A developmental approach to fear, worry and rituals among typically developing children

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Declaration

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ABSTRACT

The aim of the studies reported in this thesis was to take a developmental psycho-pathological approach to fear, worry and ritualistic behaviour in typical childhood. The first study examined developmental trends in, and interrelations between, fear, worry and ritualistic behaviour in childhood and adolescence. Content and intensity of fear, worry and ritualistic behaviour were assessed through a semi-structured interview administered to 142 typically developing children aged 7 to 16 years. In line with predictions, fear, worry and ritualistic behaviour decreased in intensity with age, although this decline was only significant between 7 and 10 years. Worry was found to be a particularly strong predictor of ritualistic behaviour across this age range. The second study followed up a sub-sample of these participants (N=80) in examining children's cognitive appraisals of anxiety-related thoughts, and showed predictable age-related decreases in strength of appraisals for Thought-Action Fusion and Intolerance of Uncertainty, but not Responsibility. In support of the cognitive model of OCD, the previously observed relation between worry and ritualistic behaviour was mediated by biased cognitive appraisals, particularly Intolerance of Uncertainty. In the third study, a separate sample of 83 typically developing children aged 11 to 16 years reported on fear, worry and ritualistic behaviour, and also completed tasks designed to assess executive functioning in the orbitofrontal ('hot') and dorsolateral ('cool') neural systems. Predicted patterns of impaired 'hot' task performance combined with intact 'cool' task performance in high-anxiety participants were not observed, suggesting that characterisations of OCD in these terms may not apply to anxiety in typical childhood. Against prediction, performance was not impaired when personally salient versions of the orbitofrontal tasks were presented. However, there was a trend towards high levels of ritualistic behaviour being associated with impaired orbitofrontal task performance in the salience manipulation condition in boys only. Taken together, these

studies demonstrate the value of taking a developmental psychopathological approach to anxiety processes in typical childhood. Theoretical considerations and implications for future research are discussed.

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CHAPTER ONE: GENERAL INTRODUCTION

Anxiety in its various forms is a common feature of childhood (Cartwright-Hatton, 2006; Cartwright-Hatton, McNicol, & Doubleday, 2006), and yet it is an aspect of children's experience which has only recently received widespread attention from psychological researchers. A better understanding of fears, worries and ritualistic behaviours in typical childhood is likely to be valuable for its own sake, but it is also likely to contribute to our understanding of why these experiences and behaviours sometimes become pathological. An awareness of what is typical at different stages of development will allow psychologists to be more sensitive to atypical patterns of experience, which will be beneficial for the early identification, management and treatment of anxiety disorders.

1.1 Rationale for a developmental psychopathological approach to fears, worries and ritualistic behaviour in typical childhood

Traditionally, psychopathology has been regarded as a discrete disease entity, far removed from the processes of normal development (Zigler & Phillips, 1961). Despite this traditional separation of approaches to typical and atypical development, those who have studied the emergence of psychological disorders in childhood have often recognised that we must understand typical development to fully grasp the nuances of psychopathological conditions. The developmental psychopathological approach (Cicchetti & Cohen, 1995, 2006) perceives development as the structural reorganisation of biological and behavioural systems (Vasey & Dadds, 2001), considering the mutual influence of interacting factors within the child (biological, social, emotional and cognitive) and between child and environment (society, community and family) (Williams, Reardon, Murray & Cole, 2005). Some of the key principles of the approach include *multifinality* (according to which the organisation of the system itself can determine how any one component may operate) and

equifinality (the notion that there can be diverse pathways to the same outcome; Cicchetti & Toth, 1995). In this way, the developmental psychopathology perspective attempts to account for ongoing change in experiences and behaviours with age and across individuals.

One of the most impressive results of this approach has been the bidirectional flow of influences between clinical developmental psychopathology and mainstream developmental psychology. Adherents to the developmental psychopathology approach will typically look to incorporate ideas from clinical child psychology and psychiatry into research with typically developing populations, and vice versa. For example, it may be fruitful to consider how the cognitive styles associated with pathological states of anxiety and depression may relate to anxiety- and depression-related appraisal of cognitions by typically developing children (Cicchetti & Cohen, 2006). In addition, an awareness of typical patterns and sequences of developmental change will inform our understanding of the clinical significance of these phenomena at different stages in development. A basic assumption in this kind of research is that the cognitive mechanisms involved in anxiety are normal cognitive processes which for some reason go awry in psychopathology. Much of the basis for cognitive models of anxiety in the adult literature has been established on healthy volunteers (e.g. Rachman & De Silva, 1978; Rassin, Merckelbach, Muris, & Stapert, 1999), and it is expected that our understanding of the corresponding processes in childhood will similarly benefit from the study of these processes in typical development.

Applying ideas from adult psychopathology to developmental psychopathology may prove effective in improving our understanding of these phenomena in typical childhood, and yet it is an approach that carries some risks. Simply applying adult models of clinical disorder to childhood, with the assumption that these models and phenomena have the same implications for children as they do for adults, is an approach likely to be insufficiently sensitive to typical patterns of developmental change. For example,

overinflated responsibility is identified as a feature of OCD in adulthood, and yet mainstream developmental research shows that it is a perfectly normal aspect of early childhood (see Chapter Three). That said, many of the most interesting aspects of models of adult anxiety have not yet been examined in relation to childhood. Such studies are likely to be highly beneficial providing they are conducted in a developmentally sensitive way.

A further advantage of the developmental psychopathology approach is that it opens the possibility of translation between mainstream developmental knowledge and clinical interventions. Translational research is defined as "the process of applying ideas, insights, and discoveries generated through basic scientific inquiry to the treatment or prevention of human disease" (Cicchetti & Toth, 2006, p. 619). The developmental psychopathology approach may help to ease the translation between fundamental research and clinical application, by ensuring that a 'common language' is spoken between the laboratory and the clinic.

While addressing the similarities between normative and pathological represents a departure from the conventional diagnostic systems, a range of evidence has accumulated to underscore the utility of this approach. Both internalising and externalising disorders (Achenbach, 1982), as well as schizophrenia (Zigler & Glick, 1986) and learning disability (Weisz, Yeates & Zigler, 1982; Zigler, 1969), have been investigated from a developmental psychopathology perspective. More recently, comparisons have also been made in the empirical literature between aspects of typically developing childhood and OCD (Bolton, 1996; Carter, Pauls, & Leckman, 1995; Evans et al., 1997; Evans, Gray & Leckman, 1999; Leonard et al., 1990; Zohar & Bruno, 1997; see Chapter Three).

OCD is an anxiety disorder characterised by obsessional worries and the display of ritualistic actions (Rapoport & Inoff-German, 2000). The primary features of OCD are

obsessions and compulsions, both of which are time-consuming and distressing for the sufferer (APA, 1994). Obsessions are recurrent, intrusive thoughts, images or impulses that are ego-dystonic and typically accompanied by feelings of anxiety, disgust, guilt or doubt (Comer et al., 2004). Compulsions are repetitive, purposeful behaviours that are executed in a stereotyped manner or according to rigid rules (Comer et al., 2004).

Over the last ten years, research interest in the nature and underlying pathology of OCD has increased dramatically, particularly with respect to childhood onset cases of the disorder. Current approaches to OCD suggest that neurobiological abnormalities may be involved in the aetiology and persistence of this condition, with genetic and other biological factors acting as a diathesis for the disorder. For example, neurobiological abnormalities in basal ganglia-frontal cortex interaction are thought to provide one route to OCD symptomatology (see Chapter Four). On a more cognitive level, specific styles of cognitive appraisal of anxiety-related thoughts have been associated with the disorder (see Chapter Three).

