McGee, 1989; Halari et al., 2009; McClure, Rogeness, & Thompson, 1997). For example, Favre et al. (2009) compared 39 children and adolescents with MDD to 24 healthy control participants on a range of EF measures, including the WCST, Trail Making Test, Controlled Oral Word Association Test, and the Stroop Colour Word Test. Contrary to their hypothesis, they found that the neurocognitive profiles for the group of depressed children and adolescents were grossly intact as most scores on EF measures fell within the average range and did not differ from the comparison group. In an interesting study using neuroimaging techniques, Halari et al. (2009) used fMRI to compare brain activation between 21 medication-naïve adolescents with a first-episode of MDD aged 14-17 years and 21 healthy adolescents on EF tasks measuring selective attention, attentional switching, and motor response inhibition. Although no significant differences in task performance were found between patients and controls, adolescents with depression, compared to healthy controls, demonstrated reduced activation in task-relevant right DLPFC, inferior PFC and anterior cingulate gyrus during all three tasks. These authors conclude that the functional abnormalities in these brain regions observed in adult MDD are likely to develop early in childhood and are inherent to the pathogenesis of MDD. Thus, as with the adult literature, there is some preliminary evidence that certain aspects of EF may be impaired in adolescents with MDD, but the precise nature of this impairment has yet to be elucidated.
Although there is some limited initial evidence that deficits in EF occur in adults with subclinical dysphoria, it is unclear whether this is also true of adolescents with subclinical dysphoria. Evidence suggests that there is continuity between subclinical depression symptoms in young adults and syndromal depression (Enns, Cox, & Borger, 2001). In addition, adolescents who demonstrate consistently high levels of subclinical depressive symptoms are at high risk for developing a depressive disorder in the future (Cooper & Goodyer, 1993; NICE, 2005). Thus, an understanding of the cognitive processes underlying depression in this group is essential. The current study will be one of the first to examine EF in a nonclinical sample of dysphoric adolescents.

**Measures of executive function.** As can be seen from the studies discussed earlier, various neuropsychological measures of EF exist, with each usually aiming to tap one particular aspect of EF. In terms of the three main aspects mentioned above, there are a number of measures which are commonly used in the literature on MDD. The most common *working memory updating* task in the MDD literature is the *n*-back task, in which participants indicate if the stimulus (usually a letter or number) matches the stimulus *n* (e.g., 3) items back. The most common *shifting* tasks in the MDD literature are the WCST (Berg, 1948; Strauss, Sherman, & Spreen, 2006), the Trail Making Test Part B (Partington & Leiter, 1949; Strauss, Sherman, & Spreen, 2006), and the Intradimensional/Extradimensional Shift task (Robbins et al., 1998). The most common *inhibition* task in the MDD literature is the colour–word Stroop task (Strauss et al., 2006; Stroop, 1935), in which participants name the colour of the ink that colour words are printed in (e.g., the word *blue* printed in red ink), overriding the automatic response of reading the word.

Regarding the other well-defined EF domains, the most common verbal *working memory* tasks in the MDD literature are forward and backward digit span, in which participants hear a sequence of numbers and repeat it in forward or reverse order. The most common visuospatial tasks are spatial span (e.g., Strauss et al., 2006), delayed-match-to-sample, and self-ordered pointing (Owen, Downes, Sahakian, Polkey, & Robbins, 1990). *Planning* tasks involve multiple cognitive demands (e.g., Goel & Grafman, 1995) and so may not represent a single EF ability. However, they are frequently used in clinical studies, perhaps because this complexity may be seen as a benefit for relating laboratory task performance to complex real-world tasks. The most common planning task in the MDD literature is the Tower of London (Shallice, 1982),
in which participants move beads across pegs from a starting position to target position in as few moves as possible. **Verbal fluency** tasks usually require participants to generate words in a limited period, either from semantic categories (**semantic verbal fluency**; e.g., animals) or starting with certain letters (**phonemic verbal fluency**; e.g., Troyer, Moscovitch, & Winocur, 1997). Like planning, verbal fluency tasks likely tap multiple cognitive processes (e.g., Rende, Ramsberger, & Miyake, 2002).

One measure which is particularly useful for measuring EF is the random number generation (RNG) task (Wagenaar, 1970), as data from a single task can be used to provide an index of multiple facets of EF (e.g., working memory updating, inhibition). The RNG task has previously been used in research with adults looking at the effects of various cognitive processes on EF, including research on both worry (Hayes, Hirsch, & Matthews, 2008; Leigh & Hirsch, 2011) and rumination (Watkins & Brown, 2002). In this task, participants are asked to produce sequences of digits (e.g., 1–10) in a random fashion. Successful RNG performance requires various higher order processes, including retaining task-related instructions (e.g., set size, task instructions) in memory, integrating information, and holding it “on-line” in working memory (central executive involvement; Baddeley, 1986), avoiding interference, monitoring output, and switching or modifying production strategy in accordance with the “on-line” concept of randomness (EF; Baddeley, Emslie, Kolodny, & Duncan, 1998; Jahanshahi, Saleem, Ho, Dirnberger, & Fuller, 2006). There is convincing evidence that people’s difficulties with RNG are neither attributable to a misconception of randomness nor to short-term memory problems (Baddeley, 1998; Wagenaar, 1970).

Towse and Neil (1998) suggested that random generation performance is a non-unitary trait and so different measures of randomisation performance are required that reflect the efficiency of the separable cognitive components servicing random generation behaviour. These authors used a set of RNG data from a previous study (Towse & Valentine, 1997) and derived 16 different indices to quantify deviations from randomness. They then performed a principal components analysis (PCA) on these indices. While some indices loaded on multiple factors, different factors were derived from the analysis. One of these factors had high loadings for the randomness indices that seemed to be sensitive to the degree to which stereotyped sequences are produced (e.g., 1, 2, 3, 4), which they termed the “prepotent associates” factor. Miyake et al. (2000) generally replicated these results using their own set of RNG data, and found that this factor mapped onto the **inhibition** component of their model, as it involves
inhibiting a stereotyped response (i.e., the tendency to count in series). Another factor in the Towse and Neil analysis had high loadings for the indices that seemed to assess the degree to which each number is produced equally frequently, which they termed the “equality of response usage” factor. Miyake et al. found that this factor maps onto the working memory updating component of their three-component model, as it involves retaining in working memory the frequency with which particular responses have already been used and varying the next response accordingly. The RNG task was selected as a measure of EF in the current study, as it is a short, simple task, which is appropriate for use with young people (Towese & McLachlan, 1999), and the same data can be used to provide a measure of two different components of one of the most influential models of EF (Miyake et al., 2000).

Cognitive Processing in Depression

Repetitive negative thinking. Given the apparent impairment in EF observed in individuals with depression discussed above, a key question is whether depression leads to a primary deficit in these processes, or impairment on executive tasks results from, or is exacerbated by, interference from other on-going cognitive activity. One such cognitive activity may be repetitive negative thinking (RNT). RNT has been identified as a transdiagnostic process that is important in several affective and anxiety disorders. Ehring and Watkins (2008) comment that this process is described differently across different psychological disorders, but all definitions describe a process which is repetitive, passive and/or relatively uncontrollable and focused on negative content. Depending on the disorder, however, the content of the thinking may vary considerably, for example, symptoms of depression; future negative events; past traumas; or recent social situations.

The most common forms of RNT discussed in the literature are worry and rumination. Worry is characterised by repetitive intrusive negative thoughts about future events. Excessive and uncontrollable worry is a hallmark feature of GAD, a disorder associated with chronic cognitive, social and occupational impairment (Kessler et al., 1994). Rumination is the form of RNT that is characteristic of depression, and is defined as a mode of responding to distress that involves repetitively and passively focusing on symptoms of distress and on the possible causes and consequences of these symptoms (Nolen-Hoeksema, 1991). Rumination does not lead to active problem solving to change circumstances surrounding these symptoms (Nolen-Hoeksema,
Wisco, & Lyubomirsky, 2008). Instead, people who are ruminating remain fixated on the problems and on their feelings about them without taking action. The content of ruminative thought in depressed people is typically negative in valence; however, Nolen-Hoeksema (1991) defines rumination as the process of thinking perseveratively about one’s feelings and problems rather than in terms of the specific content of thoughts.

Most theorists in the field of RNT appear to agree that worry and rumination show a high degree of overlap and are highly correlated. However, there is some debate as to whether they should be treated as the same process that is applied to different disorder-specific contents (e.g., Segerstrom, Tsao, Alden, & Craske, 2000) or whether they should be regarded as related but nevertheless distinct processes (e.g., Papageorgiou & Wells, 1999). In their review of the area, Ehring and Watkins (2008) conclude that there are more similarities than differences between these processes. Of the small number of differences that do exist there are no clear criteria to judge whether these should be interpreted as evidence for different processes or not. However, they argue that preference should be given to the more parsimonious hypothesis, namely that worry and rumination share the same process and only differ in content (e.g. temporal orientation), until there is stronger evidence for differences on relevant dimensions.

In a seminal paper outlining response styles theory (RST), Nolen-Hoeksema (1991) argues that RNT in the form of rumination exacerbates and prolongs distress, particularly depression, through several mechanisms. First, rumination enhances the effects of depressed mood on thinking, making it more likely that people will use the negative thoughts and memories activated by their depressed mood to understand their current circumstances. Second, rumination interferes with effective problem solving, in part by making thinking more pessimistic and fatalistic. Third, rumination interferes with instrumental behaviour, leading to increases in stressful circumstances. In addition, Nolen-Hoeksema and Davis (1999) argue that people who chronically ruminate will lose social support, which in turn will fuel their depression. These consequences of rumination then make it more likely that the initial symptoms of depression will become more severe and evolve into episodes of major depression. In addition, they could prolong current depressive episodes.

**Rumination and depression: Research with adults.** There is a large body of evidence supporting the association between an analytical ruminative response style and
increased severity and duration of depressive symptoms. In a meta-analysis of the area, Mor and Winquist (2002) found that ruminative self-focus was strongly correlated with negative affect, and that the mean weighted effect size for the relationship between ruminative self-focus and negative affect ($d = 1.08$) was significantly higher than that for other forms of self-focused attention ($d = 0.46$). Prospective longitudinal studies have shown that people who engage in rumination when distressed are more likely to develop depressive disorders and more likely to experience severe depressive episodes (for a review, see Nolen-Hoeksema et al., 2008). For example, in one study, Just and Alloy (1997) found that non-depressed participants who reported that they ruminate in response to their depressive symptoms were more likely to experience a depressive episode over 18 months than were participants who reported that they distract themselves from their symptoms. Both a ruminative response style as measured in a non-depressed state and the use of rumination during the first depressive episode predicted the severity of that episode.

There have also been several experimental studies conducted testing the effects of rumination on mood. These studies have generally used the rumination induction developed by Nolen-Hoeksema and Morrow (1993). In this, participants are asked to focus on the meanings, causes, and consequences of their current feelings. There is also generally a contrasting distraction induction designed to take participants’ minds off themselves and their problems temporarily. Several of these studies have been conducted and have found that the rumination induction significantly increases dysphoric mood in dysphoric participants but not in non-dysphoric participants. The distraction induction generally decreases dysphoric mood in dysphoric participants but has no effect on mood in non-dysphoric participants (Lyubomirsky, Caldwell, & Nolen-Hoeksema, 1998; Lyubomirsky & Nolen-Hoeksema, 1993, 1995; Lyubomirsky, Tucker, Caldwell, & Berg, 1999; Morrow & Nolen-Hoeksema, 1990; Nolen-Hoeksema & Morrow, 1993). Research involving clinically depressed participants has also demonstrated similar effects. For example, Donaldson and Lam (2004) randomly allocated 36 patients with MDD and 36 control participants to either a rumination or distraction induction condition. They found that depressed patients who were induced to ruminate experienced a deterioration in their mood, whereas all those receiving the distraction induction experienced an improvement in mood. Neither induction had an impact on mood in control participants. Similar effects in terms of mood changes have been reported in other experimental studies with clinical populations (e.g., Lavender &
Rumination and depression: Research with young people. Although more limited, correlational research with adolescents has also shown that rumination is associated with concurrent and future levels of depression (Rood, Roelofs, Bogels, Nolen-Hoeksema, & Schouten, 2009). For example, Schwartz and Koenig (1996) examined the relationship between rumination and depressive symptoms in a nonclinical sample of 397 adolescents aged between 14 and 18 years. Results demonstrated that rumination predicted follow-up depression scores, and this appeared to be the case even when controlling for initial depression scores and other cognitive vulnerability factors (i.e., a negative attributional style). These results were replicated by Abela, Brozina, and Haigh (2002) who examined a younger sample of 8-12-year-old non-referred children. Their procedure involved an initial assessment of ruminative response style and depressive symptoms, and a follow-up assessment of depressive symptoms, some six weeks later. Results showed that children with a ruminative response style exhibited an increase in depressive symptoms over the 6-week period. More recently, among a UK community sample of 12-17 year olds, Leigh, Cole, Taylor, and Smith (2014) found that the relationship between baseline scores on a measure of depression and outcome scores at six months was mediated by rumination at baseline. Abela and Hankin (2011) examined response styles, depressive symptoms, and onset of new episodes of depression in a cohort of 382 adolescents between the ages of 11 and 15 years old. All young people completed self-report measures of rumination and depression alongside a semi-structured diagnostic interview assessing MDD. Depressive symptoms were assessed every three months for the following two years and the diagnostic clinical interview was repeated at six monthly intervals. The findings confirmed that the propensity to ruminate is associated with an increased likelihood of the onset of a MDE and also the duration of these episodes. In a later study by this group (Abela, Hankin, Sheshko, Fishman, & Stolow, 2012), 56 children at high risk of depression (aged 7-14) completed measures assessing rumination and depressive symptoms. Children were subsequently given a handheld personal computer which signalled them to complete measures assessing depressive symptoms and negative events at six randomly selected times over an 8-week follow-up interval. In line with the
study’s hypotheses, higher levels of rumination were associated with prospective elevations in depressive symptoms following the occurrence of negative events.

There have been a very limited number of experimental investigations into the role of rumination in depression in young people. In congruence with the findings in adult research, Park et al. (2004) reported that among adolescents with major depression, participants who had undertaken an induced rumination task reported differentially increased low mood and over-general autobiographical memory deficits when compared to those who had participated in a distraction task. However, these results must be interpreted cautiously as a later study by the same authors (Park, Goodyer, & Teasdale, 2005) found that a 12-month follow-up of adolescents with a first episode of MDD failed to demonstrate a predictive relationship between rumination and depression. Instead, high levels of self-devaluative dysphoric experience were found to increase the likelihood of persistence of first-episode MDD.

Rood, Roelofs, Bögels, and Arntz (2012) compared the effects of experimentally induced rumination, positive reappraisal, distancing, and acceptance on affect states in 160 nonclinical adolescents (aged 13-18), when participants were instructed to think about a recent stressful event. They found that positive reappraisal (i.e., thinking about the benefits of the event and personal growth) caused a significantly larger increase in positive affect and decrease in negative affect compared to rumination, distancing, and acceptance. Unexpectedly, participants who completed the rumination induction were reported to experience a decrease in negative mood. This finding is incongruent with the predictions of RST and previous findings from experimental studies with adults and young people. The authors note that this may have been related to the level of abstractness of thoughts in the various conditions. The authors originally hypothesised that participants’ thoughts in the rumination condition would be rated as more abstract than thoughts in the other conditions by observers who were blind to condition; however, this was not the case. Indeed, the rated levels of abstractness were low in every condition, which they suggest may be due to the level of cognitive development of the participants. This might be one explanation for why rumination did not maintain, but slightly improved negative affect.

More recently, Taylor et al. (2014) examined the effects of experimentally induced rumination on thinking about the future and the self in a nonclinical sample of dysphoric adolescents. In order to try and address some of the methodological limitations of previous experimental studies, this study employed a novel method for
inducing rumination, which differed somewhat from previous research in this area. For example, Park et al. (2004) induced a ruminative state in participants by asking them to read and think about written statements that were focused on the self (e.g., “think about the physical sensations in your body” or “think about how you feel about your friendships”). However, to increase the ecological validity of the induction, the rumination induction used by Taylor et al. required participants to generate an actual difficulty they had recently experienced and then to think about this difficulty in a ruminative way (e.g., “why did this happen to me?”). Manipulation checks demonstrated that this procedure was successful in generating a ruminative state in participants, and results of the study indicated that adolescents engaging in this processing style experienced more negative thinking about the future and the self in comparison to a control group. The current study, therefore, will use a rumination induction procedure based on the one used by Taylor et al. as it has been demonstrated to be effective with a nonclinical sample of dysphoric adolescents. It is also important to note that, in contrast to much of the previous research in the field, the control condition in the Taylor et al. study involved induction of a concrete processing style, as opposed to distraction. The potential benefits of concreteness of thought are discussed in the following section.

**Adaptive cognitive processing in depression.** As described above, research to date has tended to demonstrate that analytical rumination is associated with depression. However, there is less clarity regarding what is a more helpful alternative style of processing in relation to low mood. The original RST argued that using positive distractions was an adaptive alternative to rumination and suggested that these two response styles were orthogonal, if not in direct opposition (Nolen-Hoeksema, 1991). Studies using the distraction subscale of the Response Styles Questionnaire (RSQ), however, have found inconsistent relationships to depressive symptoms and rumination (e.g., Knowles, Tai, Christensen, & Bentall, 2005). Sometimes distraction is negatively correlated with depression and rumination (Bagby & Parker, 2001; Chang, 2004; Lam, Smith, Checkley, Rijsdijk, & Sham, 2003; Nolen-Hoeksema, Parker, & Larson, 1994), sometimes it is positively correlated (Schmaling, Dimidjian, Katon, & Sullivan, 2002), and sometimes it is uncorrelated (Abela, Brozina, & Haigh, 2002; Arnow, Spangler, Klein, & Burns, 2004; Just & Alloy, 1997; Kuehner & Weber, 1999; Nolen-Hoeksema, Morrow, & Fredrickson, 1993).
Nolen-Hoeksema et al. (2008) suggest that there may be a problem with the way positive distraction is operationalised on the distraction subscale of the RSQ (and on related distraction scales). They suggest that people who score highly (i.e., engage in lots of distracting activities) may flit from one activity to another, desperately trying to get their minds off their negative mood and ruminations, but may not be attending fully to any one of these activities and thus find that none of them provide relief. In contrast, those who use distraction effectively may have one or two activities which they engage in when they are feeling upset or overwhelmed with concerns, and they may absorb themselves fully in these activities.

Recent evidence, however, has suggested that there are a number of distinct modes or types of rumination, each of which has distinct functional properties, some adaptive and others maladaptive (McFarland & Buehler, 1998; Trapnell & Campbell, 1999; Treynor, Gonzalez, & Nolen-Hoeksema, 2003). Of the various distinct modes that have been proposed, one potentially important distinction is that between an abstract, evaluative mode of processing, and a concrete, process-focused mode of processing (Rimes & Watkins, 2005; Watkins, 2004; Watkins & Baracaia, 2002; Watkins & Moulds, 2005; Watkins & Teasdale, 2001, 2004). The abstract, evaluative mode is focused on evaluating the higher-level causes, meanings, consequences, and implications of self-experience. In contrast, the concrete, process-focused mode is focused on the lower-level, specific, contextual, and concrete moment-by-moment details of how self-experience unfolds.

The theoretical rationale for this distinction comes from the reduced-concreteness theory of worry (Borkovec, Ray, & Stöber, 1998; Stöber, 1998; Stöber & Borkovec, 2002) and interacting cognitive subsystems theory (Teasdale, 1999; Watkins, 2004). Both these theories propose that self-experience can be processed in a more concrete, process-focused way or in a more abstract, evaluative way. Moreover, both theories hypothesise that when applied to negative self-experience, there are several reasons why abstract, evaluative processing is maladaptive relative to concrete, process-focused processing. First, when focusing on negative self-experience, abstract, evaluative processing may provide event descriptions that are less detailed, less action-oriented, and therefore less effective for generating plans during problem solving (Stöber, 1998; Williams, 1996). Second, abstract, evaluative processing evokes less vivid imagery of emotional events (Paivio & Marschark, 1991), resulting in reduced emotional and physiological arousal during recall (Clark & Collins, 1993) and therefore
poorer emotional processing (Foa & Kozak, 1986; Pennebaker, 1997; Teasdale, 1999). Third, an abstract, evaluative mode of processing during negative self-experience is more likely to result in overgeneralisation, which has been identified as a key process in depression (Ganellen, 1988). Therefore, the processing mode hypothesis predicts that during rumination the concrete, process-focused mode should be adaptive, whereas the abstract, evaluative mode should be maladaptive (Watkins, 2004).

Watkins and Moulds (2005) tested this hypothesis by examining the effects of inducing an abstract versus a concrete self-focused thinking style on social problem-solving abilities in a sample of 40 depressed patients and 40 never-depressed controls. In line with reduced concreteness theory, they found that the two self-focus inductions had significantly different effects on social problem-solving in depressed patients, with concrete self-focus improving social problem-solving relative to abstract self-focus. A mediational analysis found that the differential effect of the two ruminative self-focus inductions on problem solving was mediated by concreteness of problem descriptions. Similar findings have been reported using nonclinical samples of adolescents. For example, in the Taylor et al. (2014) study described earlier, adolescents experienced more negative thinking about the future and the self when they were engaged in analytical rumination compared to when they were engaged in concrete processing, regardless of their current level of depressive symptoms. Leigh et al. (2014) found a similar effect with adolescents when examining social problem-solving abilities. Interestingly, in the three studies described, both the abstract ruminative and concrete processing manipulations increased negative mood, suggesting that while a concrete processing style can have beneficial effects on variables such as social problem-solving, unlike distraction, it does not necessarily improve mood in the short-term.

Not all findings with young people support concrete processing as an adaptive alternative to rumination, however. In a study by Hilt and Pollack (2012), 102 young people (mean age of 11.51 years) were induced to ruminate and then randomly assigned to one of three conditions: distraction, problem-solving, or mindfulness. These authors found that both distraction and mindfulness helped to significantly reduce state rumination, while problem-solving did not, despite the fact that the problem-solving condition involved the use of a concrete style of thinking (e.g., generating solutions and evaluating their consequences). The authors postulate that there may be a number of reasons for this finding. One is that the problem-solving intervention was not effective enough to mitigate the negative effects of rumination on problem-solving. Although the
problem-solving intervention was guided in the same way that distraction and mindfulness were, it may have required more effort because participants were instructed to think of possible solutions to problems. Rumination has been shown to decrease motivation for problem-solving (Lyubomirsky et al. 1999), so this effort may not have been valued as worthwhile. They also suggest that problem-solving might be more effective when an individual is not actively ruminating, and that it may be more beneficial to initially lift an individual’s mood with techniques such as distraction. Thus, the utility of a concrete mode of processing as an adaptive alternative to rumination for adolescents requires further investigation. The current study, therefore, will use a concrete processing induction as a comparison condition to rumination. In line with the research discussed above, it is anticipated that, like rumination, this concrete mode of processing will increase negative mood in the short-term. However, unlike rumination, concrete processing may have beneficial effects on some aspects of EF. This rationale for this hypothesis is discussed in the following section.