Research over the last two decades has identified OCD as one of the most common of all psychiatric illnesses affecting children and adolescents (Stewart, Geller et al., 2004), with estimated prevalence rates in the range of 1-3.6% (Flament et al., 1988; Turner, 2006; Valenti-Basile et al., 1994; Zohar et al., 1992). One epidemiological study of OCD in adolescence found that the age of onset varied from 7 to 18 years, with a mean age of onset of 12.8 years (Flament et al., 1988). More than 80% of adult OCD cases are believed to develop before the age of 18 (Geller et al., 1998). This age of onset is bimodally distributed, with peaks in early childhood (7.5 years) and early adolescence (12.5 years) with a mean of 10.3 years (Geller et al., 1998; Piacentini & Bergman, 2000). Children with earlier onset (i.e. corresponding to the bimodal peak in early childhood) are more likely to be male and have a family history of OCD (Geller et al., 1998). Unusually for an anxiety

disorder, prevalence rates in adulthood are similar for males and females (Rasmussen & Eisen, 1992). In the UK, the primary recommended treatment for OCD in childhood and adolescence is cognitive behavioural therapy (CBT) (National Institute for Health and Clinical Excellence, 2005), which has shown to be an effective treatment for the disorder in both childhood and adulthood (Turner, 2006). Studies have demonstrated that CBT is consistently associated with significant improvement in obsessive-compulsive symptoms in young people (e.g. Benazon, Ager, & Rosenberg, 2002; March, Mulle, & Herbel, 1994). Importantly, treatment gains have also been maintained over follow-up intervals spanning 3 months (e.g. Scahill, Vitulano, Brenner, Lynch, & King, 1996) to 24 months (e.g. Wever & Rey, 1997).

Obsessive symptoms common to early-onset OCD include concerns about dirt and contamination, fear of harm to self or loved ones, excessive religiosity, moralization and superstition, fear of making mistakes that will have disastrous results, and obsessive thinking related to numbers and symmetry (Barrett, Shortt & Healey, 2002; Eichstedt & Arnold, 2001; Millet et al., 2004; Swedo et al., 1989). Attempts are typically made to ignore, suppress or neutralise these intrusive thoughts and any associated feelings through the performance of compulsions.

In children with OCD, compulsive behaviours often involve excessive hand-washing, showering or cleaning, checking doors, windows or locks, repeating actions over and over again, touching or tapping, a compulsion to have things arranged evenly or symmetrically, and excessive collecting or hoarding. Mental rituals include saying prayers, words or counting repeatedly in one's mind (Hanna, 1995; March & Leonard, 1996; Millet et al., 2004; Sobin, 1999, 2000).

Children and adolescents with OCD often display multiple obsessions and compulsions, the specific types of which change in both content and severity over the

course of the disorder (Hanna, 1995). Young people have much higher rates of obsessions relating to symmetry and death or illness in self or loved ones, and religious and sexual obsessions are overrepresented in adolescents (Geller et al., 2001; Shafran, Rachman & Teachman, 2001). Hoarding/saving and arranging compulsions are also more commonly seen in children and adolescents with OCD compared to adults (Geller et al., 2001; Radomsky & Rachman, 2004). Many, if not most, children will have experienced almost all of the classic OCD symptoms by the end of adolescence (Rettew, Swedo, Leonard, Lenane & Rapoport, 1992).

1.2 Prospects for a developmental psychopathological account of childhood-onset OCD

As noted above, the developmental psychopathology approach requires an integration of research on normative development with data on the emergence of psychopathology in childhood and adolescence. To fully understand the developmental aspects of maladaptive obsessions and compulsions, more information on their continuity with typical experience must be gathered. Indeed, since one third to half of all OCD cases have their onset by adolescence (Flament et al., 1988), recognising childhood risk factors is essential if an attempt is to be made to prevent OCD at an early stage.

From the point of view of developmental psychopathology, several general features of OCD immediately stand out. Obsessionality and compulsivity reflect a heterogeneous pattern of intrusive anxieties and ritualistic behaviours, and throughout childhood, both pathological and non-pathological variants are observed. Despite its apparent early prevalence, the literature indicates that few young people with OCD receive a correct diagnosis (March & Leonard, 1996). Furthermore, a disturbing delay of an average of 17 years has been reported between the age of OCD onset and provision of adequate treatment

(Hollander et al., 1996). It appears that OCD is often only recognised when very severe or if the child reaches out for help, typically after years of suffering (Swedo, Rapoport, Leonard, Lenane & Cheslow, 1989). This prolonged delay can have implications for academic, social and vocational functioning, and may result in long term deleterious effects (Adams et al., 1994; Alvarez & Macias, 1998).

Clearly, earlier intervention is needed, which in turn demands an improvement in existing means of identification. Typically developing patterns of anxiety and rituals can provide information against which to recognize pathological functioning, attenuating difficulties in distinguishing clinically relevant phenomenology from normal anxiety and ritualistic behaviour. Applying a developmental psychopathology perspective to the study of OCD is likely to be important in achieving this goal. For example, the various divergent routes that have been proposed to result in OCD illustrate the idea of equifinality, that is, that there may be many possible pathways to the same pathological symptomatology. The developmental psychopathology approach would consider both neurobiological and cognitive-behavioural theories in addressing how OCD symptoms might develop or change over time. Applying the concept of multifinality to a developmental psychopathology approach to OCD would allow models of childhood and adolescent OCD to pay due attention to the developmental stage of the individual concerned, such that the same experiences may be postulated to have very different impacts depending on the age at which they occur. The transactional nature of the developmental psychopathology approach would imply that the mutual influence of biological, social, emotional and cognitive factors underlying the disorder be considered together in a way that is specific to the developmental stage reached. The implications of this approach are explored in more detail in the chapters that follow.

1.3 Fear, worry and ritualistic behaviour in typical childhood

Taken together, the foregoing considerations suggest that part of a successful developmental psychopathological approach to understanding OCD in childhood requires normative data on anxiety and behaviours across typical development. In this section, relevant previous work is reviewed and gaps in the empirical literature identified.

1.3.1 Fear in childhood

Fear is viewed as an integral part of childhood (Gullone & King, 1997). The experience of fear is relatively common across development (Gullone, 2000), and appears to follow a specific ontogenetic course (Marks, 1987). For example, young children are unaffected by events that will frighten them at a later time, whereas older children no longer show distress over events that were once a major concern for them. While in early childhood, fears with imaginary themes such as fear of ghosts, monsters, and frightening dreams prevail, realistic fears involving bodily injury and physical danger predominate as childhood progresses (Bauer, 1976; Ollendick, Yule & Ollier, 1991; Muris, Merckelbach, Gadet & Moulaert, 2000). This culminates in fears of criticism and social and medical situations in adolescence (Dong, Xia, Lin, Yang & Ollendick, 1995; Field, Argyris & Knowles, 2001; Gullone & King, 1997; King, 1993).

Although the exact mechanisms underlying these developmental differences are not fully understood, it is probable that they are related to the developing child's capacity to recognise and understand potentially dangerous situations or stimuli (Ollendick, Langley et al., 2001). For example, fear of strangers manifests at 9 months, at which time infants have become adept at differentiating between familiar and unfamiliar faces (Muris et al., 2002).

Whereas early fears typically concern the child's immediate environment (e.g. loss of caregiver support, loud noises), anticipatory fears emerge during the preschool years, in

parallel with an ability to conceptualise and anticipate possible harm (King, 1993). Imaginary fears become widespread, and are thought to be closely related to the magical forms of thinking typical at this age (Bauer, 1976). A fear of animals commonly develops, which from an evolutionary standpoint is believed to be functionally linked to the increasing mobility of the child (Muris et al., 2002). This natural inclination to avoid potentially harmful stimuli is extended into middle childhood, when children continue to fear objects and vulnerable situations over which they have little control (e.g. being kidnapped, getting lost in a strange place) (Muris et al., 2002).

Adolescence is characterised by more sophisticated cognitive functioning, thus fears become more abstract, more reality based (e.g. concerning everyday events), and increasingly self-referential. This increase in abstract reasoning brings with it idealistic thinking and adolescent egocentrism (Elkind, 1976). Adolescents are therefore more sensitive to social evaluation and appraise themselves against ideal standards, expecting similar, scrutinising judgement from others. The increased prominence of social fears at this time may be connected to adolescents' increased knowledge of their surroundings, as well as an amplified need for independence and the desire to leave the security of the family to fend for themselves (Gullone, 2000; King, 1993).

Despite these developmental differences, fears of death and danger-related stimuli remain common throughout childhood and adolescence (Gullone & King, 1992, 1997; Ollendick, 1983). Longitudinal studies also report that these fears persist, and remain the most common over time (Gullone & King, 1997; Muris et al., 2003; Spence & McCathie, 1993). While this may indicate that concerns about safety and potential harm are relatively constant and invariant, some researchers (e.g. McCathie & Spence, 1991) have argued that this finding is actually a consequence of the methods typically employed to investigate fear in childhood.

Childhood fear research has predominantly made use of lengthy, content-based self-report questionnaires, the most widely used being the revised version of the Fear Survey Schedule for Children (FSSC-R; Ollendick, 1983). This self-report instrument requires the participant to report levels of fear towards a broad range of potentially fear-provoking stimuli and situations on a three-point scale. It has been argued that the FSSC-R does not assess actual fears, but instead reflects a negative affective response to the thought of specific negative events occurring (McCathie & Spence, 1991). McCathie and Spence (1991) contend that life-threatening, dangerous events have a low probability of actually happening, and therefore the likelihood that children are frequently concerned about these events should also be low. Compounding this issue, the large quantity of items presented to children may also have a cueing function. Thus, while use of this standardised measure has undoubtedly advanced the systematic study of childhood fears, it is difficult to know just how accurate a picture is being obtained from its use.

In terms of the general experience of fear, fearfulness appears common among young children, peaks in intensity around 7 years of age, and then decreases thereafter (Muris et al., 2000). This wane in fearfulness is most marked during middle childhood (e.g. between 7 and 10 years), and continues until adolescence, at which point fears stabilise and potentially endure (Gullone & King, 1997). This decline is thought to reflect the fact that childhood fear largely originates from unfamiliarity with stimuli, and such unfamiliarity gradually decreases as children habituate to, and learn to deal with, initially unfamiliar stimuli and situations (Marks, 1987; Muris et al., 2002).

While this pattern is true for both genders, girls overwhelmingly report more fear than boys at all ages (Gullone & King, 1997; Ollendick et al., 1991; Schaefer, Watkins & Burnham, 2003). While it is possible that boys underreport their fears because of social

conditioning and male bravado, socialisation and gender role expectations may also influence girls' higher fearfulness.

Despite the transient nature of early fear, fearfulness also appears to have a trait component, such that individuals express stability in fear intensity levels over time (Gullone & King, 1997). Thus, notwithstanding changes in subject matter, it seems a fearful young child is more likely to develop into a fearful adolescent. Furthermore, for a substantial minority of children, these typical fears can cause serious distress (Ollendick & King, 1994), lead to avoidance (Ollendick, Yule & Ollier, 1991), and interfere substantially with daily activities (Ialongo et al., 1995). Highly fearful children also possess lower self-esteem, and are less confident about their abilities to control events around them (Ollendick et al., 1991).

1.3.2 Worry in childhood

In contrast to childhood fear, examination of childhood worry is relatively scarce. In particular, there is little information regarding developmental patterns of worry content, as this construct has typically been assessed by asking participants to self-report general levels of non-specific worry and anxiety-related physiological symptoms (e.g. Chorpita, Tracey, Brown, Collica & Barlow, 1997; Kashani & Orvaschel, 1990; Pavuluri, Henry & Allen, 2002; Weems, Silverman & La Greca, 2000). The Revised Children's Manifest Anxiety Scale (Reynolds & Richmond, 1978) and the childhood version of the Penn State Worry Inventory (Chorpita et al., 1997) are typical examples of such instruments. Representative items include 'I am nervous' and 'I worry all the time' to which participants give a frequency rating. Findings have suggested that like fear, worry is also commonplace in childhood and adolescence (Bell-Dolan, Last & Strauss, 1990; Muris, Meester, Merckelbach, Sermon & Zwakhalen, 1998).

Where information about the content of children's worrisome thoughts has been gathered, interviews and thought list procedures have typically been employed (e.g. Silverman et al., 1995; Muris et al., 1998; Vasey, Crnic & Carter, 1994) in which participants are simply asked to report the situations they find worrisome, with information regarding the intensity of their worry rarely being collected. Thus, while standardised data are available relating to the general experience of worry, information pertaining to worry content is less comprehensive or comparative across childhood and adolescence. Nevertheless, useful findings have emerged from this method of data collection. Vasey et al. (1994), for example, asked children aged 5 to12 years to self-report worries, and found that concern over physical well-being predominates among 5- to 6-year-olds. In parallel with changes in fear manifestation, concrete worries become increasingly overshadowed by competency and social evaluative concerns as children mature (Campbell & Rapee, 1994; Miller & Gallagher, 1996; Vasey, Crnic & Carter, 1994), indicating a similar, specific developmental pathway. However, the most commonly reported worries (i.e. harm befalling a loved one, health, social relations and school performance) are apparent throughout childhood and adolescence (Muris et al., 1998).

In parallel with the peak in fearfulness during middle childhood, the prevalence of children reporting worry almost doubles to 80% post 7 years of age (Muris et al., 2000). In essence, worry is a process characterised by the anticipation and elaboration of catastrophic possibilities (Vasey, Crnic & Carter, 1994). The ability to worry therefore requires the aptitude to go beyond what is observable and to repeatedly rehearse long chains of negative outcomes and their consequences. This ability does not emerge until middle childhood, at which point children are able to anticipate potentially harmful outcomes (Muris et al., 2002). Consequently, worry is especially prevalent at this time, as children become increasingly sensitive to potential threats and the negative features of

certain stimuli and situations (Muris et al., 2000). After middle childhood, worry appears to gradually decrease (Miller & Gallagher, 1996; Muris et al., 2000; Ollendick, 2001). This is perhaps due to an increased ability, through personal experience, to discount the content of any unrealistic, unfounded ruminations, or at least an amplified capacity to generate alternatives.

There also appears to be a significant degree of continuity in the tendency to worry over time. Despite a general decline in worry with age, an underlying stability is apparent, such that, even with maturation, individual differences continue on a long-term basis (Ollendick, 2001). Girls also consistently report more worry than boys (Muris et al., 2002; Ollendick, 2001; Silverman et al., 1995) although, again, this could in part reflect a response bias, whereby boys may be less likely to admit their anxious experiences.

Interestingly, children with anxiety disorders describe identical worries to those that arise in community samples (Weems, Silverman & La Greca, 2000). Furthermore, research has shown that 25% of adolescents report excessive worry (Fournier, Freeston, Ladouceur, Dugas & Guevin, 1996), and that intense typical worries are similarly accompanied by interference, high levels of resistance, and are difficult to control (Muris et al., 1998). When worry becomes this extreme, it is as if the threat is constantly being rehearsed, without a solution ever being found (Silverman, La Greca & Wasserstein, 1995). Thus, while moderate worry serves an adaptive function, preparing the individual to cope with future events, excessive worry is maladaptive, and is associated with inadequate problem solving (Dugas, Letarte, Freeston, Rheaume & Ladouceur, 1995).