**Rumination and Executive Function in Depression**

Rumination and executive function in depression: Research with adults. As discussed earlier, deficits in concentration and memory are common in depression. One explanation that has been offered for these observed deficits is resource allocation theory. This theory postulates that because their cognitive capacity is reduced, depressed individuals have deficits in remembering and in engaging in other effortful cognitive processes (e.g., Ellis & Ashbrook 1988). The general assumptions are that the amount of resources available for cognitive operations is limited and that depression either occupies or functionally reduces these resources, for example, because resources are used by task-irrelevant emotional processing. Thus, deficits should become evident in effortful tasks; they should be detectable in effortful, resource-demanding components of memory tasks, for example, but not in automatic aspects of these tasks (Gotlib & Joormann, 2010). In line with this theory, the EF deficits observed in depressed individuals that are discussed above may be more indicative of difficulties in cognitive control and attentional redirection than of global processing deficits (Gotlib & Joormann, 2010; Siegle, Ingram, & Matt, 2002). At the same time, although engaging in depressive and ruminative thoughts may deplete cognitive resources that would otherwise be directed towards relevant tasks, it is also possible that underlying cognitive impairments could be the cause of depressive and ruminative styles, or that these
negative thought patterns and EF impairments interact. Some of the studies which have attempted to address the complex relationship between depression, rumination, and EF are discussed below.

A series of three experimental laboratory studies conducted by Lyubomirsky, Kasri, and Zehm (2003) demonstrated that deficits in instrumental behaviour are displayed by individuals who are induced to ruminate. In these studies, participants completed three academic tasks – reading a passage, watching a videotaped lecture, and proofreading written text. Before performing these tasks, dysphoric and non-dysphoric students completed either a rumination or a distraction induction. Results supported the hypothesis that dysphoric rumination, relative to distraction, would impair students’ concentration. In all three studies, those who were induced to ruminate reported difficulty concentrating, as well as interfering thoughts, during the relevant academic tasks. In addition, relative to those in the distraction condition, those who were induced to ruminate were slower in completing the tasks, e.g., reading the passage or answering lecture comprehension questions.

Watkins and Brown (2002) compared 14 patients with depression and 14 non-depressed controls on the RNG task described earlier, performed after either a rumination or a distraction induction. Compared with the distraction induction, the rumination induction produced a significant increase in stereotyped counting responses (thought to reflect a failure of inhibitory executive control) in depressed patients but not in controls. However, after distraction, no difference was found between the two groups. The authors concluded that EF might not be fundamentally impaired in depressed patients, as often assumed in the literature, but that the rumination induction seemed to interfere with concurrent executive processing. This interpretation thus suggests that depressive rumination is not a consequence of an executive deficit, but rather that the executive impairment observed in depressed individuals might result from their ruminative tendencies. However, the results of this study are limited by the fact that the authors only utilised one measure of randomisation performance (the count score, thought to reflect inhibitory control), whereas previous research has reported the benefits of using multiple parameters of randomness (e.g., Towse & Neil, 1998). Research utilising multiple randomness measures, reflecting different aspects of EF, would be useful to further elucidate the relationship between rumination and EF.

Although EF deficits are apparent in both these studies, as mentioned, it remains unclear which specific aspect of EF is affected by ruminative processing. Whitmer and
Banich (2007) noted that the impairment in EF observed by Watkins and Brown (2002) could have been caused by the participant either having trouble switching to the new strategy or having difficulty inhibiting the previously useful strategy. To distinguish these two possibilities, the researchers screened a large sample of university undergraduates using the Ruminative Response Scale (RRS) of the RSQ, and selected 43 participants whose scores fell in either the top or bottom 10% of the sample. Using a set-switching task (Mayr & Keele, 2000), the researchers found that the tendency to depressively ruminate was associated with difficulties inhibiting previously relevant task sets, while only being weakly associated with a poor ability to switch task set. This effect held even when statistically controlling for depressive symptoms. They conclude that those prone to rumination may have general deficits in the ability to inhibit non-optimal strategies currently in use in order to adopt new, potentially more useful strategies for solving tasks. This finding is supported by a previous study (Davis & Nolen-Hoeksema, 2000) which found that people who score high on a self-report scale of rumination show more perseverative errors on the WCST than do people who score low on rumination, even after controlling for group differences in levels of depression.

A study by Philippot and Brutoux (2008) also sought to disentangle the effects of rumination on different facets of EF. These authors screened a sample of female university undergraduates using the Beck Depression Inventory (Beck & Steer, 1987) and selected those scoring 10 or below as a control group (n=50) and those scoring 18 or above as a dysphoric group (n=44). They induced both rumination and distraction in these groups, and then compared performance on the Stroop colour-word task, looking specifically at scores measuring both inhibition and flexibility (also called task switching or shifting). In congruence with the studies above, results indicated that induced rumination decreases inhibition capacities in dysphoric individuals only. The flexibility facet of EF was not affected by induced rumination. However, dysphoric individuals demonstrated a fundamental impairment in this latter capacity, independent of rumination induction.

A more recent study by Meiran, Diamond, Toder, and Nemets (2011) did not induce rumination directly but did examine the relationship between rumination and EF in those with MDD. The study compared various measures of cognitive rigidity between individuals with MDD and those with OCD in order to explore any commonalities or differences. In order to do this, they examined the performance of 17 patients (nine with a diagnosis of MDD without OCD, and eight with a diagnosis of OCD without MDD),
and 17 control participants matched on age, gender, language and education, on a battery covering four aspects of EF (tasking switching, Stroop, working memory updating, and post-conflict adaptation), as well as other relevant measures, including the RRS. Both patient groups demonstrated difficulties with inhibition on the Stroop task relative to controls. Interestingly, rumination scores were significantly higher in patients with MDD relative to both those with OCD and control participants, and high rumination scores were correlated with poorer working memory updating. The authors note that it is difficult to determine the cause and effect with this finding. On one hand, being preoccupied with ruminative thoughts may make one less alert and less able to update working memory. On the other hand, poorer working memory updating may be the cause of rumination. Namely, it is possible that working memory updating is needed to index the fact that sufficient information has been gathered regarding problems and that it is time to stop pondering.

Rumination and executive function in depression: Research with adolescents. Although there is a dearth of comparable studies with children and young people, a recent study with a group of adolescents (Connolly et al., 2014) did address this question of whether rumination prospectively predicts EF impairments or vice versa. In this study, a community sample of 200 adolescents (aged 12-13) completed measures of depressive symptoms, rumination, and EF at baseline and at a follow-up session approximately 15 months later. They found that adolescents with higher levels of baseline rumination displayed decreases in selective attention and attentional switching at follow-up. However, somewhat in contrast to the Meiran et al. (2011) study, rumination did not predict changes in working memory or sustained and divided attention, raising a question about whether findings obtained in samples of clinically depressed patients generalise to trait rumination in nonclinical samples. Depressive symptoms were not found to predict significant changes in EF scores at follow-up and baseline EF was not associated with change in rumination or depression over time. These findings at least partially support the hypothesis that engaging in ruminative thinking consumes cognitive resources that would otherwise be allocated towards difficult tests of EF.

Two studies by Wilkinson and Goodyer (2006, 2008) also offer preliminary support for an association between rumination and EF impairments in adolescents. In their 2008 study, they compared 13 adolescents recovered from an episode of major
depression with 38 never depressed healthy controls on the Test of Everyday Attention for Children (TEA-Ch). They found that adolescents recovered from an episode of major depression had significantly reduced accuracy on tests of sustained attention and a trend for reduced accuracy on tests of attentional switching, compared with healthy controls. The 2006 study compared adolescents with current MDD and age and sex-matched controls on tests of attention and general cognitive abilities and a ruminative response style questionnaire. They found that depressed participants were significantly slower at switching attention. However, there was no association between attentional switching and mood-related ruminations and both processes contributed to the likelihood of being depressed. They concluded that depressed adolescents demonstrate dual deficits in mood-related ruminative thinking and attentional switching. While this finding elucidates the relationship between rumination and the shifting facet of EF in young people, to date there has been no research on the relationship between rumination and the working memory updating facet of EF in this group. However, some theories suggest that the preparation towards a task switch involves updating task goals (Altmann & Gray, 2008; Meiran, Kessler, & Adi-Japha, 2008) or task rules in working memory (e.g., Mayr and Kliegl, 2000, 2003). Thus, it is interesting to speculate that if shifting abilities are impaired in individuals who are low in mood, independent of rumination, the same might also be true of working memory updating.

Wilkinson and Goodyer (2006) comment that replication of their findings is required in larger numbers of adolescents not taking anti-depressants, and in those at risk but with no history of affective disorder. Importantly, levels of rumination were not experimentally manipulated in either this study or the one conducted by Connolly et al. (2014), and so it is difficult to determine causality in terms of the observed differences in EF. Indeed, changes in both variables might be due to a third process, or independently associated with depression. Thus, a study with adolescents where ruminative processing is directly manipulated is required, in order to determine causality with regard to the observed relationship between rumination and EF. As previously discussed, relative to rumination, a concrete mode of processing has been shown to improve social problem-solving ability in both adults and adolescents. However, a question remains as to whether or not the same beneficial effect would be demonstrated in relation to EF.
Rumination and executive function in depression: Summary. In terms of the relationship between rumination and EF in depressed or dysphoric adults, research has tended to demonstrated that adults who are low in mood and are induced to ruminate display difficulties with the inhibition component of EF (e.g., Philippot & Brutoux, 2008; Watkins & Brown, 2002; Whitmer & Banich, 2007). There have been no experimental studies to date examining the relationship between rumination and inhibition in adolescents who are low in mood. The current study, therefore, will examine whether a causal relationship also exists between rumination and impaired inhibition performance in adolescents with subclinical dysphoria. While the shifting component of EF also appears to be impaired in adults who are depressed or dysphoric, this impairment appears to be independent of engaging in a ruminative style of processing for both adults (e.g., Philippot & Brutoux, 2008; Whitmer & Banich, 2007) and adolescents (e.g., Wilkinson & Goodyer, 2006). In terms of working memory updating, there is evidence that this ability is impaired in adults who are prone to ruminate (e.g., Meiran et al., 2011), but research with adolescents has been less supportive of this finding (e.g., Connolly et al., 2014). In any case, given the lack of experimental research, the causal nature of this relationship also remains unclear. The current study aims to elucidate the nature of this relationship by measuring working memory updating both prior to, and following a rumination induction in both dysphoric and non-dysphoric adolescents.

Rationale for Experimental Research with Adolescents and the Current Study

Despite the convincing body of data demonstrating the relevance of rumination to EF in depressed and dysphoric mood in adults, only a handful of experimental studies have examined this relationship in young people. There are several important reasons why such research is critical. Adolescence is a crucial developmental stage, marked by a confluence of biological, psychological, and social challenges. There are significant physical maturational changes (e.g., the onset of puberty), interpersonal transitions (e.g., changes in social roles and in family and peer relationships), social-contextual changes (e.g., school transitions), and, as previously discussed, on-going maturation of the PFC and EF abilities. Although these maturational transitions offer tremendous opportunities for young people, this developmental period also is marked by heightened vulnerability, as demonstrated by the dramatic increase in incidence of depression in this age group (Hankin et al., 1998). Indeed, the normative developmental transitions associated with
adolescence might serve as sensitive periods for the activation of specific processes involved in the onset, persistence, and recurrence of depressive episodes.

While research with adults has generally supported many of the arguments of RST (Nolen-Hoeksema, 1991), it is still unclear to what extent the theory can be generalised to adolescents. Research with young people can help to highlight any potential limitations of the theory with this group and provide a potential focus for any necessary modifications. While the clinical presentation, correlates, and natural course of depression are quite similar across the lifespan, there are important developmental differences, for example, in the nature of symptomatology and biological functioning (Gotlib & Hammen, 1992). Similarly, there is evidence from the literature on normal development that children differ from adults with regard to several important facets of EF, which develop over time (e.g., Luna, Garver, Urban, Lazar, & Sweeney, 2004). In consideration of such differences, we cannot assume that the relationship between rumination and EF is comparable in an adolescent population. Demonstration of a causal role of rumination in the exacerbation of depression and related executive dysfunction would provide important information regarding cognitive processing factors that could be targeted in the development of psychological interventions. In addition, demonstration of the beneficial effects of concrete processing on EF in dysphoric adolescents would provide valuable insight into the adaptive alternatives to rumination that could be promoted within these interventions. In response to these important questions, the current study will experimentally manipulate processing style (rumination or concrete thinking) in dysphoric and non-dysphoric adolescents and measure certain facets of EF (working memory updating and inhibition), both prior to, and following the manipulations. Specific hypotheses are discussed below.

Aim and Hypotheses

The aim of the current study is to extend our understanding of the relationship between rumination and EF in adolescent depression. More specifically, the current study aims to examine the effect of dysphoric rumination on EF in young people at high risk of developing depression, compared to those at low risk. Based on the limited research conducted to date, a number of hypotheses are provided.

**Hypothesis one: Processing style and mood.** On the basis of previous findings (e.g., Taylor et al., 2014; Watkins & Moulds, 2005), it is hypothesised that engaging in
either a ruminative or a concrete processing style will exacerbate negative mood in all young people.

**Hypothesis two: Baseline differences in executive function.** Based on previous findings on shifting abilities with adolescents (e.g., Wilkinson & Goodyer, 2006), it is hypothesised that an index of the working memory updating component of EF will differ significantly at baseline, with dysphoric adolescents demonstrating impaired working memory updating performance compared to non-dysphoric adolescents, and that this difference will be unaffected by either of the processing style inductions (rumination or concrete thinking). Based on previous findings regarding inhibition ability with depressed adults (e.g., Watkins & Brown, 2002), it is hypothesised that there will be no baseline differences in inhibition ability between dysphoric and non-dysphoric adolescents.

**Hypothesis three: Changes in executive function following rumination.** On the basis of previous experimental research with adults (e.g., Philippot & Brutoux, 2008; Watkins & Brown, 2002; Whitmer & Banich, 2007), it is hypothesised that dysphoric adolescents who are induced to ruminate will demonstrate an impairment on an index of inhibition performance compared to non-dysphoric adolescents.

**Hypothesis four: Changes in executive function following concrete thinking.** Based on previous research demonstrating the beneficial effects of concrete thinking on other variables of interest in adolescent depression (e.g., negative thinking about the future and the self; Taylor et al., 2014), it is hypothesised that a concrete thinking induction will improve inhibition performance in dysphoric adolescents to a level comparable to non-dysphoric adolescents.
METHOD

Design

The current study was part of a larger project investigating cognitive processes in adolescent depression that included an initial screening phase and two experimental studies, one of which is the focus of this study. The current experimental study employed a 2 x 3 mixed design. Participants whose scores during screening on a depression measure (Mood and Feelings Questionnaire [MFQ]) fell within the upper and lower quartiles for their year group (Group: High MFQ, Low MFQ) were selected for the experimental study. During the experiment, all participants completed both experimental conditions. The conditions were characterised by training in different cognitive processing styles, namely rumination or concrete thinking. Participants completed a measure of EF (RNG) at baseline, and again following each experimental condition (Condition: Baseline, Rumination, Concrete Thinking).

Ethical considerations

Ethical approval for the study was granted from the King’s College London Psychiatry, Nursing and Midwifery Research Ethics Sub-committee on 6th November 2012 (see Appendix 1). Information sheets were provided to young people and their parents/carers (if they were under 16 years of age) before screening and following selection for participation in the study (see Appendix 2 and Appendix 3, respectively). Opt-in consent was sought from young people, and opt-out consent was sought from their parents/carers, at each stage of the research.

The use of opt-out parental consent. The use of an opt-out parental consent procedure during both screening and experimental phases of the study was employed to improve the generalisability of the current study and to ensure that all young people were given the opportunity to participate in the research. It is recognised that opt-in parental consent procedures introduce bias and that adolescents whose parents provide written consent to research participation represent a socially advantaged group (Anderman et al., 1995). Participation in the project provided young people the opportunity to discuss any concerns regarding their current wellbeing and also the
opportunity for signposting to appropriate support if required. A parental opt-in procedure may have led to the exclusion of disadvantaged young people who may have benefited from participation in the research; consequently a parental opt-out procedure was employed. It was felt that this would enable parents to make an informed decision regarding participation, while at the same time attempting to minimise the unintentional exclusion of ‘at risk’ young people. Parental information sheets and opt out forms were mailed directly to the parents at the home address on record with the school. This was in attempt to increase the likelihood that all parents received a copy of the information sheet and consent form. Steps were also taken to ensure that the young people’s consent was informed and that all young people felt able to decline the opportunity to participate should they have wished to do so. This included the provision of opportunity to discuss the details of participation both at the screening and experimental phases of the research and highlighting to participants at each stage that participation was optional and that they were free to withdraw at any time should they wish to do so.

Safeguarding procedure. All participants completed the MFQ during screening and experimental phases of the research. Completed MFQ questionnaires were reviewed by the researchers within 24 hours of completion. Clear safeguarding procedures were adhered to where a young person endorsed items that indicated risk of self-harm or suicidal ideation and scored above the recommended clinical cut-off score for depression. In accordance with the school’s safeguarding policy, the researcher passed on the name of the pupil to the child protection co-ordinator for further action from the school’s safeguarding team. All young people were informed that the content of the experimental sessions was confidential but that any disclosure that indicated risk of harm (from self or others) would be shared with the school child protection co-ordinator and appropriate actions would be taken if required to ensure their safety.

Participants

Power analysis. Sample size calculation was based on data from a similar study of adults with depression conducted by Watkins and Brown (2002). In this study, the mean count score for depressed participants in the rumination condition was 68.8 (SD = 44.7), while in the distraction condition the mean count score was 48.4 (SD = 23.3). For non-depressed control participants, the mean count score in the rumination condition was 45.5 (SD = 17.3), while in the distraction condition the mean count score for these
participants was 48.1 (SD = 16.5). Using these means, and assuming a common standard deviation of 21.82, an effect size of $d = 1.05$ is obtained. Assuming this effect size, a two-way analysis of variance (ANOVA) with a 5% significance level would have 80% power to detect an interaction between Group and Condition if the number of participants in each group was 16 (total sample size = 32). As the current study utilised a nonclinical sample, and adolescents as opposed to adults, it seemed likely that a smaller effect size might be evident. Assuming a smaller (but still large) effect size of $d = 0.8$, a two-way ANOVA with a 5% significance level would have 80% power to detect an interaction between Group and Condition if the number of participants in each group was 26 (total sample size = 52). A decision was made to attempt to recruit approximately this number of participants.

**Inclusion/exclusion criteria.** Depending on class sizes and response rates, young people in 3-5 classes per year (Years 7-13) in a large state-run secondary school in South London were included in the screening phase of the study. The most recent report from Ofsted comments that approximately 65% of students in the school are from Black Caribbean or African backgrounds, and that nearly one third speak English as an additional language. The proportion of students eligible for free school meals is above the national average. Due to the comprehension and literacy requirements of the study, young people were not selected from classes where they would be likely to have a previously documented Intellectual Disability (ID) and/or Autism Spectrum Disorders (ASD). Inclusion criteria for the experimental study included completion of the screening questionnaire and obtaining a score on the MFQ within the upper or lower quartile for their year group. Quartiles were calculated for each year group, instead of the whole cohort, in consideration of developmental differences in MFQ scores across the range of age included in the study (Cooper & Goodyer, 1993).

Following screening, the MFQ was re-administered prior to completion of the experimental study. The mean duration of time between screening and completion of the experimental study was 3.7 weeks (SD = 12.4 days). Participants were excluded if there was evident instability in their MFQ score such that their score no longer fell in the quartile range they were allocated to following screening. In addition, participants were excluded following completion of experimental tasks if they reported a lack of engagement with the allocated processing style (<50% time spent focussing on
induction questions according to self-report measures) in the induction task. See the section on experimental materials and measures for a description of the rating scales used to measure engagement with the task.

**Recruitment.** Participants for the study were identified via completion of a screening phase during which pupils in the school aged 11-19 years (Years 7-13) were invited to complete a self-report questionnaire assessing symptoms of depression (MFQ). Parents and carers (of those under 16 years of age) were initially informed of the study via an information sheet mailed to their home address. If they did not wish their child to participate, they were asked to complete an ‘opt-out’ consent form, and return it to the researcher within two weeks, in a freepost envelope which was provided. Parental consent was not sought for those over 16 years of age.

The project was explained to each class as a whole, and each young person was provided with an information sheet about the study, provided their parents/carers had not previously opted them out. If they consented to participate, they were asked to sign a consent form and complete the questionnaire. Pupils whose scores on the completed measure of depression fell within the upper and lower quartiles for their year group were invited to complete one of two experimental studies, one of which is the focus of the current study.

There were a total of 642 young people in the classes invited to participate in the two studies being conducted. Forty-two young people did not participate due to parental opt-out, and 201 young people did not consent or were absent during screening. A total of 399 young people (62%) completed screening questionnaires (Male: n = 226 [56.6%]; Female: n = 173 [43.4%]). Participant ages ranged from 11 years 6 months to 19 years 4 months, with a mean age of 14 years 7 months (SD = 2 years).

Following screening of each year group, participants were allocated to one of two experimental studies by manually alternating allocation to the two experimental studies from a list of participants ordered by MFQ score. The other study required twice the number of participants in the upper quartile as the current study. Therefore, starting with the highest scorer, every third participate in the upper quartile was allocated to the current study, while the remainder were allocated to the other study. Similarly, starting with the lowest scorer, every third participant in the lower quartile was also allocated to the current study, in order to ensure an even weighting of participants with high and low MFQ scores from each year group were represented in the study.
Using this method, 74 young people were invited to participate in the current study (High MFQ: n = 37; Low MFQ: n = 37). Of those invited to participate, 7 (9.5%) either returned parental opt-out forms, or chose not to participate in the experimental tasks (High MFQ= 2, Low MFQ= 5). Figure 1 outlines the number of participants who opted out at each stage prior to completion of the experimental tasks.

| Young people in classes invited to participate | N = 642 |
| Completed screening | N = 399 |
| Invited to participate in current study | N = 74 |
| High MFQ | N = 37 |
| Low MFQ | N = 37 |
| Completed experimental tasks | N = 67 |
| High MFQ | N = 35 |
| Low MFQ | N = 32 |

Figure 1. Recruitment pathway

**Exclusion following completion of experimental tasks.** Following screening, opt outs, and allocation, a total of 67 participants completed the experimental study reported in the current study. Each participant completed both experimental conditions (rumination and concrete thinking). Data from eight participants were excluded due to instability in their MFQ scores from screening to experimental stage (their scores at the experimental session no longer met criteria for inclusion in the quartile allocated at
screening). All of the participants excluded due to changes in MFQ scores had been allocated to the High MFQ group at initial screening. An independent samples t-test demonstrated that those in the High MFQ group were significantly more likely to be excluded than those in the Low MFQ group (t = 3.17, p = 0.003). The number of participants excluded following change in MFQ score at the experimental stage across different year groups is shown in Table 2.

Table 2. MFQ inclusion criteria and number of participants excluded across year groups

<table>
<thead>
<tr>
<th>Year Group</th>
<th>Quartile Boundaries</th>
<th>Total completed</th>
<th>MFQ Group Final N</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lower</td>
<td>Upper</td>
<td>Low</td>
</tr>
<tr>
<td>7</td>
<td>3</td>
<td>16</td>
<td>11</td>
</tr>
<tr>
<td>8</td>
<td>4</td>
<td>13</td>
<td>11</td>
</tr>
<tr>
<td>9</td>
<td>4</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>10</td>
<td>5</td>
<td>21</td>
<td>9</td>
</tr>
<tr>
<td>11</td>
<td>5</td>
<td>16</td>
<td>10</td>
</tr>
<tr>
<td>12</td>
<td>5</td>
<td>21</td>
<td>11</td>
</tr>
<tr>
<td>13</td>
<td>4</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>Total:</td>
<td>67</td>
<td>32</td>
<td>27</td>
</tr>
</tbody>
</table>

Data from a further 13 participants were excluded due to self-reported lack of engagement with the allocated processing style (<50% time spent focusing on induction questions according to self-report measures) in the induction task. Nine participants were excluded from the Low MFQ group and four participants were excluded from the High MFQ group. A chi square analysis was conducted in order to examine whether participants in each group were more likely to be excluded due to difficulty engaging with the ruminative processing style, concrete processing style, or both. Distribution of the excluded participants is displayed in Table 3. A visual examination of the data indicates that most participants who were excluded had difficulty engaging in both processing styles; however distribution did not significantly deviate from chance ($\chi^2 = 3.61, p = 0.164$). The overall exclusion of participants following completion of experimental tasks is illustrated in Figure 2.
Table 3. Exclusion of participants due to lack of engagement in processing style

<table>
<thead>
<tr>
<th>Group</th>
<th>Excluded to difficulty engaging in:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rumination</td>
</tr>
<tr>
<td>Low MFQ</td>
<td>2</td>
</tr>
<tr>
<td>High MFQ</td>
<td>0</td>
</tr>
</tbody>
</table>

Figure 2. Exclusion of participants following completion of experimental tasks

Materials and Measures

Self-report measures.

Mood and Feelings Questionnaire (MFQ; Angold & Costello, 1987). The MFQ is a 33-item questionnaire developed to assess symptoms of depression present over a two week time period in young people aged 8-18 years. It consists of 33 items covering DSM-IV criteria for depression and additional symptoms such as loneliness, feeling unloved or ugly. Respondents rate the frequency of depressive symptoms using a three-point Likert scale ranging from 0 (not true) to 2 (often true) giving a total score of 0-66, with higher scores indicating greater frequency of depressive symptoms.
The MFQ has previously been shown to demonstrate good internal consistency (Cronbach’s alpha = 0.78) and adequate test-retest reliability (Angold & Costello, 1988; Wood, Kroll, Moore, & Harrington, 1995). The current study demonstrated excellent internal consistency of the measure during both the screening (Cronbach’s alpha = 0.91) and experimental (Cronbach’s alpha = 0.95) phase of the study, as well as excellent test-retest reliability with a correlation co-efficient of 0.91.

The measure has demonstrated good convergent validity with respect to the Children’s Depression Inventory (Kovacs, 1992), Diagnostic Interview Schedule for Children (Shaffer, Fisher, Lucas, Dulcan, & Schwab-Stone, 2000), Child and Adolescent Psychiatric Assessment (Angold & Costello, 2000) and the Schedule for Affective Disorders and Schizophrenia for School-Age Children (Abrosini, 2000) (Thapar & McGuffin, 1998; Wood et al., 1995). The measure has been shown to be successful in discriminating young people with a diagnosis of depression from those without a mood disorder (Kent, Vostanis, & Feehan, 1997; Thapar & McGuffin, 1998; Wood et al., 1995), and consequently has been used extensively in community and clinical studies and in schools-based community studies to identify adolescents with symptoms of depression.

**Screen for Child Anxiety Related Emotional Disorders (SCARED; Birmaher et al., 1997).** The SCARED is a 41-item self-report questionnaire that measures symptoms of DSM-IV linked anxiety disorders in children. The measure includes five subscales: panic/somatic, generalised anxiety, separation anxiety, social phobia, and school phobia. Respondents rate the frequency of anxiety related statements using a three-point Likert scale ranging from 0 (not true) to 2 (often true) generating a total score of 0-82, with higher scores indicating greater anxiety difficulties.

Birmaher et al. (1997) demonstrated good internal consistency (Cronbach’s alpha = 0.7-0.9), test-retest reliability (p = 0.6-0.9), and discriminant validity, both within anxiety disorders and between anxiety and other psychiatric disorders, such as depression and disruptive disorders. The current study demonstrated excellent internal consistency of the measure during the experimental stage (Cronbach’s alpha = 0.95).

Muris, Merckelbach, Ollendick, King, and Bogie (2002) provided further information on the psychometric properties of the measure reporting a high level of internal consistency and highlighting that the measure is able to successfully discriminate between various anxiety disorder presentations.
Muris et al. (1998) provided evidence for the concurrent validity of the SCARED demonstrating that scores are positively related to levels of anxiety as indexed by the Spielberger State-Trait Anxiety Inventory for Children (Spielberger, 1973), the Revised Children’s Manifest Anxiety Scale (Reynolds & Richmond, 1978) and the Fear Survey Schedule for Children-Revised (Ollendick, 1983).

**Children’s Response Styles Questionnaire (C-RSQ; Abela et al., 2002).** The C-RSQ is a 25-item self-report questionnaire that assesses the extent to which young people respond to feelings of sadness with rumination. The measure presents a series of reactions to depressive symptoms which map onto three subscales: Ruminative Response Subscale, Distractive Response Subscale, and Problem-Solving Response Subscale.

The items outline responses to depressed mood (e.g. “think about how alone you feel”) and the young person is instructed to indicate how often they respond in that way when they feel sad using a four-point Likert Scale, ranging from 0 (*almost never*) to 3 (*almost always*). The Ruminative Response Subscale includes 13 items that are summed to generate a score ranging from 0 to 39, with higher scores indicating a greater propensity to ruminate. Past research indicates that the C-RSQ Ruminative Response subscale has moderate levels of internal consistency (Cronbach’s alpha = 0.74), exhibits good test-retest stability (Hankin, 2008), and positively correlates with depressive symptoms experienced by young people (Abela, Vanderbilt, & Rochon, 2004). The current study demonstrated excellent internal consistency of the C-RSQ Ruminative response subscale during the experimental stage (Cronbach’s alpha = 0.92).

**Experimental materials and measures.**

**Pilot study.** A pilot study was conducted prior to the recruitment and testing of the final sample. The experimental procedure was initially piloted with a sample of 10 young people from the school participating in the research, in order to ensure that the materials were developmentally appropriate. The method used in piloting was broadly similar to that outlined below, with a small number of changes introduced after the piloting phase. During piloting, the filler task was changed from the Speed of Comprehension Test (Version A; Baddeley, Emslie, & Nimmo-Smith, 1992) to the Similarities subtest from the Wechsler Intelligence Scale for Children, Fourth Edition (WISC-IV; Wechsler, 2004), as the former test was not developmentally appropriate for
adolescents. Initially during piloting, different imaginary scenarios (one related to forgetting a piece of homework, and one related to becoming lost) and different personal problems were used during the processing style induction of each experimental condition (rumination or concrete thinking). However, it was decided that the research would have more ecological validity if participants were asked to think about the same imaginary scenario and personal problem in each condition (as they might be asked to do during a therapeutic intervention). Data from the pilot study indicated that participants’ self-reported ability to think about the scenarios in the second processing style was not affected by having thought about the scenario in the first processing style. Some minor changes to the wording of instructions were also made based on participant feedback.

**Processing style inductions.** Experimental processing style inductions were based on those used by Taylor et al. (2014), and were originally developed based on the instructions outlined by Watkins, Moberly and Moulds (2008). Taylor et al. used a between-groups design and asked participants in each condition (Rumination and Concrete thinking) to think about three different scenarios. However, as participants in the current study completed both conditions, the number of scenarios was reduced to two, so that young people could engage in both processing styles within the allocated time period. The processing style inductions are discussed below and the experimental script used to induce the thinking styles is provided in Appendix 4.

All participants were trained to engage in both a ruminative and concrete processing style in a counterbalanced order. Participants were introduced to the concepts of concrete or ruminative thinking and instructed to engage in a processing style characterised by either ‘how’ and ‘why’ type questions, depending on condition (see Table 4). When completing the concrete condition, participants were shown seven ‘how’ type questions focusing on concrete and sensory details of the situation and discussed how people, when thinking in this way, may imagine the details the scenario whilst adopting a first-person perspective. When completing the ruminative condition, participants were shown seven ‘why’ type questions focusing on the causes, meanings and consequences of the situation.
Table 4. Questions used in the introduction of the experimental processing styles

<table>
<thead>
<tr>
<th>Concrete ‘how’ questions</th>
<th>Ruminative ‘why’ questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>How did this happen?</td>
<td>Why did this happen to me?</td>
</tr>
<tr>
<td>What did I notice?</td>
<td>What are the consequences of this?</td>
</tr>
<tr>
<td>What is the sequence of events leading up to this point?</td>
<td>What will happen because of this?</td>
</tr>
<tr>
<td>How can I understand this?</td>
<td>What will others think of me?</td>
</tr>
<tr>
<td>How can I fix this?</td>
<td>What does this mean about me?</td>
</tr>
<tr>
<td>What is the first step toward solving this problem?</td>
<td>What have I done to deserve this?</td>
</tr>
<tr>
<td>How can I decide what to do next?</td>
<td>Why do things like this keep happening to me?</td>
</tr>
</tbody>
</table>

Following this introduction, participants were trained in the relevant processing style using an imaginary scenario, related to them forgetting to bring an important piece of homework to school. The imaginary scenario was read to them, and they were instructed to spend two minutes imagining themselves in the scenario whilst answering, in their mind, questions presented on a prompt card (see Appendix 4). The content of the scenario (forgetting an important piece of homework) was previously used by Taylor et al. (2014) and was found to be acceptable to young people (see Appendix 4 for scenario). The same imaginary scenario was used in both conditions (rumination and concrete thinking). While completing the ruminative condition, participants were presented with ‘why’ type questions and while completing the concrete condition they were presented with ‘how’ type questions and instructed to work through the questions in their mind for two minutes.

Prior to the processing style inductions, participants were asked to identify a situation within the last few weeks that had made them feel sad, that had been on their mind a lot, and that they were comfortable to disclose to the researcher. Participants who were experiencing difficulty generating an example of such a situation were provided with a prompt by the researcher (e.g., “it could be an argument with friends or family or a problem at school”). Following completion of the thinking style training, all participants were asked to apply the trained thinking style to their own personal situation. Participants were reminded of the situations they had outlined and were asked to think back to a time that the situation had been particularly pertinent. They were then
instructed to remember that time as vividly as possible, focusing on cognitions, affect and somatic sensations. Participants were reminded of the task instructions, provided with a prompt card and instructed to think about the situation for two minutes in the processing style in which they had just been trained.

**Visual Analogue Scales – mood and anxiety ratings.** Ratings of current mood and anxiety were collected throughout the experiment. Ratings were taken at baseline and again after each of the four two-minute thinking induction scenarios during each of the processing mode inductions. Ratings were obtained using Visual Analogue Scales (VAS) that were 10cm in length and labelled ‘not at all sad/anxious’ and ‘very sad/anxious’ at the end points. Participants indicated their current mood level by marking an ‘X’ on each VAS. To quantify the measure, the location of the mark was measured in centimetres, yielding ratings ranging from 0 – 10 with higher scores indicating higher levels of sadness/anxiety.

**Visual Analogue Scales – ratings of personal situations.** As outlined above, participants were asked to identify a situation within the last week that had made them feel sad, that had been on their mind a lot, and that they were comfortable to disclose to the researcher. VAS were used to obtain ratings of the severity of the ‘sadness’ or ‘anxiety’ associated with the generated event when it had occurred. Participants were asked ‘how sad/anxious did that situation make you feel?’ and asked to mark an ‘X’ on scales labelled ‘not at all sad/anxious’ and ‘very sad/anxious’ at the end points. As outlined above, the location of the mark was measured in centimetres, yielding ratings ranging from 0-10 to quantify the measure, with higher scores indicating higher levels of sadness/anxiety. Participants were also asked ‘How much has that situation been on your mind recently?’ and asked to respond using a VAS labelled ‘not at all on my mind’ and ‘on my mind all of the time’ at the end points.

**Visual Analogue Scales – processing mode induction checks.** In order to assess participants’ ability to engage in the designated processing style, and as a measure of compliance with task demands, ratings were made following each induction scenario during the processing mode induction period. The ratings assessed the proportion of time that participants were thinking using the prompt cards provided and how able they
were to think of the situation for two minutes. End points of the scales were labelled ‘none of the time’ and ‘all of the time’. Participants were also asked to rate how much of the time they were thinking about the specific induction situation compared to similar situations in the past. Participants indicated their response by marking an ‘X’ on each scale. To quantify the measure, the location of the mark was measured in centimetres, yielding ratings ranging from 0 to 10. Inclusion criteria for the rumination and concrete conditions stipulated that participants needed to be able to think of the situation for two minutes using the questions on the card and using the correct mode of cognitive processing for at least 50% of the time during the induction period.

**Random number generation.** At baseline, and following each of the processing style inductions, participants completed a RNG task. In this task, participants were asked to say the numbers 1 to 10 in random order 70 times at the rate of one number every two seconds, paced by a digital timer. The concept of randomness was explained using one of the procedures for young people outlined by Towse and McLachlan (1999). This involved showing participants a 10-sided dice and asking them to imagine rolling it in their head. They were instructed to say the number on the dice they had imagined rolling every time they heard a beep. Verbatim instructions are provided in Appendix 4. Three trials were completed in total. One trial was completed at the start of the experimental procedure, as a baseline measure, and one trial was completed after each of the processing style inductions (rumination and concrete thinking). Two measures of randomness were calculated from the data obtained, which are described below. The measures were calculated using RGCalc software (Towse & Neil, 1998).

**Redundancy (index of working memory updating).** One of the most common measures of randomisation performance is Redundancy ($R$; Towse & Neil, 1998). In terms of classic information theory analyses (Attneave, 1959; Shannon & Weaver, 1949), a sequence of items can be said to contain maximum first-order information when each response alternative is selected with equal frequency. As the selection frequency among alternatives deviates from equality, the sequence can be said to have less randomness or more redundancy – hence the name for this measure – since examination of part of the sequence allows for better-than-chance estimations of subsequent choices. The $R$ score in the sequence is found by determining the extent of deviation from ideal information generation, and expressing this value as a percentage score. An $R$ score of 0% indicates no redundancy (perfect equality of response
alternative frequencies), and an R score of 100% indicates complete redundancy (the same response choice is used throughout). Using a PCA, Towse and Neil (1998) found that R scores loaded strongly onto the “equality of response usage” factor, which has been equated to the working memory updating component of the three-component model of EF (Miyake et al., 2000).

Turning Point Index (index of inhibition). Turning Point Index (TPI) involves calculating the number of responses that, as numerical values, mark a change between ascending and descending sequences (i.e., points that represent local peaks and troughs in a time-series plot). For example, in the sequence “1, 3, 5, 7, 8, 6,” there is a single turning point at response “8” as the series begins to descend at this point. In the sequence “5, 3, 4, 6, 2, 8, 9, 7,” there are four turning points (on the responses “3”, “6”, “2”, and “9”). The TPI value is reported as a percentage score, indicating the correspondence between the observed value and a theoretical expected value. Thus, values greater than 100% indicate that too many turning points were produced (relative to a theoretical distribution of random responses), whereas values less than 100% indicate fewer turning points than expected. A previous study found that patients with closed head injury produced a lower TPI than did controls (Azouvi, Jokic, Van Der Linden, Marlier, & Bussel, 1996). In the Towse and Neil (1998) analysis, TPI loaded strongly onto the “prepotent associates” factor, which has been equated to the inhibition component in the Miyake et al. (2000) model of EF.

Filler task. The Similarities subtest of the WISC-IV (Wechsler, 2004) was used as a filler task during the experiment in order to try and neutralise the effects of the first processing style induction. This task forms part of the Verbal Comprehension Index of the WISC-IV and measures logical thinking, verbal concept formation and verbal abstract reasoning. In the subtest, two similar but different objects or concepts are presented, and the young person is asked to tell how they are alike. This filler task was selected as it is developmentally appropriate for the age range of the young people who participated in the study, and it was hypothesised that the verbal comprehension demands would neutralise the effects of the preceding processing style induction.

Procedure

The full experimental procedure is depicted in Figure 3. Experimental tasks were carried out during one session lasting approximately 45 minutes. Participants
were initially given a verbal overview of the study and provided with an information sheet. After they had read it, they were asked if they had any questions, and if they were happy to participate they were asked to sign a consent form. Participants initially completed the MFQ to check that their score had remained reasonably stable from the screening phase. They then completed the RNG task in order to obtain a baseline measure of their EF. Participants were then asked to identify a personal situation and rate the level of sadness and anxiety they had experienced related to this situation. They were first trained in either the ruminative or concrete processing style using the procedure outlined above. Order of presentation of the two processing styles was counterbalanced across participants, and was decided randomly by participants selecting a letter (‘A’ or ‘B’) from a hat. Following each induction period, participants completed ratings on VAS of their mood, anxiety and ability to engage in the processing style induction. Following completion of the first processing style induction using one practice (total 2 minutes) and one personal situation (2 minutes), participants completed the RNG task again. Following this, participants completed the filler task (Similarities subtest from the WISC-IV) in order to try and neutralise the effects of the first induction. After the filler task, participants were trained in the second processing style (either rumination or concrete thinking, depending on counterbalancing), using the same practice and personal situation. Following each induction period, participants again completed ratings on VAS of their mood, anxiety and ability to engage in the processing style induction. After completion of the second processing style induction, participants again completed the RNG task. Participants completed ratings on VAS of current sadness and anxiety prior to beginning the experimental procedure and following completion of all experimental tasks. Self-report measures of anxiety and ruminative response style (SCARED and C-RSQ) were completed following experimental tasks.

**Debriefing.** All participants were debriefed at the end of the experimental session. In consideration of the potential impact of the experimental procedure on participants’ mood, participant debriefing and support was sensitively planned and conducted. All participants were provided with a summary of the research aims and hypotheses and were invited to ask questions about the experimental procedure. Participants were provided with a lay person summary of the detrimental effect of ruminative processing on mood. They were encouraged to consider the differences
between this style and a concrete style of processing, highlighting the proposed adaptive nature of the latter style. Efforts were made to ensure that young people felt supported and able to continue with their school timetable following completion of the research. All participants completed the MFQ at the start of the experimental session and this was immediately screened by the researcher. Where a participant reported continuing low mood or appeared visibly distressed following participation, they were supported by the researcher and encouraged to seek support from school pastoral staff and/or mentors. Any concerns related to a young person’s mood following completion of the experimental phase were communicated clearly to the school in line with the study’s safeguarding procedure discussed earlier.
<table>
<thead>
<tr>
<th>Step</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal overview, information and obtain written consent</td>
</tr>
<tr>
<td>Completion of MFQ</td>
</tr>
<tr>
<td>Baseline RNG task</td>
</tr>
<tr>
<td>Baseline VAS of sadness</td>
</tr>
<tr>
<td>Generation of personal scenario and completion of related VAS</td>
</tr>
<tr>
<td>Introduction of first processing style (Rumination or Concrete Thinking, dependent on counterbalancing)</td>
</tr>
<tr>
<td>Imaginary situation (2 minutes), VAS of induction check, sadness and anxiety</td>
</tr>
<tr>
<td>Personal situation (2 minutes), VAS of induction check, sadness and anxiety</td>
</tr>
<tr>
<td>Completion of RNG task following first induction</td>
</tr>
<tr>
<td>Completion of filler task (Similarities subtest from WISC-IV)</td>
</tr>
<tr>
<td>Introduction of second processing style (Rumination or Concrete Thinking, dependent on counterbalancing)</td>
</tr>
<tr>
<td>Imaginary situation (2 minutes), VAS of induction check, sadness and anxiety</td>
</tr>
<tr>
<td>Personal situation (2 minutes), VAS of induction check, sadness and anxiety</td>
</tr>
<tr>
<td>Completion of RNG task following second induction</td>
</tr>
<tr>
<td>Completion of questionnaires (C-RSQ, SCARED)</td>
</tr>
<tr>
<td>Debrief</td>
</tr>
</tbody>
</table>

*Figure 3. Experimental procedure*
Data Handling and Analysis

**Data protection.** Hard copies of participant data were anonymised and stored in a locked filing cabinet in the Institute of Psychiatry. All electronic databases were password protected.

**Data cleaning.** As parametric analyses are sensitive to the presence of outliers, all outliers were identified using graphical methods (SPSS Explore, box-whisker plots) and z-scores. Tabachnick and Fidell (2001) propose that z-scores ±3.29 (p < 0.001) are potential outliers. In identifying appropriate analyses for statistical testing, data were assessed for normality in three ways: (i) visual inspection of means and standard deviations, histograms and Q-Q plots to assess deviation from the normal distribution, (ii) examination of skewness and kurtosis scores and (iii) use of the non-parametric Kolmogrov-Smirnov test. Decisions regarding normality were made based on the combination of these checks. Parametric analyses require equality of variance and Levene’s test of equality of variance was employed.

**Treatment of missing data.** There were a minimal amount of missed items on the questionnaire used during screening. In line with previous research, response values for missing items on that questionnaire were imputed by assigning missing items the average value of all the completed MFQ items for that particular student (Chartier et al., 2008). Data were excluded in instances where more than 10% of items were missing. There were no missing data on questionnaires completed during the experimental stage, as participants were supervised during completion.

**Statistical analysis.** A mixed ANOVA was used to compare the performance of the two groups (High MFQ vs. Low MFQ) on the dependent variables (R and TPI scores in the RNG task) at baseline and following completion of the two processing style inductions (Rumination and Concrete Thinking). Results were examined to ensure that analyses had not violated the underlying assumptions of the test employed. For ANOVA this involved inspection of Levene’s test of equality of error variances to examine homogeneity of variances.

**Significance level and effect sizes.** A significance level of p < 0.05 was adopted throughout analyses. Effect sizes were reported using either partial eta squared (η²) or
Cohen’s d. Cohen (1988) recommends the following thresholds for categorisation of effect sizes: $d = .20$ is considered a small effect; $d = .50$ is a medium effect; and $d = .80$ is a large effect.
RESULTS

This section describes the characteristics of the final sample of 46 participants as well as the analysis conducted to address the hypotheses outlined in the introduction.

Inspection of Data

Normality of variables was examined as outlined previously. Results were non-significant for all variables other than the dependent variables, R and TPI, indicating suitability for parametric analysis. For the dependent variables, a sensitivity analysis was performed using a log transformation, which did not produce materially different results. Therefore, in the analysis that follows, the original raw data were used. There were no potential outliers to be considered during analysis.

Participant Characteristics

Demographics. The average age of participants was 14 years 7 months (SD = 2 years), ranging from a minimum age of 11 years 6 months to a maximum age of 19 years 4 months. An independent samples t-test revealed no significant differences in participant ages between MFQ groups. Pearson’s Chi-squared analysis revealed significant differences in the gender distribution between the MFQ groups with a higher proportion of males than females in the Low MFQ Group than would be expected by chance. Scaled scores on the WISC-IV Similarities subtest were also compared between the MFQ groups. An independent samples t-test revealed no significant differences between the groups. Table 5 summarises participant age, gender characteristics, and the mean scaled score on the WISC-IV Similarities subtest for each group.

Table 5. Age (years), gender distribution, and Similarities scaled score of participants

<table>
<thead>
<tr>
<th></th>
<th>High MFQ</th>
<th>Low MFQ</th>
<th>Test Statistic</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age* Mean (SD)</td>
<td>14.78 (2.14)</td>
<td>14.19 (1.84)</td>
<td>0.98 (44)</td>
<td>0.333</td>
</tr>
<tr>
<td>Gender* Male:Female n [%]</td>
<td>11 [48] / 12 [52]</td>
<td>18 [78] / 5 [22]</td>
<td>4.57</td>
<td>0.032</td>
</tr>
<tr>
<td>Similarities</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scaled Score* Mean (SD)</td>
<td>9.48 (1.34)</td>
<td>9.96 (1.26)</td>
<td>1.25 (44)</td>
<td>0.220</td>
</tr>
</tbody>
</table>

* independent samples t-test  ° Pearson’s Chi-squared.
Anxiety, depression, propensity to ruminate, and baseline sadness. In order to investigate expected baseline differences between the participants allocated to the High MFQ and Low MFQ groups, a series of independent samples t-tests were carried out on participants’ total scores on the MFQ and SCARED, and on their scores on the Rumination subscale of the CRS-Q, during the experimental procedure.