1.3.3 Fear and worry in childhood: is a distinction actually meaningful?

In the childhood literature, fears and worries are often bracketed together (Vasey, Crnic & Carter, 1994; Neitzel, Bernstein & Russell, 1988), with some researchers arguing

that differentiation between the two is neither possible nor useful (Neitzel et al., 1988; Rosen & Schulkin, 1998). Notwithstanding similarities in prevalence rates, gender distribution and continuity across childhood, the main basis of this argument resides in an overlap between the affective and physiological patterns in which fear and worry are expressed: both involve apprehension and are associated with trembling, sweating and gastrointestinal distress (Gullone, King & Ollendick, 2000). However, this lack of distinction has received some criticism, a viewpoint supported by data suggesting important differences between fear and worry, particularly in relation to their cognitive composition (Antony & Barlow, 1991; Gullone, 2000).

Gullone et al. (2000) report that while fear is characterised by concerns regarding danger or threat to survival (e.g. threats from animals, physical danger), worry is characterised by concern regarding possible social or cognitive discomfort. Hence, fear is viewed as a special state of the biological alarm system, preparing the individual for escape from a specific, realistic, external and aversive phobogenic stimulus (Brown, Teufel, Birch, & Kancherla, 2006; Marks, 1987). In contrast, worry is a special state of the cognitive system, and results from more abstract, anticipatory cognitive processes that can be triggered by thoughts related to either realistic or unrealistic future negative events (Barlow, 1988; Brown et al., 2006).

This assumption has strong intuitive appeal. As Gullone et al. (2000) point out, it is more common for people to express discomfort at being confronted by an angry dog as fear rather than worry. Indeed, when children aged 8 to13 years are asked to list personal fears, spiders and snakes feature prominently. However, when asked to list worries, these concerns are absent (Muris et al., 1998). In pathological terms, treatment modalities for fear and anxiety, whether involving psychopharmacology or psychotherapy, also differ. For example, flooding/exposure is often used to deal with avoidance in fears or phobias,

while cognitive restructuring, a process whereby individuals are facilitated to replace negatively biased, counterfactual beliefs with more accurate and beneficial ways of thinking, is a popular mode of treatment for anxiety (Kendall, 2000). Thus, while the experiences of fear and worry are undeniably related, a variety of evidence suggests that these constructs are ultimately distinct, representing different affective and cognitive states and reflected by different experiences.

1.3.4 Ritualistic behaviour in childhood

While there is little empirical research concerning typically developing ritualistic behaviour, rituals have long been viewed as a common aspect of child development (Freud, 1965; Piaget, 1950). In typical childhood, rituals are characterised by repetitive elements and a self-imposed adherence to rules with regard to the child's own or others' actions (Zohar & Felz, 2001).

Children between the ages of 2 and 4 in particular engage in this form of behaviour, often demanding that things should be done in certain ways, that things stay constant, and that attention be paid to minute details in the immediate environment (Evans et al., 1997; Gessel, Ames & Ilg, 1974). At this age, children may begin to arrange objects in straight lines or symmetrical patterns, and express distress at 'imperfect' objects with stains or defects (Kagan, 1981). The familiar way is often demanded at bedtimes, mealtimes and other transitional periods. This aspect of behaviour is not confined to early childhood, however. Significant bedtime ceremonies can still be seen in 4- to 6-year-olds (Nagera, 1980), and even college students report certain pre-sleep rituals (Markt & Johnson, 1993). Later in childhood, rituals can also take the form of complex, rule-based games. Tag games often manifest a theme of contamination and avoidance, and superstitious rules for behaviour begin to surface (e.g. avoiding cracks in the pavement, using a lucky number to

prevent bad luck). Certain behaviours may be enacted to ward off harm to self or others, especially parents (King & Noshpitz, 1991). 'Undoing' an act, such as crossing one's fingers, to prevent the consequences of a frightening thought is also normal (Leonard et al., 1990). Hobbies and collections are often started, and rituals relating to personal hygiene or checking (e.g. ensuring doors/windows are shut, or taps are turned off) can develop (Zohar & Bruno, 1997).

These typical behaviours clearly bear a strong phenomenological resemblance to the pathological rituals of OCD. Thus, while Rachman (1998, p.121) speaks of compulsions as being "in many ways the purest example of abnormal behaviour", compulsive behaviour barely deviates in content from its normative counterpart. Indeed, Muris, Merckelbach, and Clavan (1997) report that expert judges are unable to differentiate between normal and abnormal rituals when asked to do so based on subject matter alone. This does not mean that the rituals of typical childhood are in any way pathological, but it does suggest that the psychological mechanisms underlying normative rituals may be closely related to the malfunctioning mechanisms of OCD.

OCD is characterised by a need for absolutes. People with OCD need clear-cut demarcations, and attempt to simplify the ambiguity and multifaceted complexity of the world by orienting toward a small number of salient concerns and actions. Theorists suggest that normative ritualistic behaviour similarly provides order, direction and predictability (Piaget, 1950; Ollendick, Hagopian & King, 1997). This appears to be particularly significant for young children, as they have little control over, and little understanding, of the contingencies of daily life. In line with this, ritualistic behaviour has been found to increase during the early years, as children attempt to gain mastery in the face of increased demands for autonomy or self-control (Evans et al., 1997).

While some authors (e.g. Leonard, Goldberger, Rapoport, Cheslow & Swedo, 1990; Zohar & Felz, 2001) propose that differences in timing (OCD rituals have a later mean age of onset than normative developmental rituals) and developmental role (normal rituals enhance socialisation, while those of OCD are excessive, distressing if not performed, and interfere in one's life) seem to separate normal developmental rituals from those of OCD, this is not necessarily the case. Taken out of their developmental context, children's rituals can be rigid to the point that they would appear symptomatic. In addition, like pathological rituals, childhood rituals are commonly circumscribed and limited to a particular sphere of life (Evans, 2000). Some of the rituals in childhood also suggest the presence of egodystonia, as the behaviours themselves often cause some subjective distress, but are carried out regardless (Werner, 1948). Moreover, recent research suggests that the common fears, phobias and worries of typical childhood are often related to the display of compulsive-like behaviours, and that this association holds true for a significant proportion of children between the ages of 1 and 16 years (Evans et al., 1997; see Chapter One). It appears, then, that the rituals children create and adhere to may be more closely aligned to the rituals of OCD than initially considered. Moreover, beyond any phenomenological commonalities, normative and pathological obsessive-compulsive behaviours may also share some fundamental neurobiological underpinnings (Bolton, 1996, see Chapter Four).

Around age 6, when children become familiar with the rules of the environment and can act effectively as agents, ritualistic behaviours decrease significantly (Evans et al., 1997; Piaget, 1950), and continue to do so throughout childhood and adolescence (Zohar & Bruno, 1997). The extent of this reported decrease may be amplified, however, as research has typically utilised different methods of assessment according to the age of the sample under examination.

The rituals of early to middle childhood (e.g. pre 8 years) have mostly been investigated through parental report on the Childhood Routines Inventory (Evans et al., 1997; Zohar & Felz, 2001), a specifically constructed measure that places rituals within a normative framework. In contrast, older children have typically self-reported ritualistic behaviour on clinical measures of obsessive-compulsive symptomatology (Leonard et al., 1990; Zohar & Bruno, 1997). Thus, while early ritualistic behaviours have been normalised in research, the rituals of older childhood have remained firmly within a pathological context. This may have prompted under-responding in older children and adolescents, obscuring the extent to which rituals are actually performed during this developmental epoch.

Comparability of ritualistic behaviour across normative childhood research is also restricted by the tendency to use different informants at different ages, although this is difficult to reconcile. While parental report is appropriate for younger children, self-report measures are necessary as rituals become progressively more secretive, internalised, or restricted to contexts where parents are absent. However, self-report measures are too complex and abstract for younger children to reliably complete alone.

1.3.5 Are the ritualistic behaviours of typical childhood related to anxiety?

While a phenomenological resemblance between the rituals of OCD and typical childhood has often been noted (e.g. Leonard et al., 1990), the notion that normative ritualistic behaviours may similarly be associated with efforts to control anxiety has received relatively little empirical attention. Early research dismissed the notion of a continuum, concluding that while early childhood rituals are adaptive, developmentally appropriate tools for mastering the self and environment, pathological rituals are longer in duration, are experienced as distressing, and interfere with normal activities (Leonard et al., 1990).

However, as Bolton (1996) suggests; "these findings are unsurprising, given the criteria for 'disorder', and are neutral as to the issue of a continuity between the two kinds of phenomena." Furthermore, a growing body of more recent research evidence suggests that childhood ritualistic behaviours correlate with behavioural problems, emotional impairment, and fears (Evans et al., 1999; Zohar & Felz, 2001).

Evans et al. (1999) administered the Childhood Routines Inventory (Evans et al., 1997) and a fear inventory to a sample of 61 parents with children between 13 and 86 months of age, asking them to report on their children's rituals, fears and phobias. Although prevalence of ritualistic behaviour was highest in children aged 2 to 4, and positively correlated with fear levels at all ages, the relation between fear and rituals strengthened post 4 years of age.

Evans et al. (1999) suggest that controlling one's environment plays a major role in reducing susceptibility to fear and anxiety disorders in early childhood. Rituals may therefore have an adaptive function at this time, enabling the young child to cope with stress, as well as providing increased feelings of self-efficacy in an environment perceived as out of control (Ollendick et al., 1997; Piaget, 1950). However, the habitual performance of rituals in later childhood may well indicate an overly rigid style at a time when greater flexibility is needed to deal with increasingly complex environmental demands (Zohar & Felz, 2001). The performance of ritualistic behaviours may therefore serve a variety of functions at different ages, becoming an increasingly maladaptive reaction to anxiety as childhood progresses (Pollock & Carter, 1999).

In favour of this viewpoint, Zohar and Bruno (1997) found that in a large community sample of 8- to 14-year-olds, obsessive-compulsive symptomatology commonly reported by the youngest children was present in only a minority of the eldest, but was associated with higher levels of trait anxiety in the older group. Furthermore, a

higher proportion of older children in the sample reported extreme obsessions and compulsions. This finding is interesting, considering that OCD typically onsets during late childhood (Geller et al., 1996), and further supports the utility of a developmental psychopathology perspective by clearly highlighting developmental parallels between normative and pathological experiences.

1.4 Methodological issues

While innovative, the studies of Evans et al. (1999) and Zohar and Bruno (1997) do not provide us with a complete picture of the developmental interrelations among fear, worry, and rituals in typical childhood. Firstly, they use only limited age ranges of participants (i.e. including only young children or adolescents, as opposed to spanning childhood and adolescence) and restricted ranges of anxiety phenomena. A developmental psychopathology approach to these phenomena would involve looking at a fuller range of components of anxiety cognitions and behaviour across the full developmental range thought to be important in the development of the disorder. That is, if OCD onset is known to occur between the ages of 7 and 18 (Flament et al., 1988), it is necessary to consider the full range of this developmental period when attempting to derive normative data for fears, worries and rituals.

A second limitation is that existing studies have relied on a mix of non-comparable reporting methodologies (self-report and parental report). Although these methodologies are likely to be of different value at different stages of development, they make comparison across developmental stages more difficult. In addition, the use of informant (parent) report is likely to be of limited use given that worries and rituals in particular are likely to become more 'secret' and behaviourally silent as children get older, such that parental or other informant report is likely to become less reliable. That said, studies that rely on self-

report would need to ensure that younger children's predictable difficulties in providing testimony on their own experiences are handled in a developmentally sensitive way that enhances the reliability of such reports in the youngest participants.

A third methodological limitation to previous studies is the use of established psychiatric instruments to assess anxiety phenomena in the normal range. Younger children's rituals have mostly been investigated through parental report on the Childhood Routines Inventory (Evans et al., 1997), while older children have typically self-reported ritualistic behaviour on clinical measures. For example, Zohar and Bruno's study employed a clinical questionnaire (The Maudsley Obsessive-Compulsive Inventory) to assess obsessive-compulsive symptomatology in a non-clinical sample, which might lack sensitivity in this group. Thus, while early ritualistic behaviours have been normalized in research, the rituals of older childhood have been considered within a pathological context, potentially prompting under-responding in older children and adolescents.

A final methodological point concerns the salience of anxiety-related stimuli used in empirical research. Anxiety-related emotions, cognitions and behaviours are of course specific to particular individuals, leading to individual differences in salience which may be difficult to accommodate within 'one-size-fits-all', nomothetic self-report instruments. On the other hand, the personal formulations made possible through clinical interviews are likely to prove too unwieldy and resistant to generalisation for empirical research (Tolin et al., 2001). Future research in this area therefore needs to develop methodologies which combine the idiographic descriptions provided by clinical interviews with the generalisable empirical methods associated with mainstream developmental research.

1.5 Overview of the thesis

The studies reported in this thesis set out to address some of these methodological limitations in previous research into anxiety experiences and behaviours in typical childhood. First, in Chapter Two, a study is described in which content and intensity of fear, worry, and ritualistic behaviour were assessed through a semi-structured interview designed specifically for this study. The interview was individually administered to 142 typically developing children aged 7 to 16 years. The design allowed for the developmental trends and interrelations among fear, worry and ritualistic behaviour to be described using response modes appropriate to the age group concerned, and was sensitive to individual variation in content of anxiety phenomena. It was hypothesised that content and intensity of anxiety-related phenomena would vary in predictable ways over the age range studied. In line with previous findings, it was expected that fear and worry would be related across the age range, and that both would in turn correlate with levels of ritualistic behaviour.

In Chapter Three, a sub-sample of 80 of these children was followed up in a study designed to assess cognitive appraisals of anxiety-related thoughts. Using a semi-idiographic methodology, participants rated personally significant high- and low-salience fears and worries for the cognitive appraisals of inflated Responsibility, Thought-Action Fusion and Intolerance of Uncertainty. Effects relating to personal salience and anxiety type were investigated, in addition to relations between anxiety phenomena and biased cognitive appraisals. It was predicted that the tendency to evince high levels of these appraisals would decrease with age, and that highly salient anxieties would produce more biased appraisals than less salient ones. Reflecting the cognitive model of OCD, it was expected that any relation between anxiety and ritualistic behaviour would be mediated by

biased cognitive appraisals. This study constituted the first attempt systematically to investigate such cognitive appraisals in typical childhood.

In Chapter Four, a separate sample of 83 typically developing children aged 11 to 16 years reported on fears, worries and ritualistic behaviour and also completed tasks designed to assess executive functioning. In line with evidence that OCD is characterised particularly by abnormal processing in the orbitofrontal system, tasks were chosen to be specific to assessing functioning in the orbitofrontal and the distinct but related dorsolateral neural systems. It was predicted that executive performance would generally increase with age, and that children scoring higher on the fear, worry and ritualistic behaviour measures would perform more poorly on orbitofrontal executive tasks. Tasks were modified to include a salience manipulation, allowing the interaction of these effects with salience to be described.

Finally, in Chapter Five, the findings of these studies are discussed in relation to the utility of a developmental psychopathology approach in enhancing understanding of anxiety phenomena and behaviour in childhood. The limitations of the present research, as well as possible directions for future investigations into anxiety across typical and atypical development, are outlined.