Reflecting the group allocations, there was a significant difference in MFQ score between the two groups both at screening and during completion of the experimental tasks, with significantly higher MFQ scores in the High MFQ group than in the Low MFQ group (see Table 6). Previous research (Daviss et al., 2006) has suggested that 29 is a useful cut-off score for discriminating young people experiencing a MDE from their peers.

Investigation of scores on the SCARED during the experimental tasks also revealed a significant difference between groups, with significantly higher scores in the High MFQ group than in the Low MFQ group (see Table 6). A total score of greater than 25 may indicate the presence of an anxiety disorder (Birmaher et al., 1999).

There was a also a significant difference between the groups on scores on the Rumination subscale of the C-RSQ, with participants in the High MFQ group scoring significantly higher than participants in the Low MFQ group (see Table 6).

Participants’ rated level of sadness at the beginning of experimental testing was also compared between those in High MFQ group and those in the Low MFQ group. A significant difference was found between groups with those in the High MFQ group rating their baseline level of sadness as higher than those in the Low MFQ group (see Table 6).

Table 6. MFQ, SCARED, C-RSQ-Rumination subscale, and baseline sadness scores

<table>
<thead>
<tr>
<th></th>
<th>High MFQ (n=23)</th>
<th>Low MFQ (n=23)</th>
<th>t (df)</th>
<th>p</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>MFQ (screen)</td>
<td>26.22 (10.22)</td>
<td>2.26 (1.68)</td>
<td>11.09 (44)</td>
<td>&lt;0.001</td>
<td>3.27</td>
</tr>
<tr>
<td>MFQ (exp)</td>
<td>24.04 (8.83)</td>
<td>1.91 (1.56)</td>
<td>11.80 (44)</td>
<td>&lt;0.001</td>
<td>3.49</td>
</tr>
<tr>
<td>SCARED</td>
<td>32.30 (13.15)</td>
<td>9.52 (6.38)</td>
<td>7.47 (44)</td>
<td>&lt;0.001</td>
<td>2.20</td>
</tr>
<tr>
<td>C-RSQ-Rum</td>
<td>16.70 (7.84)</td>
<td>4.39 (4.66)</td>
<td>6.47 (44)</td>
<td>&lt;0.001</td>
<td>1.91</td>
</tr>
<tr>
<td>Sadness (base)</td>
<td>3.03 (2.06)</td>
<td>0.95 (1.24)</td>
<td>4.16 (44)</td>
<td>&lt;0.001</td>
<td>1.22</td>
</tr>
</tbody>
</table>
Personal situation analyses. Participants generated a personal situation that was used to induce a ruminative or concrete processing style in the current study. Characteristics of the personal situations generated by participants to be used in the processing style induction periods were compared between the High MFQ and Low MFQ groups. Average scores of sadness and anxiety related to the situation and the amount of time the situation had been on the participant’s mind were calculated. Mean scores can be seen in Table 7. As might be expected, a series of independent samples t-tests revealed significant differences between the groups on all measures. The situations generated by participants in the High MFQ group were rated as causing significantly more sadness and anxiety than those in the Low MFQ group. Those in the High MFQ group also reported that they spent significantly more time thinking about the situation than those in the Low MFQ group (see Table 7).

Table 7. Level of sadness, anxiety and preoccupation with personal situation generated for induction

<table>
<thead>
<tr>
<th></th>
<th>High MFQ Mean (SD)</th>
<th>Low MFQ Mean (SD)</th>
<th>t (df)</th>
<th>p</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sadness</td>
<td>6.18 (2.52)</td>
<td>2.87 (1.95)</td>
<td>2.82  (44)</td>
<td>0.007</td>
<td>1.47</td>
</tr>
<tr>
<td>Anxiety</td>
<td>5.68 (2.79)</td>
<td>3.25 (2.82)</td>
<td>2.94  (44)</td>
<td>0.005</td>
<td>0.87</td>
</tr>
<tr>
<td>Time spent</td>
<td>6.09 (2.39)</td>
<td>2.87 (1.95)</td>
<td>5.01  (44)</td>
<td>&lt;0.001</td>
<td>1.48</td>
</tr>
</tbody>
</table>

Main Research Hypotheses

Hypothesis one: Processing style and mood. In order to investigate the changes in sadness during the induction procedure, a mixed design 2 (Group: High MFQ v Low MFQ) x 2 (Condition: Rumination v Concrete thinking) x 2 (Time: Sadness at Time 1 v Sadness at Time 2) ANOVA was conducted. Time 1 refers to the rating taken prior to the processing style induction and Time 2 refers to the sadness rating provided following completion of the induction.

Multivariate analyses revealed a significant main effect of Time (F(1,44) = 63.37, p < 0.001, ηp = 0.59), highlighting that regardless of Condition or Group, ratings of sadness were significantly higher at Time 2 (Mean = 4.32) than at Time 1 (Mean = 2.26). There were no significant interactions for Time x Condition, Time x Group or Time x Condition x Group.
Analysis of between-subjects effects revealed a significant main effect of Group for self-rated sadness (F(1,44) = 24.78, p < 0.001, η_p = .36), highlighting that overall, participants in the High MFQ group provided higher ratings of sadness (Mean = 2.30) than those in the low MFQ group (Mean = 1.74). There was no significant main effect of Condition (F(1,44) = 0.89, p = 0.351, η_p = 0.02) or interaction between Condition x Group (F(1,44) = 1.29, p = 0.263, η_p = 0.03). The mean self rated level of sadness for participants in each condition and each group are presented in Figure 4. As can be seen, in line with predictions, both processing styles exacerbated negative mood in young people; thus hypothesis one was accepted.

![Figure 4. Self-rated sadness pre- and post- processing style inductions](image)

**Hypotheses related to executive function.** The analysis conducted to address hypotheses two, three, and four is described below. Each hypothesis is then discussed individually.

**Order effects of inductions.** The order of presentation of the two processing styles (rumination and concrete thinking) was counterbalanced across participants. In order to determine whether there had been an effect of order of presentation on the
dependent variables, order of presentation was entered as a covariate into the ANOVA for each of the dependent variables, R (working memory updating) and TPI (inhibition). Analysis revealed no significant main effect for order of presentation for either R scores (F(1,43) = 1.75, p = 0.19, ηp = 0.04) or TPI scores (F(1,43) = 0.01, p = 0.95, ηp < 0.01), indicating that order of presentation did not have a significant effect on the dependent variables.

**Effects of inductions on executive function.** A 2 x 3 mixed ANOVA was conducted for each of the dependent variables, R and TPI scores, comparing MFQ group (High MFQ vs. Low MFQ) across the repeated measures factor, Condition (Baseline, Rumination, Concrete thinking). No significant effect of Condition was found for either R scores (F(1, 44) = 0.17, p = 0.82, ηp < 0.01) or TPI scores (F(1, 44) = 1.08, p = 0.34, ηp = 0.03). A significant main effect of MFQ group was found for R scores (F(1, 44) = 6.77, p = 0.013, ηp = 0.14), with more random performance in the Low MFQ group compared to the High MFQ group. No significant main effect of MFQ group was found for TPI scores (F(1, 44) = 0.10, p = 0.75, ηp < 0.01). There was no significant Group x Condition interaction for either R scores (F(1,43) = 0.05, p = 0.94, ηp < 0.01) or TPI scores (F(1,43) = 0.13, p = 0.88, ηp < 0.01). The mean R and TPI scores for each condition across both groups are displayed in Table 8.

**Table 8. Mean R score and mean TPI score across each group and condition**

<table>
<thead>
<tr>
<th></th>
<th>R Score</th>
<th>TPI Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High MFQ Mean (SD)</td>
<td>Low MFQ Mean (SD)</td>
</tr>
<tr>
<td>Baseline</td>
<td>3.66 (3.30)</td>
<td>2.03 (1.42)</td>
</tr>
<tr>
<td>Rumination</td>
<td>3.34 (2.50)</td>
<td>1.92 (1.46)</td>
</tr>
<tr>
<td>Concrete thinking</td>
<td>3.68 (3.27)</td>
<td>2.17 (1.33)</td>
</tr>
</tbody>
</table>

Pairwise comparisons were conducted following the significant main effect of MFQ group on R scores. Results showed that those in the High MFQ group had significantly higher (less random) R scores than those in the Low MFQ group across all three conditions: Baseline (t(44) = 2.18, p = 0.035, d = 0.64), Rumination (t(44) = 2.36,
p = 0.023, d = 0.71), and Concrete thinking (t(44) = 2.04, p = 0.047, d = 0.62), see Figure 5.

![Graph showing R scores (updating) across each condition for High and Low MFQ groups.](image)

*Figure 5. R scores (updating) across each condition for High and Low MFQ groups*

**Hypothesis two: Baseline differences in executive function.** In line with hypothesis two, there was a significant between group difference at baseline, with non-dysphoric adolescents displaying significantly better working memory updating performance than dysphoric adolescents at baseline, and this difference was maintained regardless of processing style inductions. Also in line with hypothesis two, there was no significant between-group difference in inhibition performance at baseline. Thus, hypothesis two was accepted.

**Hypothesis three: Changes in executive function following rumination.** Contrary to hypothesis three, dysphoric adolescents did not demonstrate a significant impairment in inhibition performance following a rumination induction compared to non-dysphoric adolescents. Thus, hypothesis three was rejected.
**Hypothesis four: Changes in executive function following concrete thinking.**

Contrary to hypothesis four, there were no significant effects of a concrete thinking induction on inhibition performance in dysphoric adolescents. Thus, hypothesis four was also rejected.
Overview and Discussion of the Findings

The current study examined the effects of dysphoric rumination on different facets of EF in young people. Participants were screened using a measure of depressive symptoms and those who scored in the upper or lower quartile for their school year group were assigned to a dysphoric or non-dysphoric group respectively. These participants then underwent both a ruminative and a concrete processing style induction, in counterbalanced order, with an EF task (RNG) being completed at baseline and again following each induction. As was hypothesised, dysphoric adolescents displayed significantly worse baseline performance on an index of working memory updating than non-dysphoric adolescents. There was no significant difference at baseline on a measure of inhibition. As was also hypothesised, both the ruminative and concrete processing style inductions exacerbated negative mood in young people. However, contrary to the study’s hypotheses, dysphoric adolescents who were induced to ruminate did not demonstrate a significant impairment in inhibition performance compared to non-dysphoric adolescents. Also contrary to the hypotheses, a concrete thinking induction did not significantly affect inhibition performance in either group. These findings are discussed in turn below.

Hypothesis one: Exacerbation of negative mood following inductions. The current study aimed to investigate the impact of engaging in a ruminative and a concrete processing style in dysphoric and non-dysphoric adolescents. Studies with adult samples have demonstrated that rumination increases depressed mood in dysphoric adult participants (Nolen-Hoeksema & Morrow, 1993) but that experimental inductions do not lead to significant changes in mood in non-dysphoric adults. The current literature regarding the effects of analytical rumination on mood in dysphoric and non-dysphoric adolescents is mixed (Park et al., 2004; Rood et al., 2012).

On the basis of the previously discussed experimental research with both adults (e.g., Watkins & Moulds, 2005) and adolescents (e.g., Taylor, et al., 2014), it was hypothesised that engaging in either a ruminative or concrete processing style would lead to increased levels of low mood in all participants as a consequence of the level of
self-focus engaged in during both processing styles. The findings from the present study provided support for this hypothesis and confirmed that both a ruminative and a concrete processing style exacerbate negative mood in adolescents. Previous research with adults has highlighted that engaging in self-focused processing is related to increased low mood and depression concurrently but that the duration of the impact depends upon the level of conctual adopted during such self-focus (Traynor, Gonzalez, & Nolen-Hoeksema, 2003). Furthermore, Watkins and Moulds (2005) highlighted that whilst both an abstract-ruminative and a concrete self-focused processing style led to increased low mood, the processing styles differed regarding their impact on cognitive factors associated with depression (i.e., social problem solving). While beneficial effects of a concrete processing style on EF in dysphoric adolescents was not demonstrated in the current study, it is still possible that this processing style would have beneficial effects on other cognitive factors associated with depression. Findings from the current study do not allow comment on the effects of a ruminative and concrete processing style on mood in the long term; thus it may have been informative to include a measure of self-reported mood after various time delays.

The present study suggests that the effect of rumination on mood was not limited to individuals who report symptoms of depression as the effect was also observed in individuals with low scores on a measure of depression. This finding is consistent with previous research of Park et al. (2004) who reported that non-depressed adolescents demonstrated significant reductions in mood following completion of the rumination induction. The observed reductions in mood following rumination in non-dysphoric adolescents is in contrast to findings with adults, but is line with previous research by Taylor et al. (2014) with adolescents. This difference might be attributable to the potency of the inductions in the studies conducted with adolescents compared to the studies with adults. Alternatively, the findings could reflect differences between adolescents and adults with regard to sensitivity to the effects of self-focused processing styles.

**Hypothesis two: Baseline differences in measures of executive function.** The finding that working memory updating differed at baseline between dysphoric and non-dysphoric adolescents, and was unaffected by the rumination induction, seems broadly in line with the findings of Wilkinson and Goodyer (2006). These authors found that there was no association between attentional switching and mood-related ruminations.
and that both processes contributed to the likelihood of being depressed. They concluded that depressed adolescents demonstrate dual deficits in mood-related ruminative thinking and attention. Further support for this interpretation of the results is provided by the previous study by Philippot and Brutoux (2008), which found that flexibility component of EF was fundamentally impaired in depressed individuals, and unaffected by induced rumination. Both these studies utilised tasks which are more related to the shifting component of EF (i.e., attentional switching on the TEA-Ch, and task switching on a modified Stroop task). As discussed previously, however, EF is comprised of separable, but related, components and some theories suggest that the preparation towards a task switch involves updating task goals (Altmann & Gray, 2008; Meiran et al., 2008) or task rules in working memory (e.g., Mayr and Kliegl, 2000, 2003). Thus, it is interesting to speculate that the impairment in working memory updating observed in the current study could eventually result in a lesser ability to prepare towards a task switch.

A different explanation for these results may lie in the manner in which rumination is operationalised in different studies. Most studies of rumination have used self-report questionnaires to measure individuals’ tendency to ruminate when they are in a negative, sad, or depressed mood. Research using these scales has demonstrated that a tendency to ruminate is sufficiently stable to be trait-like, and remains stable despite changes in levels of negative affect (Nolen-Hoeksema et al., 2008). Other studies, including the current one, have attempted to induce rumination in participants in order to examine how the active occurrence of ruminative thought, that is, a state of rumination, affects cognitive functioning. As demonstrated, dysphoric adolescents in the current study had significantly higher scores on a measure of trait rumination than non-dysphoric adolescents. It is only possible to speculate as to how this may have affected the results, as there are several other possible confounding variables, such as other depressive symptoms. However, the finding of a significant baseline difference in working memory updating between dysphoric and non-dysphoric adolescents may be related to these pre-existing differences in trait rumination. This explanation would be somewhat in line with the results of the Meiran et al. (2011) study discussed previously. These authors reported that in a depressed sample, trait rumination was related to difficulties on a task that required participants to update a number maintained in working memory after performing an arithmetic operation on the number, suggesting that trait ruminators may have been engaging in rumination without being explicitly
instructed to do so. It may have been helpful to test this hypothesis in the current study by asking participants to complete a measure following the baseline RNG task, asking them to list any task-irrelevant thoughts they had. The content of these thoughts could then be rated to assess whether or not they could be classified as ruminative intrusions, and whether the level of ruminative intrusions differed between the dysphoric and non-dysphoric groups.

Using a similar task to the Meiran et al. (2011) study, Joormann, Levens, and Gotlib (2011) examined mental sorting costs, or the additional time it took depressed and non-depressed participants to reverse the order of words maintained in working memory versus remembering them in the order in which they were presented. They found that trait rumination was related to larger sorting costs for negative words, even when controlling for severity of depressive symptomatology, suggesting that trait ruminators have difficulty updating the format of information maintained in working memory. However, not all previous findings support this conclusion. For example, the Connolly et al. (2014) study found that a baseline measure of trait rumination was not predictive of poorer working memory at follow-up. They suggest that this finding may mean that the results of previous studies (e.g., Meiran et al., 2011; Joormann et al., 2011) do not extend to trait rumination in nonclinical samples. However, the current study provides some evidence to the contrary, suggesting those with a tendency to ruminate may have less available capacity for updating working memory.

The lack of baseline differences in inhibition abilities between dysphoric and non-dysphoric adolescents is also in line with some previous research with adults, assuming that these differences might be related to pre-existing differences in levels of trait rumination. In one study looking at the relationship between trait rumination and EF, Lau, Christensen, Hawley, Gemar, and Segal (2007) did not find a relation between scores on the RRS and stopping ability on the stop-signal task in depressed participants. In contrast, however, using an antisaccade task, De Lissnyder, Derakshan, De Raedt, and Koster (2011) found that both dysphoric and non-dysphoric trait ruminators had difficulties suppressing reflexive saccades toward cues flashed on the sides of the screen. As such, findings in this area remain mixed, but thus far there is not reliable evidence that trait ruminators differ significantly in terms of inhibition abilities from non-trait ruminators.
Hypothesis three: Impairment in inhibition following rumination induction.
The lack of significant impairment in inhibition performance in adolescents who were induced to ruminate does not support previous research in this area. For example, Watkins and Brown (2002) previously found that, compared with the distraction induction, a rumination induction increased the probability that depressed (but not control) participants would experience difficulties with inhibition in a RNG task. There may be a number of reasons for the lack of similar findings in the current study. One explanation is that findings obtained in samples of clinically depressed patients may not generalise to nonclinical samples. Although trait rumination has previously been shown to predict impairments in EF at follow-up (Connolly et al., 2014), there is, thus far, no evidence that experimentally inducing rumination causes EF impairments in a nonclinical sample of adolescents. There is also some debate over the use of analogue studies with nonclinical participants as a method for studying depression; however, the rationale for use of analogue samples is discussed in the following section.

Another potential explanation for the null findings in relation to the rumination induction might lie in the nature of the EF task. Although no impairment in scores on the EF task was found following a rumination induction, this may be because the RNG task is emotionally neutral. This does not preclude the possibility that impairment might be found on an EF task involving emotional information. For example, depressed adolescents show impairments in attentional switching on the Affective Go/No-go task which is emotionally sensitive but not on the ID-ED task which is mood neutral (Kyte et al., 2005). It is possible that ruminators’ attention towards and difficulty disengaging from emotional information may deplete cognitive resources and result in poorer performance on tests of EF involving emotional information. Indeed, attentional biases towards emotional, and particularly negative, information have been found to prospectively predict depressive and ruminative thought processes in adults (De Lissnyder, Koster, Derakshan, & De Raedt, 2010; Zetsche & Joormann, 2011). These attentional biases towards emotional information, which are hypothesised to exist as vulnerability factors for the future development of rumination and depression, may emerge during adolescence as EF abilities mature (Alloy & Abramson, 2007; Jacobs, Reinecke, Gollan, & Kane 2008). Indeed, there is substantial evidence demonstrating that cognitive biases in depression operate at various stages of information processing (i.e., attention, interpretation, memory, cognitive control), and that there is significant interplay among these processes (Everaert, Koster, & Derakshan, 2012).
Hypothesis four: Improvement in inhibition following concrete thinking induction. The hypothesised improvement in inhibition performance in dysphoric adolescents following a concrete thinking induction was also not demonstrated in the current study. Following the finding that there was no impairment in inhibition performance in dysphoric adolescents who were induced to ruminate, relative to non-dysphoric adolescents, it was unlikely that a concrete thinking induction would significantly improve performance. Indeed, inhibition performance remained comparable between the two groups following the concrete thinking induction. However, there are also a number of alternative explanations for why the hypothesised improvement in performance was not demonstrated. One is that the concrete thinking induction was not effective enough to mitigate the negative effects of rumination in dysphoric adolescents. Although the concrete processing style induction was very similar to the rumination induction, it may have required more effort because participants were asked to think about possible solutions to problems. As previously discussed, rumination has been shown to decrease motivation for problem-solving (Lyubomirsky et al. 1999), and so those who experience high levels of trait rumination might find this particularly difficult. However, as indicated earlier, there were no significant differences in exclusions between the two groups (High MFQ and Low MFQ) due to their ability to engage with the processing styles, so this seems less likely.

It is also possible that engaging in a concrete thinking style requires more intensive training or instruction than was provided in the current study. Interventions that involve training individuals to think in a more concrete manner typically involve a much higher level of modelling and practice. For example, in the Concreteness Training (CNT) provided by Watkins et al. (2012) participants initially attended an individual face-to-face session lasting approximately 1.5 hours, and were asked to practise the training exercises daily for 15-30 minutes over the following six weeks. The addition of CNT significantly improved depressive symptoms as compared to treatment as usual, and significantly reduced rumination and overgeneralisation in comparison to another active treatment. It may be unreasonable to expect similar effects from the short intervention in the current study. That said, however, previous research with adolescents (Taylor et al., 2014; Leigh et al., 2014) has demonstrated beneficial effects of a short period of training in concrete processing on thinking about the future and self and social problem-solving, indicating the potential utility of this technique with adolescents.
Methodological Considerations and Limitations

Sample size and characteristics. Based on statistical calculations, a minimum of 16 participants were needed in each group in order to satisfy power criteria for the primary hypotheses, based on the likelihood of detecting effect sizes as indicated by a previous study with depressed adults (Watkins & Brown, 2002). It is likely that the size of any potential effect in the current study would be smaller, as the current study utilised a sample of dysphoric and non-dysphoric nonclinical adolescents. Thus, a study with this number of participants might have been underpowered to detect a very small effect, increasing the possibility of a Type II error. However, an attempt was made to compensate for any potential smaller effect size by recruiting approximately 50% more participants than indicated by the power calculation (23 per group).

The final sample represents a group of young people who persistently demonstrated MFQ scores within high or low ranges. The current study’s use of stringent exclusion criteria using the MFQ, a measure with demonstrated test re-test reliability, increases the methodological rigour of the current study and strengthens the confidence with which conclusions can be drawn from the significant findings. However, the conclusions drawn from the sample of young people in the current study may be limited by the presence of sampling biases in screening and experimental phases of the study. The exclusion criteria employed in the screening of participants for the current study were relatively broad. Due to the comprehension and literacy requirements of the study, young people were not selected from classes where they would be likely to have a previously documented ID and/or ASD. The exclusion of participants with previously documented ID and ASD was important in ensuring that the performance on the dependent variables of interest could not be better explained by wider cognitive impairments and disorder-related factors (e.g., reduced verbal comprehension, attentional abilities). However, the application of such criteria may render the current sample less representative of the depressed adolescent population as a whole. Particularly, the exclusion of participants with ID may mean that a group of young people with elevated prevalence of depression (Linna et al., 1999) may have been omitted.

The study also excluded participants whose level of literacy and/or poor comprehension of English indicated that they would not be able to complete questionnaire measures or experimental tasks required during participation. Whilst such criteria were essential in recruiting participants who were able to engage with and
complete the experimental tasks, the current study may be biased towards a higher functioning sample, thus limiting the generalisability of the findings. In addition, inclusion in the current study was limited to pupils who were currently attending secondary education. Research suggests that depression is negatively associated with attendance of mainstream education (Fletcher, 2008). Unavoidably, the current study excluded participants experiencing difficulties of a severity that impacted upon their school attendance. However, this is a limitation of the majority of investigations of depression in nonclinical settings as the recruitment of a representative community sample is inherently difficult.

In addition, the present sample may be systematically biased by excluding individuals who were experiencing significant levels of depression that impacted upon their willingness or ability to participate. Unfortunately, detailed clinical data was not available on individuals who chose not to participate in screening, and it is possible that this group may have evidenced differentially lower mood than those who chose to participate. However, rates of non-participation following screening were quite low (9.5%), and there were no significant differences (as measured by MFQ) between those who chose to complete the experimental tasks and those who opted out, suggesting that recruitment bias may not have been a significant problem. The use of an opt-out parental consent procedure during both screening and experimental phases of the study may have improved the generalisability of the current study. Previous research (Chartier et al., 2008) has documented that, as well as increasing overall rates of participation, the use of an ‘opt out’ parental consent system differentially increases participation among student subgroups with an increased risk for depression. The current study’s use of opt-out consent minimises bias due to parental factors such as not responding to an invitation for their child to participate.

The breadth of the age range of the participants in the current study may also have affected the results. As participants were selected from all school years, they ranged in age from 11 years 6 months to 19 years 4 months. As discussed previously, research has documented that many specific domains of EF show improvement beyond the preschool years well into adolescence and young adulthood. While inhibition abilities shows prominent improvement during the preschool years and less change later on, the abilities to update working memory and shift between tasks, on the other hand, appear to emerge in the preschool years but really improve the most afterwards in a more linear fashion (Best, Miller, & Jones, 2009). Interestingly, however, neither R
scores (working memory updating) nor TPI scores (inhibition) were significantly correlated with participants’ age in the current study (baseline R scores: $r = 0.21$, $p = 0.171$; baseline TPI scores: $r = 0.15$, $p = 0.333$), indicating no linear improvement in either of these abilities with age. While this might be less surprising for inhibition abilities, ability to update working memory has previously been shown to improve in a linear fashion during adolescence. The reason for the absence of this finding in the current study may be related to the complexity of the task utilised. As mentioned previously, developmental differences in working memory abilities among adolescents only tend to emerge on relatively complex tasks (e.g., Luciana and Nelson, 1998). The RNG task is relatively simple, and has previously been demonstrated to be understood by children as young as 8 years old (Towse & Mclachlan, 1999). This may mean that performance on this task may not differ between younger and older adolescents solely due to age differences, indicating that the wide age range of participants in the current study may not be particularly problematic. Similarly the mean age of participants in the dysphoric and non-dysphoric groups was very similar (14.78 and 14.19 years respectively), so it is unlikely that observed differences in EF between the groups could be solely attributed to age. That said, future research utilising the RNG task with adolescents may benefit from using a narrower age range, or utilising a sample of both younger and older adolescents and comparing differences in performance between the two age groups.

The use of an analogue study to investigate depression in adolescents. The current study was conducted to elucidate whether a ruminative thinking style plays a causal role in impairing EF in dysphoric adolescents. It is anticipated that advancing our understanding of causal cognitive processes will contribute to psychological treatments of depression and interventions targeting maintaining factors of the disorder. It is therefore important to consider the extent to which the current data can be generalised to depressed adolescents. The study employed an analogue research design including a nonclinical population of young people whose MFQ scores indicated low or high depressive symptomatology relative to their academic year group. The validity of analogue research in depression has been the subject of much debate and some have argued that the disorder qualitatively differs between analogue and clinical samples (Flett, Vredenburg, & Krames, 1997). However, as previously mentioned, evidence suggests that there is continuity between subclinical depression symptoms in young
adults and syndromal depression (Enns et al., 2001) and, indeed, impairments in EF have previously been reported in adults with subclinical dysphoria (e.g., Ganguli et al., 2009). In addition, the mean score of those in the High MFQ group at the experimental stage of the current study was 24.04, which is only marginally below the cut-off score of 29 reported by Daviss et al. (2006) for discriminating youth experiencing a MDE from their peers. Of the 23 participants in the High MFQ group, five (22%) scored above this cut-off point. Taken together, these findings suggest that comparing individuals in the nonclinical population who score relatively low and high on a measure of depression is a useful way of identifying the psychological processes that underlie the extreme of clinical depression.

In addition, the current study’s exclusion of participants who demonstrated inconsistent MFQ scores between screening and completion of the experimental tasks increases its generalisability to a depressed adolescent population. The application of such exclusion criteria increases the likelihood that the current study included a population of young people who experienced a stable high level of depressive symptoms whilst excluding those who may have been experiencing a temporary fluctuation of mood. The use of analogue samples has become increasingly popular as it permits experimental investigation using complex designs (Stopa & Clark, 2001). The successful use of an analogue approach in studying psychopathology has been demonstrated in a number of disorders including GAD (Leigh & Hirsch, 2011), social anxiety disorder (Stopa & Clark, 2001) and depression (Enns et al., 2001).

**Ethical issues associated with using a dysphoric sample.** This study required some important ethical issues to be considered. While the study did not utilise a clinical sample of depressed young people, many of the young people in the study scored above the clinical cut-off score for depression on the MFQ. This raises issues about the acceptability of asking these participants to undertake exercises that have the potential to lower mood (i.e., thinking about a personal problem in a ruminative way). A number of steps were taken to attempt to counteract any potential negative effects of participation. Firstly, participants were notified before providing consent that they would be required to think about sad or upsetting events, and that there was no obligation on them to take part. When conducting research with young people under the age of 16 it is also important to gain parental consent. While the opt out consent procedure used in the current study meant that there was the possibility that parents
might not read the information sheet provided and thus unintentionally give consent by not replying, this possibility was minimised by posting information sheets to the parents’ home address.

At the end of the experimental procedure, participants were fully debriefed, and informed of the potential beneficial effects of thinking about problems in a concrete, rather than a ruminative, way. Participants were not released back to class until they felt ready and were often engaged in general conversation for a few minutes to give them time to regulate their mood. It may have been useful to also include a positive mood induction at the end of the experimental procedure, and this is something which could be included in similar research in the future. As discussed previously, participants who were identified as very low in mood or at risk during the experimental procedure were referred to the school’s safeguarding team, and some went on to receive further input from school counselling or their local Child & Adolescent Mental Health Service. It is likely that a number of these young people would not have been identified as in need of extra support had they not taken part in the study.

Experimental procedure. With the exception of research by Rood et al. (2012), previous studies with adolescents investigating rumination have employed standardised symptom-focused methods to induce ruminative processing (e.g., instructing participants to think about how active/passive they feel, the physical sensations in their body, or what their feelings may mean). Whilst this methodology has enabled valuable insights into the causal role of ruminative thinking in aspects of depression, findings with non-depressed participants and young people have been inconsistent. In order to maximise the potency of the cognitive processing style inductions and increase the ecological validity of the current study, the inductions in the current study were based on those developed by Taylor et al. (2014). These inductions required participants to generate a personal situation which was then used to induce the relevant processing style. One of the limitations of the Taylor et al. study was that, due to the between-groups design, different personal situations were used by participants in the ruminative processing condition compared to those in the concrete processing condition. Therefore, any observed differences between conditions could not be unambiguously attributed to different styles of processing between the two conditions. Participants in the current study participated in both conditions, and used the same the personal situation in each, reducing the differences between conditions. Another benefit to this design was that it
appeared to be more similar to a therapeutic situation where individuals might be asked to think about a situation they had been ruminating about in a more concrete way. For example, a young person might be asked to identify when they are experiencing a ruminative thought about a situation (e.g., “why did this happen to me?”) and to try to generate an alternative more concrete thought (e.g., “how can I start to fix this problem?”).

However, there were also limitations to this design. It is possible that thinking about a situation in the first processing style may have contaminated the second processing style (e.g., ruminative thoughts about a situation during the first condition may have continued while trying to think about the situation in a concrete way). In order to try to neutralise this potential effect, the order of presentation of each processing style was counterbalanced across participants, and a filler task requiring verbal reasoning was completed between processing styles. In piloting, participants’ self-rated ability to think in the allocated processing style was no worse in the second condition than in the first, indicating that continuation of the first processing style was not particularly problematic. Importantly, the ruminative and concrete processing styles induced in the current study both involved participants engaging in self-focused processing, with only the processing style being manipulated. Consequently, the two processing inductions are considered more comparable than processing styles that differ in the level of self-focus (e.g., rumination versus distraction).

Previous studies that have employed processing style inductions have highlighted the difficulties in ensuring that participants adhere to the allocated mode of processing and that the manipulation of processing is sufficient to allow comparison of the effects of processing styles. Participants in the current study completed one two-minute processing style induction using a hypothetical situation followed by one two-minute induction using a personal situation, in each condition. This induction time is somewhat shorter than has been previously used in experimental research with young people (e.g., Park et al., 2004; Rood et al., 2012), and may have attenuated the effectiveness of the processing style inductions. However, the current processing style inductions were based on those used by Taylor et al. (2014) and Leigh et al. (2014), which did demonstrate a significant effect on thinking about the future and self, and social problem-solving, respectively.

In order to determine whether the experimental manipulation of processing style was effective, the current study included a self-report measure of participants’ ability to
engage in the relevant processing style. The use of manipulation checks represents
an important development from previous research with adolescents (e.g., Park et al., 2004;
Rood et al., 2012) and adults (e.g., Lavender & Watkins, 2004; Moulds, Kandris &
Williams, 2007; Watkins & Teasdale, 2004) that have either failed to include
manipulation checks or have included manipulation checks that rely upon the
experimenter or participant rating the content of their thoughts during the induction
(e.g., the level of abstract thinking, level of imagery, etc.). To be included in the current
study, participants were required to have rated their ability to engage in the allocated
processing style as 5/10 or above (0 = not at all able – 10 = completely able). Where
participants failed to sufficiently engage in the assigned processing mode during the
induction period, their data were not included in analyses. The inclusion of such
stringent inclusion criteria increases the probability that those included in the final
analysis had engaged in the relevant processing style. Overall, 13 participants (19%) were
excluded using this method, nine from the Low MFQ group and four from the
High MFQ group. Most participants (8/13) were excluded due to inability to engage
with both processing styles, suggesting that these participants generally had difficulties
engaging with the experimental procedure, rather than with one specific processing
style. While the small number of participants excluded makes statistical analysis less
robust, a chi square analysis revealed that the exclusion of participants from each group
did not significantly deviate from chance. The fact that the proportion of participants
excluded was relatively small indicates the experimental procedure was generally
comprehensible and accessible to participants. This may indicate that training in a
particular processing style (e.g., increasing concreteness of thought) is a feasible clinical
intervention for young people with depression.

While the inclusion of manipulation checks is a strength of the current study,
there is a possibility that participants’ reported ability to engage in the processing styles
might reflect the influence of demand effects. The manipulation checks relied upon self-
report of performance and it is possible that participants over-rated their abilities in
accordance with what they believed was expected of them and the impact of researcher
presence. It might also be possible that participants could adjust their performance on
the RNG task depending on the processing style they had just completed due to demand
effects. However, this seems unlikely as debriefing at the end of the experimental
procedure indicated that participants were generally not aware of the experimental
hypotheses and did not immediately understand what the RNG task purported to measure.

Another limitation that warrants mention is that participants in the current study were not explicitly instructed to keep thinking in the relevant processing style during completion of the experimental task (RNG). Engagement with the processing style was measured by self-report directly after the induction. In line with previous research (e.g., Watkins & Brown, 2002), it was assumed that participants would continue to think in this style during the RNG task which took place directly afterwards, and thus any observed effects on EF might be attributable to the processing style (e.g., impaired inhibition performance due to on-going rumination). However, processing style during the RNG task was not directly assessed, and it is possible that while completing this task, participants were engaging in a processing style that was different to the induction they had just completed. That said, it would have been practically difficult to include further assessment of processing style during completion of the RNG task, and this limitation is also present in several of the previous studies which have measured a particular dependent variable following engaging in a ruminative processing style.

A strength of the current study is that it included a baseline condition, where a measure of the dependent variable was taken before participants engaged in either of the induced processing styles. Presumably, during this baseline measure participants would have been thinking in the processing style that was generally typical for them. It might have been useful to try to quantify this baseline processing style in some manner (e.g., the content, valence, degree of self-focus). However, given the significant difference observed between the High and Low MFQ groups on a rumination response scale, it seems likely that the habitual processing of those in the High MFQ group was relatively much more ruminative than those in the Low MFQ group. The observed differences in the dependent variable at baseline potentially provide an insight into day-to-day impairment of EF in dysphoric adolescents.

Finally, there are a number of strengths and limitations to the experimental task (RNG) used in the current study. The RNG task allows a quick and efficient measure of EF, and is relatively free of the practice effects apparent in some other EF tasks (Towse & Cheshire, 2007). Similarly, as random generation performance requires the use of separable cognitive components, a single set of random generation data can provide a measure of different facets of EF. However, RNG as a measure of EF has not been as well-researched as other commonly available measures (Heuer, Kohlisch, & Klein,
2005), and therefore also does not have not have the age or gender norms that are available with other measures of EF (e.g., the TEA-Ch). That said, previous research has documented the utility of the RNG task as a measure of EF among young people (Towse & Mclachlan, 1999).

**Theoretical Implications**

As discussed earlier, a frequently cited explanation for the cognitive deficits exhibited by ruminators is the resource allocation hypothesis, which posits that a state of rumination usurps limited executive resources from task-relevant processing (e.g., Hertel, 1998; Levens, Muhtadie, & Gotlib, 2009; Philippot & Brutoux, 2008; Watkins & Brown, 2002). However, the results of the current study do not neatly support this explanation. An alternative explanation for some of the contradictory findings in this area is provided by an attentional scope model of rumination (Whitmer & Gotlib, 2012a). Attentional scope refers to the array of thoughts, percepts, and actions (e.g., low-level motor programs) that will be activated in working memory, or available for selection from long term memory, and can become either wider or narrower depending on individuals’ mood or emotional state (e.g., Frederickson & Branigan, 2005). The attentional scope model of rumination postulates that when individuals who already possess a narrowed attentional scope enter a high negative or low positive mood, this will limit the array of thoughts and actions that are accessible to them to an even greater extent, increasing the likelihood that their thoughts will continue to focus on the same topic over time (i.e., be repetitive). In other words, individuals who have a more constricted attentional scope, holding constant the influence of mood, will be more likely to think repetitively when they are in a negative mood because the negative mood will further constrict their already narrow attentional scope. In contrast, individuals with an inherently broader attentional scope will be protected from rumination when they enter a negative mood because their attentional scope should remain sufficiently broad that their thoughts will continue to shift from topic to topic. If this postulation is correct, then trait ruminators, that is, individuals who report frequent rumination when in a negative mood, should exhibit a narrower attentional scope than do non-ruminators, even when they are not in a negative mood and/or when investigators control for mood state.

Although no studies to date have explicitly examined trait rumination in the context of an attentional scope model, Whitmer and Gotlib (2012a) posit that the pattern
of control functioning exhibited by trait ruminators can be reinterpreted as a manifestation of a constricted attentional scope. For example, the current study, and a substantial number of others (e.g., Davis & Nolen-Hoeksema, 2000; Joormann et al., 2011; Joormann & Tran, 2009; Whitmer & Banich, 2007, 2010, 2011; Whitmer & Gotlib, 2012b), have found that trait ruminators have difficulties updating working memory. They argue that decreased updating of working memory is a key characteristic of a narrowed attentional scope at the level of working memory processing, and that the attention of trait ruminators is likely to be restricted to the small set of information that was recently activated or established in working memory, and closed to new and alternative lines of processing.

The attentional scope model can also help to explain findings that appear to be contradictory. For example, investigators have found that non-depressed trait ruminators are better than non-ruminators at ignoring distracters (Altamirano, Miyake, & Whitmer 2010; Zetsche & Joormann, 2011). In these situations, a narrowed attentional scope may allow trait ruminators to ignore distracting information in cognitive tasks because it keeps their attention focused on task-relevant information. When trait ruminators enter a negative mood, however, the negative mood will not only constrict their attentional scope further but will also bias their thoughts toward negative self-relevant information. Thus, thoughts about negative personal concerns will remain the focus of these individuals’ narrowed attentional scope even when a situation requires them to engage in other tasks, resulting in impaired performance in tests of inhibition (e.g., Philippot & Brutoux, 2008). The results of the current study do not fully support this assertion, as dysphoric adolescents did not evidence a significant impairment in inhibition abilities following a rumination induction. However, as discussed, it is possible that subclinical dysphoria is not sufficient to produce this effect. Possible future research into this model, as well as other aspects of rumination and EF in young people, is discussed later.

**Clinical implications**

Despite the limited conclusions that can be drawn from use of a nonclinical sample, some clinical implications of the current research warrant mention. Whilst cognitive behavioural therapy (CBT) has been recognised as a successful treatment for depressed young people, the effectiveness, particularly for those with more severe symptoms, has been questioned. In addition, studies have demonstrated that the beneficial effects of cognitive behavioural interventions are not always maintained
following the cessation of treatment (Michael & Crowley, 2002; Reinecke, Ryan, & DuBois 1998; Weisz, McCarty, & Valeri, 2006). Subsequently, there has been increased recognition of the need for the development of interventions that target specific cognitive factors that have been implicated in the onset and maintenance of depression. The findings of the current study have some notable implications regarding the development of interventions for adolescents with depression.

The current study provides indication that working memory updating is impaired in adolescents who are low in mood. Any interventions, which aim to ameliorate low mood in this group, should take this information into account. For example, difficulties with EF might hinder a young person’s ability to generate goals for treatment and/or negatively impact upon their ability to plan and make progress towards recovery. Similarly, any tasks completed during therapy or for homework that involve the use of complex EFs may require extra support (e.g., using written or electronic reminders, or involving parents), as they might prove particularly difficult for those that are low in mood. Consideration should also be given to how EF impairments might inform the structural aspects of psychological therapies for depression (e.g., CBT). Previous research (e.g., Scott, 1992) has documented the utility of adapting the style of delivery of CBT to the cognitive deficits present in those with chronic depression (e.g., having shorter sessions more frequently). Results of the current study suggest that similar modifications might be necessary even with young people experiencing milder symptoms. It might also be helpful to educate patients with MDD, as well as others around them, that the lack of organisational strategies for action in these individuals (i.e., avolition) is an inherent symptom of the disorder, rather than evidence of a lack of motivation on part of the individual. This is somewhat analogous to the negative symptoms that are often described in individuals with schizophrenia (Velligan et al., 1997).

Some recent reports suggest that, despite their very high heritability (Friedman et al., 2008), EFs can be improved through training. For example, Diamond, Barnett, Thomas, and Munro (2007) showed that preschool programmes, which foster self-control, improve performance on tests of EF. Bialystok (2007) reviewed a series of studies showing that bilinguals, who arguably need to constantly exercise self-control to suppress their dominant language, show better performance on tests of EF and show better resilience against detrimental aging effects including dementia. Moreover, there is indirect evidence that teaching individuals how to become more flexible in their
thinking, or at least avoid rigid, habitual, negative cognitive sets, may help protect them from developing disorders such as depression. Over the past decade, a number of cognitive behavioural programmes which specifically focus on promoting more flexible, accurate thinking have been developed and tested (Gillham, Chapman, Reivich, & Hamilton, 2008; Horowitz, Garber, Ciesla, Young, & Mufson, 2007). Findings suggest that these prevention models are, in some cases, more effective than control conditions in preventing depression up to two years later, and that this effect is mediated by cognitive, explanatory styles (Gillham, Reivich, Jaycox, & Seligman, 1995; Seligman, Schulman, & Tryon, 2007). Siegle, Ghinassi, and Thase (2007) have described the beneficial effects of a therapy for depression named ‘cognitive control training’ (CCT), which can be used as an adjunctive intervention for severe depression. CCT takes into account the EF deficits that have been demonstrated in those with severe depression, and aims to ameliorate these difficulties with tasks that specifically target EF abilities.

The current study also provides some evidence that young people with high levels of depressive symptoms can be successfully trained to engage in an adaptive concrete thinking style. The vast majority of participants rated themselves as able to engage in this style of thinking, and during debriefing could recognise the potential utility of this thinking style in dealing with difficulties that might arise for them. While the current study did not provide evidence of beneficial effects of this thinking style on EF in young people, previous research has indicated that a more concrete processing style can have beneficial effects on other variables related to depression in young people, such as negative thinking about the future and the self (Taylor et al., 2014) and social problem-solving (Leigh et al, 2014), indicating that concrete processing may be an adaptive alternative processing style to rumination. Comparable experimental findings with adults have led to an emergence of therapeutic interventions for depression that target a ruminative processing style, for example, Rumination-Focused CBT (Watkins et al., 2007), Mindfulness Based Cognitive Therapy (Kuyken et al., 2008) and CNT (Watkins et al., 2012). Evaluation of these interventions has shown promising results (e.g., Watkins et al., 2012) but further research is required to investigate the use of such interventions in an adolescent population.

As demonstrated in the current study, trait rumination is elevated in young people who are experiencing low mood. It seems likely, therefore, that during cognitive-behavioural assessment and formulation of young people with depression, it might be
beneficial to assess the young person’s response style to aid in creating an individualised formulation that includes a shared understanding of the role of rumination in the maintenance of depressive symptoms. This could be achieved by asking young people to complete the C-RSQ at assessment, during intervention, and post-therapy. This would also aid in evaluating whether improvements in mood also led to changes in trait ruminative tendencies, and whether on-going ruminative tendencies were predictive of future relapse. Given the findings of the current study, it might also be useful to complete a brief standardised measure of EF during assessment of a young person with depression. Any discovered impairment would also provide useful information when formulating their difficulties, and provide a potential explanation for the avolition which the individual might be experiencing. Subsequent measurement of EF following successful therapeutic intervention would also provide evidence of whether these difficulties are fundamental in individuals with low mood, or dependent on state factors, such as engaging in ruminative thought.

**Recommendations for Future Research**

The findings of the current study highlight a number of potential avenues for future research in this area. Discussion of the findings of the current study has highlighted methodological limitations regarding the categorisation of participants according to their scores on a measure of depression. The lack of significant findings in relation to the inhibition component of EF may be as result of the use of a nonclinical sample of adolescents who were low in mood, rather than a sample of adolescents with a diagnosis of MDD. Future research examining the effects of both trait and state rumination on the three main components of EF (working memory updating, shifting, and inhibition) in young people with a diagnosis of MDD would be useful, in order to examine whether the current findings are replicated in this group. This would provide useful insight into whether there is some level of continuity between nonclinical rumination and depressive rumination, or whether these are distinct processes. Such research might also benefit from excluding individuals who also meet criteria for an anxiety disorder. Dysphoric participants in the current study had significantly higher levels of anxiety than non-dysphoric participants and it is unclear to what extent this may have affected the findings. While induced rumination did not significantly affect EF in the current study, it would be interesting to examine whether a relationship exists
between rumination and other factors implicated in adolescent depression, such as impairments in instrumental behaviour or reduced social support.

Further research into theoretical explanations of the relationship between rumination and EF is needed, for example into the resource allocation hypothesis (Levens et al., 2009), the attentional scope model of rumination (Whitmer & Gotlib, 2012a), and the potential relationship between these theories. While substantial progress has been made using correlational approaches, it is important that investigators endeavour to examine explicitly directions of causality and to distinguish between control factors that increase susceptibility to rumination and control functioning that is affected by ruminative thinking about negative personal concerns. Researchers should examine not only how rumination manipulations affect control functioning but also how manipulating control functioning (e.g., improving EF through training, as previously discussed) influences susceptibility to rumination. This research would aid in the development of more preventative approaches for individuals at risk for rumination.