CHAPTER TWO: FEAR, WORRY, AND RITUALISTIC BEHAVIOUR IN CHILDHOOD: DEVELOPMENTAL TRENDS AND INTERRELATIONS

2.1 Introduction

As discussed in the previous chapter, an increasing focus on anxiety disorders in childhood has led researchers to consider how psychopathological conditions can be illuminated through the study of anxiety in typical development. For example, normative rituals have a strong phenomenological resemblance to the pathological rituals of obsessive-compulsive disorder (OCD), and also relate to emotional distress and anxiety (Evans, Gray, & Leckman, 1999; Leonard et al., 1990; Zohar & Bruno, 1997). This does not mean that the rituals of typical childhood are in any way pathological, but it does suggest that the potentially pathological mechanisms underlying normative rituals may be closely related to the malfunctioning mechanisms of OCD. Thus, further investigation regarding the typical manifestation of patterns of anxiety and ritualistic behaviour across childhood and adolescence may provide a useful backdrop against which to interpret both typical and atypical manifestations of development.

The study reported in this chapter used a cross-sectional design to determine how fears, worries and ritualistic behaviours manifest and interrelate in typically developing children and young people between the ages of 7 and 16. The use of an improved methodology specifically designed for assessing these experiences in typical childhood permitted a clearer developmental picture (through the use of measures that were consistent across ages), and consequently an examination of the developmental relations among fear, worry, and anxiety in more detail, and over a wider age range, than has been possible in previous studies.

The choice of methodology was motivated by a desire to combine the systematicity of closed-response techniques with the greater flexibility of open-response methods.

Children were initially given an opportunity to self-report anxieties, after which they were presented with closed-response lists of fears, worries, and ritualistic behaviours. It was decided that an interview format would be most inclusive of all children, decreasing participation demands sufficiently to allow even the youngest children in the study (aged 7 to 8 years) reliably to report on their fears, worries, and ritualistic behaviours, while also ensuring the sensitivity of the procedure. This method was also expected to produce a truer picture of the most common anxiety phenomena in childhood and adolescence, avoiding the aforementioned problems of exclusively using a closed-response format. For example, while for comparability purposes the closed-response data would form the basis of any inferential analyses, the open-response component would permit the detection of items not included in the closed-response lists (providing an indication of the representativeness of each scale), and also help to ameliorate the potential cueing function of exclusively presenting items in a closed-response format. In addition to allowing the investigation of these experiences across a wide age range of typically developing children, this methodology made it possible to examine developmental relations among these variables.

Previous research has suggested that common developmental themes colour typical childhood fears, worries, and rituals (see Chapter One), and, on this basis, it was expected that the content of each of these constructs would alter in predictable fashions according to age (Hypothesis 1). In terms of fear, this would reflect a general shift from physical danger concerns to fear of social and medical situations. Similarly, worries regarding physical well-being were expected to be increasingly overshadowed by competency and social evaluative concerns as development progressed. Finally, it was thought that ritualistic behaviour would manifest as symmetry/counting rituals and superstitious games or behaviours (e.g. avoiding cracks in the pavement, crossing one's fingers to 'undo' an act) earlier in childhood, progressing into personal hygiene/checking behaviours with age. It

was also hypothesized that fear, worry, and ritualistic behaviour would be most prevalent in middle childhood, decreasing with increasing age (Hypothesis 2), and that girls would report higher levels of fear, worry, and rituals than boys (Hypothesis 3). In line with prior findings (e.g. Gullone et al., 2000) it was expected that fear and worry would be positively related across childhood and adolescence (Hypothesis 4). It was also anticipated that ritualistic behaviour would be positively related to fear across childhood, extending the findings of Evans et al. (1997) (Hypothesis 5). The relation between rituals and worry has not specifically been explored in the previous empirical childhood literature. However, as high worry is known to be especially associated with maladaptive problem-solving (Dugas et al., 1995), worry was expected to play a significant role in the performance of ritualistic behaviours across childhood and adolescence (Hypothesis 6).

2.2 Method

2.2.1 Participants

Participants were recruited following written informed parental consent from schools in North-East England. The sample included 142 children aged between 7 and 16 years, divided into four age groups: 7-8 years (M = 7.5 years, SD = .47, N = 31, 18 girls), 10-11 years (M = 10.3 years, SD = .44, N = 31, 18 girls), 13-14 years (M = 13.7 years, SD = .49, N = 40, 20 girls) and 15-16 years (M = 15.2 years, SD = .32, N = 40, 20 girls). The proportion of pupils eligible for free school meals ranged from broadly in line with the national average, to above average. Only 3% of children were from minority ethnic groups, and all participants spoke English as a first language. The ethics committee from Durham University's psychology department approved the study and all children assented to their participation (Copies of all documentation relating to Ethical approval can be found in Appendix 7).

2.2.2 The fears, worries, and ritualistic behaviours interview

A combined open-and closed-response methodology that was initially developed as part of a Masters thesis project and revised for the current study, (Laing, Turner & Freeston, 2002, outlined further below) was selected for the design of the interview. With regard to fears and worries, the interview was formatted to include both open and closed questioning, whereby children firstly self-generated fears and worries, and then reported on how much they feared, or how often they worried, about a list of closed-response items. This combined methodology allowed children spontaneously to report their most salient fears and worries without being influenced by the subsequent items, providing an indication of the validity of the closed-response anxieties. It has also been argued that fear/worry endorsements are a function of the research method employed (e.g. McCathie & Spence, 1991). A semi-structured approach can offset this potential problem, while also allowing for standardized comparability of fear, worry, and ritualistic behaviour endorsements across age groups via closed-response lists. While the advantages of using a combined methodology apply non-discriminately to the present study, the option for participants to report highly salient fears and worries not included in the closed-response lists was particularly integral to the aims of study 2, which is reported in Chapter Three. In Study 2, a sub-sample of children from Study 1 were selected to further participate based on their highly salient and less salient fears, worries and ritualistic behaviours, as identified during the interview. Thus, the children taking part in Study 2 had already taken part in Study 1, and the semi-structured interview that they then received was individually tailored according to their responses on the fears, worries and ritualistic behaviours interview. Further information regarding the inter-linking of the procedures from Study 1 and 2 can be found in Appendices 1.

Piloting with 60 7-11 year old typically developing children (Laing et al., 2002) suggested that asking children to self-generate ritualistic behaviours proved too abstract for most, particularly in the younger age groups. Children would typically provide examples of behaviours that were not ritualistic in nature when asked, for example, if there was anything they felt they 'had' to do in their daily lives. Some examples include 'eat my meals', 'play with my sister' and 'watch TV'. As such, questions referring to ritualistic behaviour were closed-response only. The wording of all closed-response items was kept as simple as possible.

2.2.3 Item Selection

The majority of items within the closed-response lists were initially developed as part of a Masters project (Laing et al., 2002). This study examined the fears, worries and ritualistic behaviours of typically developing children aged 7-8 and 10-11 years of age. Item generation for this initial study involved a comprehensive literature review of research articles examining fear (Gullone & King 1992; Zohar & Bruno, 1997; Ollendick et al, 1996, 1983; Muris et al, 2000, 2002) worry, (Spence et al, 1998; Ollendick et al, 1991; Muris et al, 1998; Weems et al, 2000); Heffman et al, 1988; Silverman et al, 1995) and ritualistic/repetitive behaviour (Evans et al, (1997, 1998, 1999; Spence et al, 1998; Bamber et al, 2002; Berg et al, 1986; Toro et al, 1992) in children aged 7-11 years. The most commonly reported fears, worries and rituals found to be reported in the empirical literature among children within this age range were then used to form each scale.