As discussed, the use of the RNG task as a measure of EF in the current study has some limitations. The lack of finding of an impairment on a neutral task of EF as a result of induced rumination does not necessarily preclude the possibility that an impairment would have been found on a task involving emotional information. Therefore, in future research, it would be important to assess whether induced rumination causes impairment solely on EF tasks related to emotional information, as opposed to neutral EF tasks. Also, given the baseline impairment in working memory updating in adolescents identified in the current study, future research might also examine how this impairment relates to difficulties in the classroom. For example, working memory is closely tied to the ability to perform mental arithmetic, and a finding of an impairment in this ability in those who are low in mood would have important implications for academic attainment. Findings arising from such studies could assist clinical decision-making by characterising individual differences in EF and socio-emotional processing. This may help guide and predict the impact of treatments and enhance the young person’s understanding of their lived experience of depression.

As one of the few experimental studies comparing a ruminative and concrete processing style in adolescents, the current study provides novel insight into the mechanisms underlying ruminative processing in this age group. This is the first study to examine various aspects of EF in adolescents following experimental induction of a ruminative processing style, and thus provides preliminary answers to important
questions about the role of EF impairments in depressive symptomatology in young people. The finding of a baseline difference in working memory updating between dysphoric and non-dysphoric adolescents highlights the importance of taking potential EF deficits into account in any interventions with this population, and provides guidance as to a number of exciting avenues for potential future research.
REFERENCES


Appendix 1: Letter granting ethical approval

Dr Patrick Smith  
Department of Psychology  
Institute of Psychiatry  
De Crespigny Park  
London SE5 8AF  
06 November 2012

Dear Dr Smith

PNM/12/13-9 Rumination in adolescent depression: the impact on cognitive processes.

Review Outcome: Full Approval

Thank you for sending in the amendments/clarifications requested to the above project. I am pleased to inform you that these meet the requirements of the PNM RESC and therefore that full approval is now granted with the following provisos:

1. All Information Sheets: Please insert the correct wording for the 'No fault compensation scheme:' ‘If this study has harmed you in any way you can contact King’s College London using the details below for further advice and information’ followed by your name, departmental and email address.

2. All Consent Forms: In the first bullet point include the date up to which participants can withdraw their date i.e. 30 June 2013.

Note that you do not need to submit a response to the above provisos, however it is a condition of the approval granted by the PNM RESC that the provisos are carried out prior to the study commencing. If the provisos are not adhered to, the approval granted by the PNM RESC would no longer be valid. Should you have any queries on this please do not hesitate to contact the Research Ethics Office.

Please ensure that you follow all relevant guidance as laid out in the King’s College London Guidelines on Good Practice in Academic Research (http://www.kcl.ac.uk/college/policyzone/index.php?id=247).

For your information ethical approval is granted until 06 November 2014. If you need approval beyond this point you will need to apply for an extension to approval at least two weeks prior to this explaining why the extension is needed, (please note however that a full re-application will not be necessary unless the protocol has changed). You should also note that if your approval is for one year, you will not be sent a reminder when it is due to lapse.

Ethical approval is required to cover the duration of the research study, up to the conclusion of the research. The conclusion of the research is defined as the final date or event detailed in the study description section of your approved application form (usually the end of data collection when all work with human participants will have been completed), not the completion of data.
analysis or publication of the results. For projects that only involve the further analysis of pre-existing data, approval must cover any period during which the researcher will be accessing or evaluating individual sensitive and/or un-anonymised records. Note that after the point at which ethical approval for your study is no longer required due to the study being complete (as per the above definitions), you will still need to ensure all research data/records management and storage procedures agreed to as part of your application are adhered to and carried out accordingly.

If you do not start the project within three months of this letter please contact the Research Ethics Office.

Should you wish to make a modification to the project or request an extension to approval you will need approval for this and should follow the guidance relating to modifying approved applications: http://www.kcl.ac.uk/innovation/research/support/ethics/applications/modifications.aspx

The circumstances where modification requests are required include the addition/removal of participant groups, additions/removal/changes to research methods, asking for additional data from participants, extensions to the ethical approval period. Any proposed modifications should only be carried out once full approval for the modification request has been granted.

Any unforeseen ethical problems arising during the course of the project should be reported to the approving committee/panel. In the event of an untoward event or an adverse reaction a full report must be made to the Chair of the approving committee/review panel within one week of the incident.

Please would you also note that we may, for the purposes of audit, contact you from time to time to ascertain the status of your research.

If you have any query about any aspect of this ethical approval, please contact your panel/committee administrator in the first instance (http://www.kcl.ac.uk/innovation/research/support/ethics/contact.aspx ). We wish you every success with this work.

With best wishes

Yours sincerely

Catherine Fieulleteau
Senior Research Ethics Officer
Appendix 2: Information sheets provided to young people and parents/carers during screening phase

INFORMATION SHEET FOR PARTICIPANTS

This information sheet is for young people

REC Reference Number: PNM/12/13-9

YOU WILL BE GIVEN A COPY OF THIS INFORMATION SHEET

Rumination in adolescent depression: the impact on cognitive processes

We are asking you to take part in a research project. If you decide not to take part, nothing bad will happen to you. You should only take part if you want to. Before you decide if you want to or not, we would like you to understand why we are doing this project and what will happen if you do take part. Please read the following information carefully and talk to other people about it if you want. Please ask us if there is anything that you're not sure about.

- **Why are we doing this project?**
  Young people are expected to do lots of difficult things these days (such as exams) and sometimes they can get stressed. When you get very stressed, this can affect how you feel. It might make you feel moody or low. You may stop enjoying things as much as you used to. It can also affect how well you sleep, how much you eat, or being able to concentrate. It can even stop you getting on with friends and family.

  We want to look at the ways in which young people think and how this affects the way they feel. We also want to look at how thinking in certain ways affects how you feel about things that happened in the past, or how good your memory is.

- **Who are we asking to take part?**
  Firstly, we are asking all pupils to take part by filling out a form with some questions about how they are feeling (unless they have trouble reading English). We will then ask pupils who get a certain score on the questionnaire to do some further tasks.

  If you decide to take part, you will be asked to sign a consent form. If you sign the consent form, this means that you understand the project, and you want to take part. It is up to you to decide whether to take part or not and you do not have to take part. If you decide to take part you are still free to pull out at any time and without saying why. If you decide not to take part, or to pull out at any time, no one will be angry with you and nothing bad will happen to you. If you have any questions about this project and what you are being asked to do, please ask the researcher before you decide whether to join in.

  If you are under 16 years old, we will also ask your parent/carer if you can take part. If you are over 16 years old, we will be sending your parent/carer an information sheet about the study, so they are aware that you might choose to take part.

- **What will happen if I agree to take part?**
  If you (and your parent/carer if you are under 16) agree to take part, you will be asked to fill in a form with some questions about how you feel. This will take about 5 minutes. It is not a test and there are no right or wrong answers. You will complete the questions in your classroom during class time. Your answers to the questions are private. They will be handed back to us and will not be seen by any other pupils or by your teachers.
If you get a certain score on the questionnaire, you will be asked to do some tasks involving different ways of thinking. These tasks will be in the form of stories and questionnaires and will involve both speaking and using pen and paper. You will be asked to fill out some forms with questions about how you are feeling and what you think about if you feel sad. You will also be asked to talk about some sad things that might have happened in the past or to do a short task to test your memory. This will take about 50 minutes. There are no right or wrong answers to the tasks. Some of your answers will be recorded, if this is OK with you. Recordings of your answers will be deleted once the research team has written them down.

- **Could anything bad happen to me if I take part?**
  It is unlikely that anything bad will happen to you if you take part in this project. Sometimes, answering questions about how you feel can be upsetting, but there will always be someone there to help if you need it. All the information you tell us is private. If you tell us something that means that you are at risk of harm (for example if someone is hurting you, or if you want to harm yourself), then we would need to talk to your parents about it, or to other people who can help you. We would always talk to you about this first.

- **What are the good things about taking part?**
  One good thing is that if you are feeling very low and you take part in the study we can help to find people who can help you with these feelings.

- **Who will see the forms that I fill out?**
  We will keep any forms that you fill out. These will be locked away safely and only the project team will be able to look at them. All the information will be entered into a computer database so that we can look at the results. Information stored on the computer will not have your name on it. You can ask us to take any information about you out of the project any time before we start writing it (until June 30th 2013). All information will be kept safely at King’s College London for a few years after the project is finished.

- **Name and contact details of the researchers**
  If this study has harmed you in any way you can contact King’s College London using the details below for further advice and information:

  Dr Patrick Smith
  Department of Psychology, Box PO77,
  Institute of Psychiatry,
  De Crespigny Park,
  London SE5 8AF
  Tel: 0207 848 0033
  Email: patrick.smith@kcl.ac.uk

  Damien Rushe / Jennifer Scott
  Department of Psychology, Box PO77,
  Institute of Psychiatry,
  De Crespigny Park,
  London SE5 8AF
  Email: damien.rushe@kcl.ac.uk jennifer.scott@kcl.ac.uk

  This study has been approved by the Psychiatry, Nursing and Midwifery Research Ethics Subcommittee at King’s College London (PNM/12/13-9).
Rumination in adolescent depression: the impact on cognitive processes

We would like to invite your child to participate in this original research project during school time. You should only allow your child to participate if you want to; choosing not to let your child take part will not disadvantage them in any way. Before you decide whether you let your child take part, it is important for you to understand why the research is being done and what their participation will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information.

- **Aims**
  There are many pressures on young people today inside and outside of school and life can be difficult at times. When difficulties mount up they can affect how your child may feel. They might make them feel moody or really low, which may stop enjoying things as much as they used to and can affect sleep, appetite, and concentration. It can also stop them getting on with friends and family.

  We want to investigate the relationship between mood and the ways in which young people think. We also want to investigate how thinking in certain ways influences how children experience past memories, and how much information they can hold in mind.

- **Who are we asking to take part?**
  Firstly, we are inviting all pupils to take part by filling out a questionnaire about their mood (unless they have trouble reading English). We are then inviting pupils whose scores on the questionnaire fall within a particular range to take part in some further tasks.

- **What will happen if I agree that my child can take part?**
  We will also be seeking consent directly from your child to take part in the study. If your child agrees, and you do not opt out, your child will be asked to complete a questionnaire related to their feelings. This questionnaire will take approximately 5 minutes to complete. There are no right or wrong answers to any of the questions. Your child will complete the questionnaire in their classroom during tutor time. The questionnaire is private and will be handed back to us and it will not be seen by any other pupils or by teachers.

  Your child does not have to take part. It is up to you and your child to decide whether they will take part or not. If you decide that your child may take part, they are still free to withdraw at any time and without giving a reason. A decision not to take part, or a decision to withdraw at any time, will not affect the standard of education or care that you or your child receives.

  If you do not wish your child to take part, please return the attached form in the enclosed pre-paid envelope within two weeks, or contact Dr Patrick Smith, Damien Rushe or Jennifer Scott using the contact details at the end of this information sheet. If we do not hear back from you within two weeks, we will assume that you are happy for your child to fill out the questionnaire.

  If your child’s score on the questionnaire falls within a particular range, he or she will be invited to participate in some further tasks. These tasks will involve either talking about a past memory, or examining working memory capacity. Again, there are no right or wrong answers to any of the tasks
involved, and all responses are kept strictly confidential. Sessions will be done at school and scheduled in liaison with a member of school staff in order to minimise disruption to your child’s school day. The session will be conducted in private, but there will always be someone there to help if needed. To help in our work, we will ask your child if we can record the tasks using an audio recorder.

If your child is eligible to complete these tasks, we will contact you again to let you know and to ask you to inform us if you do not wish your child to take part.

It is up to you to decide whether your child will take part or not. If you decide to let your child take part, you are free to withdraw them at any time and without giving a reason. A decision not to take part, or a decision to withdraw at any time, will not affect the standard of education or care that your child receives.

- **Are there any risks?**
  It is unlikely that there are any risks. Sometimes, thinking about low mood can be upsetting, but there will always be someone there to help if your child needs it. All the information your child tells us is private and confidential. However, if we are told something that suggests that your child is at risk of harm (for example if someone is threatening them, or if they want to hurt themselves), then we would have to make an exception to this confidentiality. We would discuss this with them first and then inform you. We will help your child to access services that can help them if they are in this situation. If you are worried about your child’s wellbeing at any stage, you can also contact your GP for further advice.

- **Are there any benefits?**
  The main benefit is that by participating in the study any young people with difficulties with their mood will be identified and we can assist them in accessing services which can help them.

- **Arrangements for ensuring confidentiality.**
  We will keep the original paper copies of the questionnaire that your child fills out. These will be locked away securely and only the study team will have access to them. All data will be entered into a computer database so that we can analyse the results. Data stored on the computer will be anonymised (it will not have young people’s names on it). You can withdraw your child’s data at any time before we begin writing the final project (until June 30th 2013). All data will be securely stored at King’s College London after completion of the study for a set period of time.

- **Name and contact details of the researcher**
  If this study has harmed your child in any way you can contact King’s College London using the details below for further advice and information:

  Dr Patrick Smith
  Department of Psychology, Box PO77,
  Institute of Psychiatry,
  De Crespigny Park,
  London SE5 8AF
  Tel: 0207 848 0033
  Email: patrick.smith@kcl.ac.uk

  Damien Rushe / Jennifer Scott
  Department of Psychology, Box PO78,
  Institute of Psychiatry,
  De Crespigny Park,
  London SE5 8AF
  Email: damien.rushe@kcl.ac.uk
  jennifer.scott@kcl.ac.uk

This study has been approved by the Psychiatry, Nursing and Midwifery Research Ethics Subcommittee at King’s College London (PNM/12/13-9).
Appendix 3: Information sheets provided to young people and parents/carers during experimental phase

INFORMATION SHEET FOR PARTICIPANTS

This information sheet is for young people

King’s College Research Ethics Committee Reference: PNM/12/13-9

YOU WILL BE GIVEN A COPY OF THIS INFORMATION SHEET

Rumination in adolescent depression: the impact on cognitive processes

We are asking you to take part in a research project. If you decide not to take part, nothing bad will happen to you. You should only take part if you want to. Before you decide if you want to or not, we would like you to understand why we are doing this project and what will happen if you do take part. Please read the following information carefully and talk to other people about it if you want. Please ask us if there is anything that you’re not sure about.

- **Why are we doing this project?**
  Young people are expected to do lots of difficult things these days (such as exams) and sometimes they can get stressed. When you get very stressed, this can affect how you feel. It might make you feel moody or low. You may stop enjoying things as much as you used to. It can also affect how well you sleep, how much you eat, or being able to concentrate. It can even stop you getting on with friends and family.

  We want to look at the ways in which young people think and how this affects the way they feel. We also want to look at how thinking in certain ways affects how you feel about things that happened in the past, or how good your memory is.

- **Who are we asking to take part?**
  Firstly, we asked all pupils to take part by filling out a form with some questions about how they were feeling. Now we are asking pupils who got a certain score on the questionnaire to do some more tasks.

  If you decide to take part, you will be asked to sign a consent form. If you sign the consent form, this means that you understand the project, and you want to take part. It is up to you to decide whether to take part or not and you do not have to take part. If you decide to take part you are still free to pull out at any time and without saying why. If you decide not to take part, or to pull out at any time, no one will be angry with you and nothing bad will happen to you. If you have any questions about this project and what you are being asked to do, please ask the researcher before you decide whether to join in.

  If you are under 16 years old, we will also ask your parent or carer if you can take part.

- **What will happen if I agree to take part?**
  You already filled out a questionnaire about how you feel – thank you very much for doing this. Because of your score on these questions, we are asking you to do some more things as part of our research.

  If you (and your parent/carer if you are under 16) agree to take part, the tasks we ask you to do will involve you trying different ways of thinking. These tasks will be in the form of stories and questionnaires and will involve both speaking and using pen and paper. You will be asked to fill out
some forms with questions about how you are feeling and what you think about if you feel sad. You
will also be asked to talk about some things that might have happened in the past or to do a short
task to test your memory. This will take about 50 minutes. There are no right or wrong answers to the
tasks. Some of your answers will be recorded if this is OK with you. Recordings of your answers will
be deleted once the research team has written them down.

- **Could anything bad happen to me if I take part?**
  It is unlikely that anything bad will happen to you if you take part in this project. Sometimes, answering
  questions about how you feel can be upsetting, but there will always be someone there to help if you
  need it. All the information you tell us is private. If you tell us something that means that you are at
  risk of harm (for example if someone is hurting you, or if you want to harm yourself), then we would
  need to talk to your parents about it, or to other people who can help you. We would always talk to
  you about this first.

- **What are the good things about taking part?**
  One good thing is that if you are feeling very low and you take part in the study we can help to find
  people who can help you to deal with these feelings.

- **Who will see the forms that I fill out?**
  We will keep any forms that you fill out. These will be locked away safely and only the project team
  will be able to look at them. All the information will be entered into a computer database so that we
  can look at the results. Information stored on the computer will not have your name on it. You can ask
  us to take any information about you out of the project any time before we start writing it (until June
  30th 2013). All information will be kept safely at King’s College London for a few years after the project
  is finished.

- **Name and contact details of the researchers**
  This study has been approved by the Psychiatry, Nursing and Midwifery Research Ethics
  Subcommittee at King’s College London (PNM/12/13-9).

Dr Patrick Smith
Department of Psychology, Box PO77,
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Email: damien.rushe@kcl.ac.uk
jennifer.scott@kcl.ac.uk
INFORMATION SHEET FOR PARTICIPANTS

This information sheet is for parents and carers

REC Reference Number: PNM/12/13-9

Rumination in adolescent depression: the impact on cognitive processes

We would like to invite your child to participate in the next part of this research project. Before you decide whether you want your child to take part, it is important for you to understand why the research is being done and what their participation will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information.

- **Aims**
  There are many pressures on young people today inside and outside of school and life can be difficult at times. When difficulties mount up they can affect how your child may feel. They might make them feel moody or really low, which may stop enjoying things as much as they used to and can affect sleep, appetite, and concentration. It can also stop them getting on with friends and family.

  We want to investigate the relationship between mood and the ways in which young people think. We also want to investigate how thinking in certain ways influences how children experience past memories, and how much information they can hold in mind.

- **Who are we asking to take part?**
  Your child kindly already completed a questionnaire about their mood for us – thank you very much for agreeing for your child to be involved. Now we are inviting pupils whose scores on this questionnaire fall within a particular range to take part in some further tasks.

- **What will happen if I agree that my child can take part?**
  Your child has already completed a questionnaire about their feelings. We are now inviting your child to take part some further tasks. These will involve either talking about a past memory or examining working memory capacity. Again, there are no right or wrong answers to any of the tasks involved. Sessions will be done at school and scheduled in liaison with a member of school staff in order to minimise disruption to your child’s school day. The session will be conducted in private, but there will always be someone there to help if needed. To help in our work, we will ask your child if we can record the tasks using an audio recorder.

  It is up to you to decide whether your child will take part or not. We will also be seeking consent directly from your child to take part in this part of the study. If you decide to let your child take part, you are still free to withdraw your child at any time and without giving a reason. A decision not to take part, or a decision to withdraw, will not affect the standard of education or care that you or your child receives.

If you do not wish your child to take part in the next phase of the study, please return the attached form in the enclosed pre-paid enveloped within two weeks, or contact any of the researchers using the contact details at the end of this information sheet. If we do not hear back from you within two weeks, we will assume that you are happy for your child to take part in the next phase of the research.
• **Are there any risks?**
  It is unlikely that there are any risks. Sometimes, thinking about low mood can be upsetting, but there will always be someone there to help if your child needs it. All the information your child tells us is private and confidential. However, if we are told something that suggests that your child is at risk of harm (for example if someone is threatening them, or if they want to hurt themselves), then we would have to make an exception to this confidentiality. We would discuss this with them first and then inform you. We will help your child to access services that can help them if they are in this situation. If you are worried about your child’s wellbeing at any stage, you can also contact your GP for further advice.

• **Are there any benefits?**
  The main benefit is that by participating in the study any young people with difficulties with their mood will be identified and we can assist them in accessing services which can help them.

• **Arrangements for ensuring confidentiality.**
  We will keep the original paper copies of the questionnaires that your child filled out. These will be locked away securely and only the study team will have access to them. All data will be entered into a computer database so that we can analyse the results. Data stored on the computer will be anonymised (it will not have young peoples’ names on it). You can withdraw your child’s data at any time before we begin writing the final project (until June 30<sup>th</sup> 2013). All data will be securely stored at King’s College London after completion of the study for a set period of time.

• **Name and contact details of the researchers**
  If this study has harmed your child in any way you can contact King’s College London using the details below for further advice and information:

  Dr Patrick Smith
  Department of Psychology, Box PO77,
  Institute of Psychiatry,
  De Crespigny Park,
  London SE5 8AF

  Tel: 0207 848 0033
  Email: patrick.smith@kcl.ac.uk

  Damien Rushe / Jennifer Scott
  Department of Psychology, Box PO77,
  Institute of Psychiatry,
  De Crespigny Park,
  London SE5 8AF

  Tel: 0207 848 0033
  Email: damien.rushe@kcl.ac.uk
  jennifer.scott@kcl.ac.uk

  This study has been approved by the Psychiatry, Nursing and Midwifery Research Ethics Subcommittee at King’s College London (PNM/12/13-9).
Appendix 4: Experimental script used in the processing style inductions

ADMINISTRATION INSTRUCTIONS

Random Number Generation (Baseline):

Let's play a game with numbers. What I want you to do is pretend that you are rolling a dice, like this one here, and then tell me what number appears when you've rolled it. The dice that you can roll has all the numbers between 1 and 10. Let's practise with this dice. Now, each time you hear a beep on the timer, imagine you are rolling the dice and say the number on the dice that you have pretended to roll.

So what I want you to do is try and say numbers just like a dice would produce numbers, without any order to them. So if you said number 2, then number 3, then number 4, then number 5, then that wouldn’t be much like the roll of a dice would it? So what you should try and do is jumble up the order.

You can use all the numbers between 1 and 10, and you can choose the same number twice by just repeating it if you want to. But remember to tell me which number you have chosen each time you hear the beep. So you might say number 4, then number 1, then number 6, then number 3, then number 3 again, and so on.

Let’s practise. Tell me the first number after you hear the first beep, and keep going until the beeps stop.

OK, now you’ve got the hang of it. Let’s try again. Tell me the first number after you hear the first beep, and keep going until the beeps stop.

Ruminative Thinking:

Before we start the rest of today's tasks, I would like to get an idea of how you are feeling right now. On this scale of 0 - 10 where 0 is not all sad and 10 is very sad, how sad do you feel right now?

Personal Situation One

Ok, for the next thing we are going to do today, I would like you to think of something that has made you feel sad recently and that you have been thinking about a lot over the last week. Maybe a fight/row that you have had with your parents or a friend or a problem you have had at school.

I won’t ask you to tell me too much about the situation but please think of something that you are comfortable to tell me a little bit about. I’ll give you a few minutes to think of something just let me know when you have…

Ok, can you tell me a little bit about the problem or situation that has been on your mind recently?

Ok so the situation is XXX and your main concern is XXXXX.

- On a scale of 0-10 where 0 is not at all and 10 is very much, how much has that situation been on your mind over the last week?
- On a scale of 0-10 where 0 is not at all sad and 10 is very sad, how sad has that situation made you feel over the last week?
- On a scale of 0-10 where 0 is not at all anxious and 10 is very anxious, how anxious has that situation made you feel over the last week?