In determining whether an item was a 'fear' or a 'worry', definitions of each of these constructs were also considered. For example, following the recommendations of Gullone et al., (2000), among others (e.g. Barlow, 1988; Marks, 1987), a fear was conceptualised as a concern regarding danger or threat to survival, whereas a worry was

conceptualised as a concern regarding possible future social or cognitive discomfort. When selecting items relevant to the measurement of ritualistic behaviours, the most common compulsions reported in paediatric studies were again selected to ensure developmental appropriateness. Items were then placed in the context of normative behaviour, and phrased to avoid casting the behaviours within a pathological framework. For example, it was described that questions would concern 'things that young people have said they do sometimes,' and pointed out that 'lots of people do things in their own particular way, and I'd like to know if you do these things too.' It was considered important to normalize the ritualistic behaviours to minimize false denial when responding. On the basis of this process, and following consultation with a Clinical Psychologist with specialist expertise in anxiety disorders and obsessive-compulsive disorder (Professor Mark Freeston), the final lists used for the Master's project included 10 fear items, 11 items pertaining to worry, and 14 items representing ritualistic behaviours. Reliability analyses were subsequently conducted, and estimates of internal consistency (Cronbach alpha coefficients) of the three implemented scales were good, ranging from .75 for the worry scale, and .78 for both the fear and ritual measures.

As the current study involved participants of an extended age range it was decided that it may be necessary to modify the original closed response lists to ensure each list was equally representative across the extended age range of participants. To ascertain whether this modification was necessary, the prior literature review was repeated, this time including studies with participants from 7-17 years of age (e.g. Fear: Bauer, 1976; Dong et al., 1995; King, 1993; Gullone, 2000; Gullone & King, 1997; Muris et al., 2000, 2002; Ollendick et al., 1991, 2001, Worry: e.g. Miller & Gallagher, 1996; Muris et al., 1998, 2002; Ollendick, 2001; Silverman et al., 1995; Vasey et al., 1994; Weems et al., 2000, and Ritualistic Behaviour: e.g. Evans et al., 1997; Geller et al., 2001; Leonard et al., 1990;

Millet et al., 2004; Swedo et al., 1989; Zohar & Bruno, 1997) in childhood. Only those items reported as being among the 15 most common fears and worries in two or more studies were considered, increasing the likelihood that each question would be within most children's common experience. This was also expected to improve the quality of responding and minimise the likelihood of a child becoming distressed by age-inappropriate or unfamiliar themes. This was particularly important, given each scale was to be administered across a greater age range (from 7-16 years) in the current study.

Following the literature review, a clinical psychologist (Professor Mark Freeston) and a child psychiatrist (Professor Ann Le-Couteur) with special expertise in childhood obsessive-compulsive and other anxiety disorders were consulted. Each list of fears, worries, and ritualistic behaviours was edited accordingly. Potentially sensitive or distressing items, including anxiety for self or family dying, and worry about parents divorcing, were removed. This editing process was useful both in terms of ensuring relevance and sensitivity, and in reducing the time demands of participation; time was a factor both in terms of permitted access to participants, and in the anticipated inability of younger children to attend for long periods. The final list included 15 fear items, 15 worry items, and 15 items representing ritualistic behaviours (see Appendix 1). Thus, 5 items were added to the fear scale (fear of heights, fire, injections/blood, the dentist and closed-in spaces), 4 to the worry scale (worry about whether tasks have been completed correctly, being clean enough, meeting someone for the first time and being betrayed by a friend) and 1 to the rituals scale (An inflexible need to complete tasks in a very particular way).

Subsequently, the interview was piloted with 4 schoolchildren aged 7-8 years to confirm the applicability of the additional closed-response items and ensure that the procedure was not distressing in any way. The procedure was also piloted with 5 schoolchildren aged 14-15 to assess the suitability of the items and indeed the overall appropriateness of the

modified interview to children over the age of 11 years. In each case, items were commonly endorsed as part of each child's typical experience, with high levels of familiarity and relevance, and demands of participation were well within each child's capacity.

2.2.4 Rating Scales

In previous research (e.g. Ollendick, 1983), it has been noted that young children have difficulty understanding and discriminating responses on scales that have 5 points or above. In consideration of this, 4-point Likert scales were used for children's ratings. A standardized format was adopted to examine each construct. For example, while most studies examine fear by asking children how scared they are of each response item (e.g. Ollendick, 1989, 1991), typically reflecting an in-situ, externally focussed threat, worry is commonly measured in terms of frequency of thought (e.g. Weems et al., 2000; Silverman et al., 1995), as future-oriented rumination is characteristic of this emotion. Ensuring the rating scales reflected the specific characteristics of each form of anxiety was another means to encourage delineation between these two related, yet ultimately distinct constructs. Thus, for fear, children rated how scared they were of each item, with 0 = not scared, 1 = a little scared, 2 = quite scared, and 3 = very scared. For worry, children were asked to rate how often they worried about each item, with 0 = never, 1 = sometimes, 2 = often, and 3 = always. As the ability to suppress is an important feature of pathological rituals as well as worry, ritualistic behaviour was similarly measured in terms of frequency, with children reporting how often they performed these behaviours on the same scale of 0-3. In addition, an individual total score for fear, worry, and ritualistic behaviour was derived by summing the scores for the 15 closed-response items representing each variable. Fear, worry, and ritualistic behaviour scores each had a maximum total of 45.

2.2.5 Visual prompts

A 'scare-meter', a 'worry-meter', and a 'habit-meter' were used to facilitate participants' understanding and to help anchor ratings. These were large card scales (1 metre x 30 cm) depicting the Likert ratings outlined previously. After endorsing an item, children were asked to point to, or refer verbally to, the place on the meter that best described how they felt about each fear, worry, or ritual. The fear and worry meters also included pictures of scared or worried faces displaying the emotions of the extreme points on each scale to aid younger children in particular (see Appendix 3).

2.2.6 Procedure

Participants were interviewed individually in their schools, in a separate room away from the main classroom. Standardized instructions explained the aim and content of the procedure. Children were reassured that there were no right or wrong answers to any of the questions, and that it was acceptable to withdraw from the study at any time. Once assent was given, the interview commenced. Self-generated replies and intensity ratings were written down verbatim by the researcher. The procedure and closed-response items are further outlined in Appendix 1.

Initially, children were asked to self-generate personal fears (e.g. 'To start with, I'm going to ask you about things that make you scared or frightened. For example, some children/people are frightened of the dark. Can you tell me about anything that you find scary'?). If, after the first prompt, children said that they could not think of any fears, or that they did not have any (this happened with 20% of the participants), the interviewer proceeded to the closed-response questions. If the child did generate a response to the first prompt, they were given up to two more prompts so a maximum of three self-generated fears were obtained. Following the prompts, participants were thanked. They were then

required to rate, with the aid of the 'scare meter', just how scary they believed those things to be. At this point the scare meter was placed on the desk in front of the child. Considerable care was taken with younger children in particular in explaining and describing the rating scale. Attention was predominantly focused on ensuring that the children comprehended the distinctions being drawn by the different positions on the meter.

To further ensure younger children's understanding of the rating scales, a practice item (fear of the dark) was provided for children in the 7-8 and 10-11 age groups. Participants rated the practice item, and then discussed their response with the investigator. Any misconceptions (which were few) were rectified at this time. At this point, the investigator read out any self-generated fears, and children indicated how scared they were of each item. Each fear item from the closed-response list was then read out in turn, and the participant reported whether they had a fear of this item. Affirmative responses were followed by asking just how scared they were of each item. If no fear was reported, the interviewer went on to the next question. If children had already self-generated an item that was included within the closed-response list, this item was still presented as usual during the closed-response component as comparability of ratings across each reporting format provided a useful reliability check. In no instance did a self-generated and closed-response rating of the same fear or worry differ. Once the list of fears was completed, children were asked if they were happy to carry on (all agreed).

The procedure then progressed to asking participants to self-generate any worries they had. This was done in an identical manner to when children were asked to self-generate fears, with an example of worry mentioned first (e.g. *Everybody worries about things now and then. For instance, many children worry about how they do in school, like how well they have done in a test/exam. Could you tell me what you worry about?*), and

then up to three prompts being given. Once again, the interviewer moved onto the closed-response list of worries if children failed to self-generate any worries of their own (this happened with 27% of the participants). If children did report any worries, the 'worry meter' was introduced. Particular attention was also paid to ensure that participants understood that they now had to indicate how often they worried about each concern they had mentioned. Following this part of the procedure, children were presented with the closed-response list of worries, and asked to report how often they worried about each one. Following a positive response, children indicated on the worry meter how often they had that particular concern.