Thank you for telling me about that. We are going to come back to thinking about that situation later but first we are going to do something different. This task involves thinking about problems in a particular way. Sometimes when we are thinking about problems we might think about questions like the ones on this card (CARD 1).
- Why did this happen to me?
- What will this mean?
- What will happen because of this?
- What will others think of me?
- What does this mean about me?
- What have I done to deserve this?
- Why do things like this keep happening?

I am going to give you an imaginary situation and what I would like you to do is spend 2 minutes imagining yourself in the situation and answering the questions on the card in your mind. I won’t be asking you to tell me what you thought of for each but it is important that you try to answer all of the questions. If you find your mind wandering, gently bring your attention back to the situation I give you and the questions. If you find it hard to fill the time, I’d like you to replay the thoughts, like they’re on a tape loop, until I tell you to stop.

So, I will give you a situation and you will spend 2 minutes thinking about the situation answering the questions on the card. Does that make sense?

**Practice Situation One:**
I’d like you to imagine yourself in this situation at school. You have been working really hard on an important piece of homework/assignment. The teacher for that lesson is really strict and you have tried really hard to get the work right. It’s taken you a long time to finish it and you’re really pleased with it.

On the morning you are due to hand it in you are running late and you have to rush to school. I would like you to imagine that in as much detail as possible. Imagine rushing around the house, hurrying to get to school.

You rush to form just on time and sit down at a desk. You open your bag to get your homework to hand in for the next lesson and realise that you have forgotten it. Notice any feelings in your body. Notice how you feel and what you think. Try to hold on to that feeling, this is a really important piece of homework and the teacher is very strict.

Now think about the situation using the questions on this card.

**CARD 1**

- On a scale of 0-10 where 0 is not at all sad and 10 is very sad, how sad do you feel at this moment?
- On a scale of 0-10 where 0 is not at all anxious and 10 is very anxious, how anxious do you feel at this moment?
- On a scale of 0-10 where 0 is not at all and 10 is very much, how able were you to think about that situation for 2 minutes?
- On a scale of 0-10 where 0 is none of the time and 10 is all of the time, how much of the time were you thinking about the situation using the questions on the card?
- On this scale, can you mark whether you were thinking about just this situation or a similar event that has happened to you in the past
- On this scale, can you mark whether you were thinking in words or images?
Personal Situation One:
Earlier you told me about a situation XXXX. Thinking of that situation, I’d like you to think back to a time recently when you were most bothered by this situation?

When was that?
Where were you?
Who were you with?

Can you remember that as clearly as possible? Imagine being XX and what you can see around you. Try to capture that feeling. Notice any feelings in your body. Notice how you feel and what you think. Try to hold on to that feeling.

I would like you to spend 2 minutes thinking about the situation and answering the questions on this card in your mind. If you find your mind wandering, gently bring your attention back to the problem and these questions. If you find it hard to fill the time, I’d like you to replay the thoughts, like they’re on a tape loop, until I tell you to stop.

CARD 2

- On a scale of 0-10 where 0 is not at all sad and 10 is very sad, how sad do you feel at this moment?
- On a scale of 0-10 where 0 is not at all anxious and 10 is very anxious, how anxious do you feel at this moment?
- On a scale of 0-10 where 0 is not at all and 10 is very much, how able were you to think about that situation for 2 minutes?
- On a scale of 0-10 where 0 is none of the time and 10 is all of the time, how much of the time were you thinking about the situation using the questions on the card?
- On this scale, can you mark whether you were thinking about just this situation or a similar event that has happened to you in the past
- On this scale, can you mark whether you were thinking in words or images?

Random Number Generation (following rumination):

Now we are going to complete the task that we did at the start of our time again. So what I want you to do is try and say numbers just like a dice would produce numbers, without any order to them.

You can use all the numbers between 1 and 10, and you can choose the same number twice by just repeating it if you want to. But remember to tell me which number you have chosen each time you hear the signal.

Let’s begin. Tell me the first number after you hear the first beep, and keep going until the beeps stop.

Administer Similarities subtest as per WISC-IV instructions.

Concrete Thinking

Now we are going to do something different. This task involves thinking about problems in a different way. Sometimes when we are thinking about a situation that has upset us we might think about how it happened and what led up to the problem happening.

We might imagine the situation re-playing in our mind really vividly, like we are watching a movie of how it happened, at the same time remembering how it made us feel in our body and what we could see and
hear at the time. We might picture it through our own eyes, as if we are looking out on the situation and watching it happen. We might think about the situation as if it were happening again right now. We might think about questions like the ones on this card (CARD 3).

- How did this happen?
- What did I notice?
- What is the sequence of events leading up to this point?
- How can I understand this?
- How can I fix it?
- What is the first step to solve this problem?
- How can I decide what to do next?

I want you to think about the imaginary situation from earlier again, the one about forgetting your homework. But this time, would like you to do is spend 2 minutes imagining yourself in the situation and answering the questions on this card in your mind.

I would like you to imagine the situation as if it is happening right now. Focusing on how it happened and what has led up to it happening. Imagine it in your mind as vividly as possible, like a movie from the beginning to the end. Try to see it through your own eyes, as if you are looking out on it happening.

If you find your mind wandering, gently bring your attention back to the situation and these questions. If you find it hard to fill the time, I’d like you to replay the thoughts, like they’re on a tape loop, until I tell you to stop.

So, I will give you a situation and you will spend 2 minutes thinking about the situation, imagining it like a movie in your mind and answering the questions on the card. Does that make sense?

**Practice Situation 2:**
I’ll read the situation to you again.

You have been working really hard on an important piece of homework/assignment. The teacher for that lesson is really strict and you have tried really hard to get the work right. It’s taken you a long time to finish it and you’re really pleased with it.

On the morning you are due to hand it in, you are running late and you have to rush to school. I would like you to imagine that in as much detail as possible. Imagine rushing around the house, hurrying to get to school.

You rush to form just on time and sit down at a desk. You open your bag to get your homework to hand in for the next lesson and realise that you have forgotten it. Notice any feelings in your body. Notice how you feel and what you think. Try to hold on to that feeling, this is a really important piece of homework and the teacher is very strict.

Now imagine yourself in that situation, picturing it like a movie from the beginning to the end and answering the questions on this card.

**CARD 3**
Personal Situation Two:
Earlier you told me about XXXX. I want you to think back to that situation again.

When was that?
Where were you?
Who were you with?

Can you remember that as clearly as possible? Imagine being XX and what you can see around you. Try to capture that feeling. Notice what you are feeling in your body. Notice what thoughts you have, note what feelings you have and how strong they are.

I would like you to spend 2 minutes imagining yourself in the situation and answering the questions on this card in your mind. I would like you to imagine this situation in the XXX as if it is happening right now. Focusing on how it happened and what has led up to it happening. Imagine it in your mind as vividly as possible, like a movie from the beginning where you are XXX to the end where XXX. As you imagine this situation, see it through your own eyes, as if you are looking out on the scene. If you find it hard to fill the time, or if you find your mind wandering, gently bring your attention back to the situation and these questions until I tell you to stop.

CARD 4

- On a scale of 0-10 where 0 is very sad and 10 is not at all sad, how sad do you feel at this moment?
- On a scale of 0-10 where 0 is very anxious and 10 is not at all, how anxious do you feel at this moment?
- On a scale of 0-10 where 0 is not at all and 10 is very much, how able were you to think about that situation for 2 minutes?
- On a scale of 0-10 where 0 is none of the time and 10 is all of the time, how much of the time were you thinking about the situation using the questions on the card?
- On this scale, can you mark whether you were thinking about just this situation or a similar event that has happened to you in the past
- On this scale, can you mark whether you were thinking in words or images?

Random Number Generation (following concrete thinking):
Now we are going to complete the number task from earlier again. So what I want you to do is try and say numbers just like a dice would produce numbers, without any order to them. You can use all the numbers between 1 and 10, and you can choose the same number twice by just repeating it if you want to. But remember to tell me which number you have chosen each time you hear the signal.

Let’s begin. Tell me the first number after you hear the first beep, and keep going until the beeps stop.
PART B
SERVICE EVALUATION PROJECT

FEASIBILITY AND EFFECTIVENESS
OF A GROUP CBT INTERVENTION
FOR INDIVIDUALS WITH BIPOLAR
DISORDER WITHIN A PSYCHOSIS
SERVICE

Supervisor:
Dr Annis Cohen
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Bipolar disorder is a serious mental illness that can have a severe impact on an individual’s psychosocial functioning. For various reasons, service users with a diagnosis of bipolar disorder within the Southwark Psychosis Support & Recovery teams currently receive limited provision of psychology services. The aim of the current project was to ameliorate this identified gap in service provision, by examining the feasibility and effectiveness of a 10-week CBT group intervention for these service users. The group covered aspects recommended by NICE (2006), including psychoeducation, mood monitoring, and coping strategies. Five service users completed the group intervention and demonstrated small, but non-significant, improvements on self-report measures of depressive symptoms, illness perception, and general psychological wellbeing. Participants also completed a feedback questionnaire, providing suggestions for future development of the intervention. Limitations of the study, challenges for implementation, and implications for future service delivery are discussed.
Bipolar Disorder

Clinical Characteristics. Bipolar disorder is a serious mental illness that is characterised by extreme changes in mood, from mania to depression. The disorder is characterised by substantial chronicity as well as an elevated rate of relapse and hospitalisation sometimes entailing dramatic consequences on social and occupational functioning and quality of life (Rouget & Aubry, 2007). The fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013) lists two main subtypes for the disorder. To receive a diagnosis of bipolar I disorder, an individual must have experienced at least one manic or mixed episode. Bipolar II disorder is characterised by at least one episode of hypomania and at least one episode of major depression. About 4% of people have one of the types of bipolar disorder at some point in their life (Ketter, 2010). In DSM-5, bipolar and related disorders are placed between the chapters on schizophrenia spectrum and other psychotic disorders and depressive disorders in recognition of their place as a bridge between the two diagnostic classes in terms of symptomatology, family history, and genetics. Given this overlap between bipolar disorder and other mood and psychotic disorders, differential diagnosis can be particularly difficult (McIntyre, 2010).

It is estimated that 75% of individuals suffering from bipolar illness present at least one relapse over the course of the 5 years following a manic episode (Gitlin, Swendsen, Heller, & Hammen, 1995). In a review of 31 studies of 9389 patients with bipolar disorder, the lifetime prevalence of suicide ranged from 9% to 60% with a weighted mean of 19% (Goodwin, 1999). Disruptions in social functioning also seem to persist between the different episodes of the illness and several studies show that bipolar disorder is associated with considerable residual functional deficits that persist after symptomatic recovery (Blairy et al., 2004). In the UK, it has been estimated that the annual societal cost of bipolar disorder is about £2 billion. Cases of bipolar disorder often remain unrecognised (mainly misdiagnosed as unipolar depression), resulting in suboptimal treatment and an increase in the overall total healthcare costs (National Institute for Health and Care Excellence [NICE], 2006).
The Psychosocial Context. Since the discovery of lithium in 1949, pharmacotherapy has long constituted the treatment of choice for bipolar disorder. However, in the past two decades, there has been resurgence of interest in the role of psychosocial processes in the onset, course, expression, and treatment of bipolar spectrum disorders. This shift toward the inclusion of psychosocial factors in research on bipolar disorder is largely attributable to researchers’ dual recognition that genetic and biological processes are unable to fully account for differences in the expression, timing, and polarity of symptoms (O’Connell, 1986) and that lithium’s and other drugs’ prophylactic effects are limited (Goodwin, 2002).

A growing body of evidence suggests that the current environmental context has an important impact on the onset, course, and expression of bipolar spectrum disorders (Alloy, Reilly-Harrington, Fresco, & Flannery-Schroeder, 2005). The role of two kinds of environmental factors has been studied in bipolar disorder: recent life events and social support (including negative support such as expressed emotion). The life events literature has been fairly consistent in suggesting that individuals with bipolar disorder experience increased stressful events prior to onset or subsequent episodes of their disorder (Alloy et al., 2005; Johnson & Kizer, 2002). Several retrospective studies (e.g., Bebbington et al., 1993; Sclare & Creed, 1990) have found that manic patients experienced more independent negative events during the period prior to onset than either controls, or the period after onset. In another more methodologically sound prospective study, Christensen et al. (2003) used questionnaire assessment of life events every three months for up to three years, and found that bipolar women (but not men) experienced a greater number of events in the three months prior to a depressive phase compared to a control period.

Another important aspect of an individual’s current environment that affects the course of bipolar disorder is supportive or non-supportive interpersonal relationships. Social support from family and friends can buffer against the deleterious effects of stress or directly enhance functioning among individuals with bipolar disorder, whereas high criticism and emotional over-involvement (high “expressed emotion” or EE) from family members can provide additional stress and worsen the course of bipolar disorder. A number of cross-sectional studies (e.g., Beyer et al., 2003; Kulhara, Basu, Mattoo, Sharan, & Chopra, 1999) have found that individuals with bipolar disorder experience less social support than various control groups and that low social support is associated with mood episode relapses.
Similar findings have been reported for prospective studies. For example, in their study of 94 patients with bipolar disorder in full or partial remission followed for one year, Johnson, Lundstroem, Aberg-Wistedt, and Mathe (2003) found that those who relapsed had lower social support than those who did not relapse and that levels of social support were equivalent for both manic and depressive relapses. Prospective studies have also shown that high EE is predictive of a worse course of bipolar disorder. In their study, Rosenfarb et al. (2001) examined relatives’ affective style during a family interaction in 27 patients with bipolar disorder followed for nine months. Relatives of patients who relapsed made a greater number of both critical and supportive statements during the interactions than did relatives of patients who did not relapse, and among the relapsing group, relatives’ criticism was positively related to patients’ unusual thoughts during the interaction.

Psychological Interventions for Bipolar Disorder

Given the increased awareness of the importance of the psychosocial context in the course of bipolar disorder, a growing number of psychological interventions for bipolar disorder have been evaluated in recent years. At least five approaches have been evaluated in randomised controlled trials (RCTs): interpersonal and social rhythm therapy (Frank et al., 2005), family-focused therapy (Miklowitz, George, Richards, Simoneau, & Suddath, 2003), group psychoeducation (Colom et al., 2003), life goals programme (Simon, Ludman, Bauer, Unützer, & Operskalski, 2006), and cognitive behavioural therapy (CBT; Lam et al., 2003). All approaches have demonstrated some efficacy in either acute or long-term studies when compared with treatment as usual (TAU) or other controlled conditions. Family-focused therapy, interpersonal and social rhythm therapy and life goals programme appear to be more effective when patients are acutely ill, whereas group psychoeducation and CBT showed better results when started during a period of remission (Miklowitz, 2008). As the current study focuses on individuals with bipolar disorder in remission, the latter two approaches will be briefly discussed.

Group Psychoeducation. Reduced to its most basic level, psychoeducation consists of providing information to a patient about their illness. In a broader sense, Callahan and Bauer (1999) suggest that “psychoeducation should also help to foster an alliance whereby the patient becomes an active collaborator in treatment” and that it is
“a mutual process that attempts to improve a patient’s illness management skills through the bidirectional sharing of relevant information”. Several studies have evaluated the efficacy of psychoeducation, either delivered alone or in combination with other therapeutic approaches in the framework of more complex interventions. However, solid evidence in favour of the efficacy of psychoeducation as an adjunctive treatment to pharmacotherapy is fairly recent since methodological limits, such as non-controlled studies, small sample sizes and short follow-up periods were present in frequently cited early studies.

One group (Colom et al., 2003), which attempted to ameliorate this gap in literature, conducted a controlled trial with 120 outpatients with bipolar disorder in remission for at least six months prior to the study, who were receiving standard pharmacological treatment. Participants were matched for age and sex and randomised to receive, in addition to standard psychiatric care, 21 sessions of group psychoeducation or 21 sessions of non-structured group meetings. Participants were assessed monthly during the 21-week treatment period and throughout the 2-year follow-up. They found that group psychoeducation significantly reduced the number of relapsed patients and the number of recurrences per patient, and increased the time to depressive, manic, hypomanic, and mixed recurrences. The number and length of hospitalisations per patient were also lower in patients who received psychoeducation.

**Individual CBT for Bipolar Disorder.** While the above study evaluated psychoeducation administered as a distinct treatment, other studies have evaluated the efficacy of psychoeducation in combination with other therapeutic approaches in the framework of more complex interventions, such as CBT. A cognitive model of bipolar disorder asserts that the interpretation of changes in internal state is a central explanatory factor in the understanding of the disorder (Mansell, Morrison, Reid, Lowens, & Tai, 2007). This model explains how attempts at affect regulation are disturbed through the multiple and conflicting extreme personal meanings that are given to internal states. These meanings prompt exaggerated efforts to enhance or exert control over internal states, which paradoxically provoke further internal state changes, thereby feeding into a vicious cycle that can maintain or exacerbate symptoms. Counterproductive attempts at control are classified as either ascent behaviours (increasing activation), or descent behaviours (decreasing activation).
A number of studies have examined the efficacy of CBT in the treatment of bipolar disorder (e.g., Lam et al., 2003). The two particular areas targeted in this intervention were coping with bipolar prodromes and disruption of social rhythms. A previous study (Lam, Wong, & Sham, 2001) had found that patients with bipolar disorder were able to report common prodromes reliably during an 18-month period. Furthermore, patients’ ability to cope with manic prodromes predicted their levels of social functioning and relapses 18 months later. Hence, the early detection of prodromes and introduction of useful strategies during this phase is an important aspect of psychological intervention.

Another study (Malkoff-Schwartz et al., 1998) reported that in the eight weeks prior to manic episodes, a significantly greater proportion of individuals with bipolar disorder had social rhythm disruption events than during the 8-week episode-free control period. If these events play an important role in the onset of mania, psychological interventions should help individuals with bipolar disorder to cope with such life events to prevent its onset. Some individuals with bipolar disorder who have frequent relapses engage in striving behaviour to “make up for lost time” (Mansell et al., 2007). Thus, it is also important to promote a good routine and target the extreme striving or goal attainment beliefs.

The CBT offered by Lam et al. (2003) followed tradition CBT treatment for depression, but included elements to address the above concerns. These included: teaching skills to monitor mood, including prodromes, and to modify behaviour to prevent prodromal stages from developing into full-blown episodes; emphasising the important of sleep and routine; and looking out for behaviour that compensated for “loss of time” due to previous illness or extreme striving attitudes. In order to examine the effectiveness of this intervention, they conducted a trial where they randomised 103 individuals with bipolar disorder, who experienced frequent relapses despite the prescription of commonly used mood stabilisers, into a CBT group or control group. In addition to usual psychiatric input, the CBT group received an average of 14 sessions of CBT during the first six months and two booster sessions in the second six months. They found that during the 12-month period the CBT group had significantly fewer hospital admissions for mood episodes. The CBT group also had significantly higher social functioning.
Group CBT for Bipolar Disorder. Group CBT (G-CBT) interventions for bipolar disorder have also been evaluated more recently. The results of three open trials of G-CBT for patients with bipolar disorder suggested good feasibility, increased psychosocial functioning (Palmer, Williams, Gorsefield, & Adams, 1995; Patelis-Siotis et al., 2001) and improved information about the disorder (Bernhard et al., 2006) using this format. However, small sample sizes and the absence of control groups limited the applicability of these studies. Integrated group therapy, the only manual-based therapy developed to treat the frequent comorbidity of bipolar and substance abuse disorders, uses cognitive behavioural group techniques (Weiss et al., 2007). A pilot study of G-CBT for bipolar disorder (González-Isasi et al., 2010), compared to a control TAU condition, failed to find any significant differences between the groups post-treatment or at 6-month follow-up. There was a significant difference at 12-month follow-up, with the CBT group evidencing significantly higher quality of life than the TAU group. One of the reasons these authors suggest for their non-significant findings is that, unlike the study by Lam et al. (2003), they included patients with acute symptoms of mania in the programme, as well as those in remission.

Two RCTs of G-CBT have been published recently, comparing a manualised G-CBT condition to a TAU condition. In the first, Gomes et al. (2011) allocated 23 patients with bipolar disorder who were in remission to a G-CBT programme of 18 structured sessions covering topics such as psychoeducation about bipolar disorder, cognitive and behavioural strategies to manage depression and manic episodes, assertiveness and problem solving, and relapse prevention. Time to remission was compared with a group of 27 patients who received TAU (primarily pharmacological treatment). Contrary to their hypothesis, time to recurrence of illness and number of episodes were not different in the group of patients treated with G-CBT compared to TAU. However, median time to relapse was shorter in the TAU group.

A later study by a Brazilian group (Costa, Cheniaux, Rangé, Versiani, & Nardi, 2012) evaluated the effectiveness of 14 sessions of G-CBT for patients with bipolar disorder (n=27) compared to a TAU group (n=14). The researchers in this study did not examine time to relapse, but rather changes in measures of quality of life and mood symptoms. At the end of treatment, compared with the TAU group, those in the G-CBT condition exhibited lower scores for mania (not statistically significant) and depression (statistically significant) as well as a reduction in the frequency and duration of mood episodes. There was also significant improvement on six of the eight subscales used to
assess quality of life. They conclude that G-CBT may be useful in the treatment of bipolar disorder.

**Advantages and Disadvantages of Group Therapy.** There are several advantages and disadvantages to a group format for intervention. In terms of advantages, group therapy has been associated with potential time and cost savings per patient, the possibility of treating a greater number of people and reducing waiting lists (Jeffrey, 1999; Lewinsohn & Clarke, 1999; Morrison, 2001; Cox, Vinogradov & Yalom, 2008). The effects of group cohesion, imitative behaviour, interpersonal learning, opportunity for group members to serve as co-therapists and offer mutual support are claimed to be positive by-products of group treatment (Lewinsohn & Clarke, 1999; Morrison, 2001; Spence, 1989; Toseland & Siporin, 1986; Cox, Vinogradov & Yalom, 2008). Group settings are also said to provide group members with the opportunity to recognise common experiences shared among other group members (Lewinsohn & Clarke, 1999; Morrison, 2001; Toseland & Siporin, 1986; Cox, Vinogradov & Yalom, 2008). These non-specific factors of the therapeutic relationship have repeatedly been shown to result in positive outcomes for clients (Corey & Corey, 2002; Horvath & Bedi, 2002).

However, there are also many disadvantages associated with group therapy. These include the risk of one patient monopolising sessions, confrontation between group members, subgroups developing, differential improvement rates discouraging slower improvers, and the propensity for groups to descend into small-talk (Morrison, 2001; Cox, Vinogradov & Yalom, 2008). Furthermore, group situations may mean that individuals are reluctant to discuss disturbing cognitions and, as a result, fail to undertake rigorous exploration and evaluation of some of these more challenging cognitions (Morrison, 2001; Toseland & Siporin, 1986; Cox, Vinogradov & Yalom, 2008). Difficulty in arranging a day or time convenient for all group members means that a greater number of missed sessions may result or, conversely, may require more time off work and lost income, reducing claims of cost-effectiveness (Morrison, 2001; Cox, Vinogradov & Yalom, 2008). However, it should be noted that the stated advantages and disadvantages of group psychotherapy are at present not solidly backed by empirical evidence (Hornsey, Dwyer, Oei, & Dingle, 2009).

In considering cost effectiveness of group therapy, one of the challenges in reviewing the literature is the widely varying methods taken in calculating the costs of
psychotherapy treatment. Also, financial considerations alone are not sufficient to determine the cost-effectiveness of group and individual CBT. Another important consideration is the effectiveness of the treatments in question. If group CBT has less than equal therapeutic benefit when compared to individual CBT, it cannot be said to be more cost-effective, as money is being wasted on an ineffective treatment (Tucker & Oei, 2007).

While there have been no comprehensive studies examining the cost effectiveness of group psychotherapy for bipolar disorder, there have been several studies which have compared effectiveness of individual versus group CBT for the treatment of depression. Of previous studies looking at effectiveness, some have shown support for the superiority of individual CBT in treating depression, while others support the equal effectiveness of group and individual CBT (Tucker & Oei, 2007). In terms of cost, Scott and Stradling (1990) report savings of 25% to 50% from using group CBT, whereas Shapiro, Sank, Shafer, and Donovan (1982) reported savings of 63%. Alternatively, Antonuccio, Thomas, and Danton (1997), who had the most comprehensive method of cost-calculation, reported only a 2% saving from group CBT. Based on cost savings, coupled with apparent equal effectiveness of group and individual CBT, the current available evidence suggests that group CBT is a cost-effective treatment for depression, so it seems reasonable to consider that this might also be the case for bipolar disorder.

The Current Study

The Service Context. Service users with a diagnosis of bipolar disorder within the Southwark Psychosis Support & Recovery teams currently receive limited provision of psychology services. There are various reasons why this may be the case. NICE guidance on the provision of psychological interventions to individuals with psychosis or schizophrenia (NICE, 2014) clearly state that all patients should be offered CBT and family intervention either after a first episode or subsequent acute episode of psychosis. The guidelines also specify exactly what these interventions should involve and who should administer them. By comparison the NICE guidelines on bipolar disorder (NICE, 2006) are less clear about when psychological interventions should be provided and what form these interventions should take. Specifically the guidelines state that “structured psychological interventions should be considered for people with bipolar
disorder who are relatively stable, but may be experiencing mild to moderate affective symptoms… and should:

- include psychoeducation about the illness, and the importance of regular daily routine and sleep and concordance with medication
- include monitoring mood, detection of early warnings and strategies to prevent progression into full-blown episodes
- enhance general coping strategies”

The relative clarity of the guidance on psychological interventions for psychosis has meant that high targets have been set within the South London and Maudsley NHS Trust for access to CBT and family intervention for service users with psychosis. This may mean that historically psychological intervention has been prioritised for these individuals.

More recently, mental health services provided by the Trust have been organised into seven different Clinical Academic Groups (CAGs), in order to try to bring together clinicians and researchers working in the same field. Patients with bipolar disorder are generally treated by clinicians within the Mood, Anxiety and Personality (MAP) CAG. However, patients with bipolar disorder for whom psychotic experiences play an important role (e.g., during a manic episode) are treated within the Psychosis CAG, where the majority of patients have a diagnosis of schizophrenia or other psychotic disorder. As service users with bipolar disorder are in the minority in the Psychosis CAG, this may have added to the difficulties in accessing intervention. Of late, there has been increased recognition of this gap in service provision within the Psychosis CAG, and there is currently a specific aim within the CAG to improve access to psychology services for these individuals. The current project formed part of that objective, and aimed to examine the feasibility and effectiveness of a weekly CBT intervention group for these service users with bipolar disorder. The group aimed to be quite structured and cover the aspects recommended by NICE, as well as providing a space for service users to discuss their personal experiences. The group was facilitated by the current author and a clinical psychologist from the Southwark Northeast Support & Recovery team.

**Selection of Measures.** As discussed earlier, the primary outcome measure in much of the research on CBT for bipolar disorder (e.g., Lam et al., 2003) has been illness relapse, including future number of mood episodes, days in episodes, and
hospitalisations. Given the short-term and exploratory nature of the current study, it was not feasible to include illness relapse as an outcome measure. However, the research on CBT for bipolar disorder has also found changes in secondary measures of mood symptoms. For example, in the Lam et al. study, more than 56% of participants were experiencing a mild to moderate level of depression at recruitment, and CBT had a significant effect in reducing these residual depression symptoms. Previous studies of G-CBT have also demonstrated improvements in knowledge about the disorder (Bernhard et al., 2006) and quality of life (Costa et al., 2012). Given these findings, self-report measures of depressive symptoms, illness perception, and general psychological well-being were included as outcomes measures in the current study. As this was an exploratory study, a qualitative feedback questionnaire was also issued to participants following completion of the group.
METHOD

Design
A repeated measures within-subjects design was adopted to examine changes in the global psychological functioning, depressive symptoms, and illness perceptions of participants following the group intervention. A comparison between baseline and post-intervention data was conducted to determine if any changes occurred on the measures employed.

Participants
Inclusion Criteria. Participants were recruited from the Southwark Northwest and Southwark Northeast Support & Recovery teams. All participants were required to have an active diagnosis of bipolar disorder and to be receiving care co-ordination from one of these Support & Recovery teams. Participants were required to be in remission (i.e., no episodes of mania or severe depression) for at least six months prior to starting the group, as the content of the group focused mainly on relapse prevention.

Exclusion Criteria. Participants who were experiencing a current manic episode were excluded from the programme, as the group content was not suitable for them. Participants with a diagnosis of a mood/psychotic disorder other than bipolar disorder were also excluded.

Recruitment
Approval for the current project was given via the Governance Project Officer from the Psychosis CAG. Following approval, details of the plans for the group were relayed to care co-ordinators during weekly team meetings in the Southwark Northwest and the Southwark Northeast teams. A follow-up email was then sent to all care co-ordinators outlining the inclusion and exclusion criteria for the group, and asking them to suggest names of service users whom they believed would be suitable. A search of the electronic Patient Journey System (ePJS) was also undertaken to identify service users within the teams with a diagnosis of bipolar disorder. Their suitability for the group was then discussed with the relevant care co-ordinator. Once a list of suitable
service users had been drawn up, service users were contacted individually by means of a letter to their registered home address, which outlined the nature of the group, its location, and the dates and times it would take place. Service users who were interested in taking part were asked to contact one of the facilitators. For services users who did not reply, a follow-up phone call was made to ascertain whether they had received the letter, if they had any questions, and whether or not they would be interested in participating.

**Measures**

**Clinical Outcomes in Routine Evaluation – Ten Item Version (CORE-10).** The CORE-10 (Connell & Barkham, 2007) is a self-report measure of psychological distress designed as a pre- and post-therapy measure. It contains 10 questions indexing psychological distress over the previous week. It has been developed from the original 34-item CORE-OM (Evans et al., 2000), with which it is well correlated. It is widely used as a measure of psychological distress in the NHS.

**The Centre for Epidemiological Studies – Depression scale (CES-D).** The CES-D (Radloff, 1977) is a brief self-report scale designed to measure symptoms associated with depression experienced in the past week. The scale includes 20 items comprising six scales reflecting major facets of depression: depressed mood, feelings of guilt and worthlessness, feelings of helplessness and hopelessness, psychomotor retardation, loss of appetite, and sleep disturbance. High internal consistency has been reported with Cronbach’s alpha coefficients ranging from .85 to .90 across studies (Radloff, 1977). Concurrent validity by clinical and self-report criteria, as well as substantial evidence of construct validity, have been demonstrated (Radloff, 1977).

**The Brief Illness Perception Questionnaire (BIPQ), adapted for Bipolar Disorder.** The BIPQ (Broadbent, Petrie, Main, & Weinman, 2006) is a 9-item questionnaire designed to rapidly assess cognitive and emotional representations of illness. It has shown good test-retest reliability and concurrent validity with relevant measures (Broadbent et al., 2006). For this questionnaire, the general word ‘illness’ can be replaced by the name of a particular illness. In the current study, the word ‘illness’ was replaced with ‘bipolar disorder’.
Feedback Questionnaire. Qualitative data was collected by means of a feedback questionnaire provided to participants at the end of the eighth session. Questions were focused on what were the most helpful/unhelpful aspects of the group and what participants would like to change if the group were to run again.

Course Outline

The 10-week course took place in the Southwark Northeast Support & Recovery team base at Chaucer Community Resource Centre on Thursday afternoons, from June to September 2013. Each session lasted approximately 90 minutes with a 5-10 minute break approximately half way through. An outline of the material covered in each session can be seen in Table 1. The content of the sessions was guided by CBT-based self-help materials, particularly the online information package ‘Keeping Your Balance’ (Centre for Clinical Interventions, 2010) and the self-help book ‘Overcoming Mood Swings’ (Scott, 2010). However, the group also aimed to provide space for discussion of service users’ personal experiences of bipolar disorder.

An 8-week programme was originally selected, as this was the number of modules in the ‘Keeping Your Balance’ programme. However, due to time constraints, it was not possible to cover all the material in eight weeks, and so two additional sessions were offered to participants at the end of eight weeks. As the course was originally scheduled to be eight weeks long, outcome measures were completed during the first session, and again after the eighth session. Participants who could not attend the eighth session were sent the measures by post and asked to return them in an enclosed stamped addressed envelope. The course was facilitated by the current author (a trainee clinical psychologist) and a clinical psychologist from the Southwark Northeast Support & Recovery team.

Table 1. Outline of material covered over the 10-week intervention

<table>
<thead>
<tr>
<th>Group</th>
<th>Agenda</th>
</tr>
</thead>
</table>
| 1. Introductions & what is bipolar disorder? | • Getting to know you activity  
• Introduction to the group (hopes/expectations, ground rules)  
• What is bipolar disorder?  
• What does my bipolar disorder look like? |
| 2. Causes of bipolar disorder | • Participants’ views on causes of their bipolar disorder  
• Introduction to the vulnerability-stress model of |
Data Analysis

Baseline and post-intervention data were available for five participants who completed the group. Given the small sample, data were assumed to be non-parametric, and so Wilcoxon Signed Ranks Tests were used to assess the within-subjects changes on the measures from baseline to post-intervention. Three participants opted to complete anonymous end-of-intervention feedback questionnaires. These questionnaires were then analysed for themes emerging within each individual question.
RESULTS

Participants

Following discussions with care co-ordinators, 33 service users were identified who met inclusion criteria for the group. All 33 service users were contacted by letter and follow-up phone calls were also attempted for any who did not reply to the letter. Telephone contact was made with 16 service users (48.5%), nine of whom said they might be interested in attending the group. Five service users reported that they were not interested in attending due to other commitments at the time of the group, one service user reported that she did not want to be around other people with bipolar disorder, and one reported that she did not agree with her diagnosis.

Seven service users attended for the first group session. Of these seven, five attended at least 50% of sessions and completed pre- and post-intervention measures. The remaining two service users attended fewer than three sessions and did not complete follow-up questionnaires. Demographic information and attendance records of both completers and non-completers are provided in Table 2.

Table 2. Demographic information and attendance record of group participants

<table>
<thead>
<tr>
<th>Gender</th>
<th>Age</th>
<th>Ethnicity</th>
<th>Completed?</th>
<th>Attendance for each Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>M</td>
<td>50</td>
<td>White British</td>
<td>Yes</td>
<td>✓</td>
</tr>
<tr>
<td>M</td>
<td>44</td>
<td>Columbian</td>
<td>Yes</td>
<td>✓</td>
</tr>
<tr>
<td>M</td>
<td>50</td>
<td>White British</td>
<td>Yes</td>
<td>✓</td>
</tr>
<tr>
<td>F</td>
<td>38</td>
<td>White British</td>
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<td>✓</td>
</tr>
<tr>
<td>F</td>
<td>48</td>
<td>Chinese</td>
<td>Yes</td>
<td>✓</td>
</tr>
<tr>
<td>M</td>
<td>67</td>
<td>White British</td>
<td>No</td>
<td>✓</td>
</tr>
<tr>
<td>F</td>
<td>65</td>
<td>White British</td>
<td>No</td>
<td>✓</td>
</tr>
</tbody>
</table>
Outcome Measures

Quantitative Outcomes. A visual examination of the boxplot graphs (see Figure 1) for the outcome measures used revealed very small changes in the expected direction from baseline to post-intervention.

Figure 1. Changes in outcome measures from baseline to post-intervention

A Wilcoxon Signed Ranks was carried out to examine changes from baseline to post-intervention on the measures employed. As can be seen in Table 3, although there were small changes in the expected direction, no significant differences from baseline to post-intervention were found.

Table 3. Wilcoxon Signed Ranks Tests for each of the outcome measures

<table>
<thead>
<tr>
<th>Measure</th>
<th>Baseline Mean (SD)</th>
<th>Post-intervention Mean (SD)</th>
<th>z value</th>
<th>Exact Sig. of z (one-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CORE-10</td>
<td>18.80 (7.79)</td>
<td>17.00 (6.44)</td>
<td>1.11</td>
<td>0.27</td>
</tr>
<tr>
<td>CES-D</td>
<td>29.00 (15.05)</td>
<td>27.20 (9.09)</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>BIPQ</td>
<td>54.60 (6.66)</td>
<td>53.20 (6.46)</td>
<td>0.45</td>
<td>0.66</td>
</tr>
</tbody>
</table>
**Qualitative Outcomes.** Anonymous feedback forms were completed by three participants. On the form, participants were asked to rate their satisfaction level with the group as a whole on a 5-point Likert scale ranging from 1 (very dissatisfied) to 5 (very satisfied). The ratings given were 3, 4, and 4 (mean = 3.67). Participants were also asked about the most helpful aspects of the group, the least helpful aspects, and what they would change in future groups. The responses for each question are displayed in Table 4.

*Table 4. Responses of participants to feedback questionnaire*

<table>
<thead>
<tr>
<th>Question</th>
<th>Response Themes</th>
</tr>
</thead>
</table>
| What was the most helpful aspect of the group? | • Meeting and sharing experiences with other people with bipolar disorder
• Learning about the multiple causes of bipolar disorder
• Hearing about the facilitators’ previous clinical experiences of bipolar disorder
• Facilitators were open and informative, and sensitive to the issues raised |
| What was the least helpful aspect of the group? | • Being unable to attend the group due to other commitments
• The inconsistent attendance of other participants
• Over-emphasis on the CBT model
• Occasional lack of clarity in terms of the aims of the group |
| If the group were running again, what might you change? | • More emphasis on commonalities that clinicians have found in relation to people with bipolar disorder
• Hearing about what aspects of treatment have been most useful for each individual
• More practical work
• Less time focusing on the CBT model and more weeks with unique topics |
DISCUSSION

Feasibility

The aim of this study was to investigate the feasibility and effectiveness of a group CBT-based intervention for services users with a diagnosis of bipolar disorder in the Southwark Support & Recovery teams. In terms of feasibility, the take-up rate from those who were offered the service was reasonably low, at approximately 21%. There may have been a number of factors which affected this rate, related to the disadvantages of groups discussed earlier. For some people, the set time for the group during office hours clashed with other commitments (e.g., employment). Other people may have been reluctant to share their experiences within a group setting. The location of the group may also have been problematic for some individuals. The group took place in the Southwark Northeast team base, and four of the five group completers were from this team. Although the group was also offered to service users from the Southwark Northwest team, only one participant came from this team. This may have been due to the further distance required to travel, or the fact that service users would have been unfamiliar with this setting.

The time of year at which the group took place may also have affected attendance. The group ran over the summer months, during which many service users take holidays, which may have made some people reluctant to attend in the first place. Even for those who completed the group, attendance rates were low, as some participants took holidays during the period which the group ran. Similarly, the Olympic Games took place in London during the period which the group ran, and travel restrictions affected the attendance of some group members.

As discussed earlier, group interventions can potentially offer a more efficient and cost-effective approach towards providing treatment. Providing individual CBT for each of the five group participants would require approximately five hours of therapeutic input per week (2.5 hours per clinician), whereas the group input required 1.5 hours of therapeutic input for each clinician per week. Future groups would require a minimum of four participants in order to make the group time and cost-effective. However, as discussed, the benefits of group intervention need to be weighed against
the potential greater benefits which might be provided through individualised formulation and therapeutic intervention.

Effectiveness

In terms of the effectiveness of the group, small, but non-significant, improvements were found on the measures employed, which looked at global psychological functioning, depressive symptoms, and illness perceptions. Given the small sample size, it is difficult to make firm interpretations, but there may be a number of reasons for these small improvements. In terms of depressive symptoms, there is a substantial literature on the experience of post-psychotic depression (PPD; Birchwood & Iqbal, 1998), which may also be applicable following a manic episode in bipolar disorder. Research has demonstrated that the likelihood of developing PPD is linked to negative appraisals of psychosis related to greater loss, humiliation and entrapment (Birchwood, Iqbal, Trower, & Chadwick, 2000). It is conceivable that psychoeducation around bipolar disorder may help to shift some of the negative appraisals of the illness (as evidenced by small changes on the BIPQ), while relapse prevention work may provide a practical means of avoiding feelings of entrapment and promoting control, thus improving symptoms of depression.

For participants who completed the feedback questionnaires, moderate levels of satisfaction with the group were reported (mean = 3.67/5). In terms of qualitative feedback, participants reported that meeting and discussing their experiences with other people with bipolar disorder was helpful. As mentioned previously, it has been demonstrated that social support from family and friends can buffer against the deleterious effects of stress or directly enhance functioning among bipolar individuals. It is possible that support from other individuals with bipolar disorder within the group could also provide some of these benefits. Participants also commented on the usefulness of hearing about the facilitators’ previous clinical experiences of working with those with bipolar disorder, and appreciated their openness and sensitivity to issues raised.

Limitations of the Study

There are a number of limitations to the study which warrant discussion. Firstly, the sample size was very small, which limits the analysis of any outcome data in a number of ways. Given the low number of participants, data were not normally
distributed, necessitating the use of a non-parametric statistical test. Similarly, the absence of a control group limits interpretation of the data. It is possible that service users with bipolar disorder who received no intervention might have shown deterioration on the measures employed over the same period, but without the inclusion of a matched control group it is not possible to make this assertion.

The study is also limited somewhat by the measures employed. As discussed earlier, much of the previous research on CBT for bipolar disorder has used rates of relapse of the main outcome measure. Given the exploratory nature of the current study, this was not possible. Instead self-report measures were used, which aimed to assess other variables that have demonstrated a shift in previous research on CBT for bipolar disorder. These measures aimed to reflect to some extent the areas targeted during the current group (i.e., global psychological well-being, depressive symptoms, and understanding of bipolar disorder). However, as most participants in the group were in remission from their illness for a period of time, some of these measures may have been less relevant.

**Challenges for Implementation**

As discussed earlier, differential diagnosis of bipolar disorder is far from a clear issue. Current diagnostic systems, such as DSM-5 (APA, 2013), attempt to distinguish between schizophrenia and bipolar illness in a categorical way. In clinical reality, however, it is difficult to discern any sharp symptomatic distinction between the two disorders; indeed, the invention of the category of schizoaffective disorders testifies to this. Patients with acute mania frequently present with positive psychotic symptoms and those diagnosed with depression with psychotic features will have necessarily experienced delusions or hallucinations (Kendell & Gourlay, 1970; Shergill, van Os, & Murray, 1999). Conversely, many patients with schizophrenia have symptoms of depression or mania. Indeed, depression is common among patients presenting with their first episode of schizophrenia, being reported in up to 75% of cases (Koreen et al., 1993; Hafner, Löffler, Maurer, Hambrecht, & an der Heiden, 1999).

In terms of the clinical presentation of those who attended the group in the current study, there was large variation regarding individual experience of the illness, as well as how each individual had come to receive a diagnosis. Some of the group members had, in the past, received diagnoses of various other mood or psychotic disorders. This heterogeneity of participants inevitably makes group programmes more
difficult, as not all participants will necessarily feel that particular material being covered is relevant to them. This was evident in some of the feedback provided on the feedback questionnaire. Similarly, the CAG structure discussed earlier creates some challenges in offering services to these more complex clients. The participants in the current study were individuals with bipolar disorder in a service for those with psychosis, so inevitably there is likely to be some overlap with schizophrenia and schizoaffective disorder. This group of individuals may potentially differ from participants in previous research on the effectiveness of CBT for bipolar disorder (e.g., Lam et al., 2003). For example, many of the participants in the current study had been in remission from any serious manic episodes for several years, and so material on relapse prevention may have been less important to them than management of on-going depressive symptoms.

Implications for Service Delivery

Despite limited evidence for the effectiveness of the current group, the findings of the current study provide some support for the provision of further groups for those with a diagnosis of bipolar disorder within the Southwark Support & Recovery teams. However, some changes to the structure and content of future groups would be helpful in order to maximise the potential benefits for participants and the service more widely. In terms of practical arrangements, a number of changes could be made in order to try to maximise group participation rates. Firstly, the group could be opened up to all Support & Recovery teams within the Southwark area in order to increase the potential pool of participants. Assuming attrition rates similar to the current study (initial uptake of 21% and drop-out rate of 29%), approximately 53 services users would have to be initially contacted in order to generate eight participants who completed the group. Changing the location of the group to the more centralised location of St. Giles House, where three of the four Southwark Support & Recovery teams are based might also increase participation, as service users would be more familiar with the location and might be more willing to travel there. Finally, running the group outside of the summer period might help to ensure that attendance rates for participants were higher, as they would be less likely to be taking holidays while the group was running.

Given the complex nature of bipolar disorder, and based on the experience of the current study, at least 10 sessions would be recommended for future groups. As a result of the poor attendance rates in the current study, there was frequent repetition of
previously covered material in each session (e.g., explanation of the CBT model), which some participants reported as being unhelpful. This also resulted in two extra sessions being added to cover all the relevant material outlined at the beginning of the group. Future groups could benefit from having more clearly defined topics for each session, based on the components of CBT for bipolar disorder which have been demonstrated to be effective (e.g., mood monitoring, modifying behaviour during prodromal phases, importance of sleep and routine, etc.). If participants miss a particular session they could be given a hand-out summarising the content in the following one, in order to prevent unnecessary repetition for other participants.

The design of future groups could also be improved in terms of evaluating effectiveness. The inclusion of a control group could help to demonstrate whether service users who participate in the group intervention evidence improvements in functioning relative to those who do not. These could be achieved by recruiting twice the number of participants and randomly assigning half to a wait-list. This wait-listed group could also complete the relevant measures at baseline and at the end of the first group. A second group could then be run for the wait-listed service users in order to ensure equitable access for all service users who wanted to participate in the group. As mentioned previously, a measure of relapse prevention would also be beneficial in determining the efficacy of the group, for example, hospital admissions or number of days in a bipolar episode in the year following the group, as compared to a suitable control group.

**Conclusion and Future Directions**

In conclusion, the current study demonstrated small, but non-significant, gains on the measures employed (i.e., global psychological functioning, depressive symptoms, and illness perceptions) for adults with bipolar disorder following completion of a weekly CBT intervention group. Qualitative feedback provided details of the perceived beneficial aspects of the group as well as potential areas for improvement. Certain methodological limitations, particularly the limited sample size, prevent firm conclusions from being drawn. That said, however, the current study offers some preliminary support for the provision of this type of intervention within the Southwark Support & Recovery teams.

In terms of future directions, it may be useful for interventions in this area to incorporate more of a recovery approach to complement the CBT relapse prevention
work undertaken in the current group, particularly given some of the participant feedback related to over-reliance on the CBT model. Andresen, Oades, and Caputi (2003) discuss a model of recovery from psychosis incorporating four key processes: finding hope, re-establishment of identity, finding meaning in life, and taking responsibility for recovery. Similarly, Gumley and Schwannauer (2006) have outlined a therapeutic approach to recovery and relapse prevention in psychosis which incorporates interpersonal factors as well as cognitive processes. Their Cognitive Interpersonal Therapy (CIT) aims to develop reflexivity, adaptive coping, and self-regulation through development of a compassionate mentality and orientation to oneself and others. It is likely that many of these more recovery-oriented approaches would also be beneficial to those in remission from bipolar disorder.
REFERENCES


Hammen (Eds.), *Handbook of depression* (pp. 141–165). New York: Guilford Press.