Following completion of the worry items, children were asked if they were happy to continue, and the interview turned to ritualistic behaviours. The 'habit meter' was explained and demonstrated with care, and it was ensured that each participant fully understood what each rating represented. The interviewer then asked the respondent whether they performed the first closed-response ritualistic behaviour item regarding bedtime routines. If this was confirmed, were next required to indicate on the scale how often they performed this behaviour. Following this, each item from the closed-response list was read out in turn, with participants reporting how often they performed each item following an affirmative response.

Throughout the procedure, participants were also required to report the ritualistic/coping behaviours and strategies they employed to deal with fears and worries rated with a 1 (A little scared or Sometimes worry) or a 3 (Very scared or Always worry); these anxieties could be either self-generated or from the closed-response list. Participants reporting any ritualistic behaviours were also asked whether they performed this ritual in response to any fear or worry they had, and were then asked to rate how frightening or worrisome they found this related anxiety. Rituals and corresponding anxieties were only

recorded as a linked pair if the fear or worry was rated with a 1 or a 3. Lastly, participants were asked to describe what they thought would occur if they didn't employ the ritualistic/coping behaviour they make use of when dealing with a reported fear or worry. This aspect of the procedure specifically relates to the study reported in Chapter Three.

The fear, worry and ritual assessments were always administered in the same order and the whole procedure lasted around 20 minutes. Once the formal interview had finished, participants were asked if they had any questions. To end the interview on a positive note, they then asked to report a happy memory and thanked for taking part.

2.3 Results

2.3.1 Reliability of the Fear, worry, and ritualistic behaviour scales

Internal consistency estimates for each closed-response scale (Cronbach's alpha coefficients) were good, ranging from .78 for the ritualistic behaviour scale to .84 for both fear and worry measures. Test-retest analyses were also conducted. Twenty-eight of the 31 children initially tested in each of the younger age groups (7-8yrs and 10-11yrs), and 37 of the 40 children initially tested in each of the older age groups (13-14yrs and 15-16yrs), were located nine months later and interviewed a second time. Across age groups, correlations ranged from 0.69 to 0.75 for the fear scale, 0.62 to 0.80 for the worry scale, and 0.59 to 0.80 for the ritualistic behaviour scale (see Table 2.1). Each scale thus showed acceptable levels of stability, especially given the prolonged interval.

Table 2.1 Nine-month test re-test data for fear, worry and ritual intensity scores by age

Age (yrs)	Fear	Worry	R.Beh.
Fear			
7-8	**.657****		
10-11	**.687****		
13-14	**.748****		
15-16	**.686****		
Worry			
7-8		.762**	
10-11		.621*	
13-14		.719**	
15-16		.795**	
Ritualistic Behaviour			
7-8			**.739****
10-11			**.588***
13-14			**.795****
15-16			**.719****

**p<.001 (2-tailed) *p<.01 (2-tailed)

2.3.2 The nature of childhood fear

Responses to the closed-response items of the interview were examined across age groups to assess the nature of fear, worry, and ritualistic behaviour throughout middle childhood and adolescence. Mean values and the percentage of extreme (i.e. 3) ratings given for each item were calculated to determine average ratings and the specific proportion of children reporting intense fears, worries, or ritualistic behaviours within each age group. Based on this proportion (i.e. percentage of children given the maximum intensity rating of 3), items were then ranked within each age group according to frequency of extreme ratings. Lastly, closed-response replies were compared to self-generated fears and worries as a means to determine the content validity of these scales. Descriptive results relating to fear can be seen in Table 2.2.

Inspection of Table 2.2 suggests that an increase in age is associated with a decrease in fear intensity. Mean values typically reduce and the proportion of children reporting that they are 'very scared' of an item commonly lessens with increasing age. This decrease is especially apparent between the ages of 7 to 11, when fears of animals, heights, ghosts/the supernatural, and being alone at home become substantially less extreme. An intense fear of strangers, lonely places, being in a car accident, and nightmares continues to reduce up to 13-14 years of age. In contrast, fear of visiting the dentist increased across the whole age range, and insect fears increased from 10-11, becoming most pronounced at 15-16 years of age.

Table 2.2 Mean fear ratings (maximum = 3), percentage of 'very scary' (3) ratings, and rank order for each item (lowest = 15) by age group

Fear Item	7-8 yrs (n=31)	10-11 yrs (n=31)	13-14 yrs (n=40)	15-16 yrs (n=40)
	Mean	Mean	Mean	Mean
	%3	%3	%3	%3
	Rank	**Rank**	**Rank**	**Rank**
Animal	1.6	1.0	0.6	0.8
(e.g. dog, snake)	35.5	9.7	10.0	15.0
	6	**8**	**7**	**7**
Insect	0.9	0.9	0.8	1.2
(e.g. spider, wasp)	9.7	9.7	15.0	22.5
	13	**8**	**3**	**4**
Strangers	2.5	2.1	1.3	1.6
	67.7	48.4	22.5	30.0
	3	**2**	**1**	**2**
Getting lost	2.3	1.7	1.1	1.4
	58.1	12.9	10.0	20.0
	5	**7**	**7**	**5**
Heights	2.3	0.5	0.7	0.7
	64.5	6.5	10.0	12.5
	4	**11**	**7**	**8**
Being in a fire	2.6	2.4	1.1	1.6
	74.2	64.5	12.5	25.0
	2	**1**	**5**	**3**
Injections/Blood	1.4	0.9	0.7	0.8
	16.1	9.7	7.5	17.5
	11	**8**	**10**	**6**
Car accident	2.6	2.0	1.1	1.9
	77.4	35.5	20.0	40.0
	1	**3**	**2**	**1**
Going to the dentist	0.2	0.1	0.5	0.7
	0.0	3.2	5.0	12.5
	15	**12**	**11**	**8**
Being in the dark	0.5	0.3	0.4	0.2
	6.5	3.2	2.5	2.5
	14	**12**	**12**	**14**
Ghosts/supernatural	1.2	0.5	0.5	0.4
Phenomena	32.3	0.0	2.5	7.5
	7	**15**	**12**	**12**
Lonely places	1.6	0.8	1.0	0.9
	22.6	16.1	12.5	2.5
	7	**5**	**5**	**14**
Alone at home	1.2	0.7	0.4	0.4
	32.3	3.2	2.5	5.0
	10	**12**	**12**	**13**
Lifts/Small spaces	0.9	0.8	1.0	0.6
	12.9	16.1	15.0	10.0
	12	**5**	**3**	**10**
Nightmares	1.8	1.3	0.8	0.7
	32.3	19.4	2.5	10.0
	6	**4**	**12**	**10**

While the intensity with which a fear was experienced typically appeared to decrease with age, fear of strangers and being in a fire or car accident ranked highly across ages, continuing to be the most extreme concerns within each group. The comparative rank of other items tended to reflect the patterns outlined above, with the rank for heights and ghosts reducing substantially from 7-8 years to 10-11 years (from 4 to 10 and 7 to 15 respectively) and nightmares decreasing from a rank of 4 to a rank of 12 between 10-11 and 13-14 years of age. Dentist and insect fear rankings rise steadily with age, confirming an increase in the relatively intense experience of these fears as children get older. Interestingly, fears of small, enclosed spaces and of being somewhere lonely rank considerably higher at 10-11 and 13-14 years compared to other age groups.

Comparison of self-generated replies versus closed-response items supported the content validity of the fear scale. The percentage of self-generated fears not included on the closed-response scale and rated as 'very scary' (i.e. receiving a maximum rating of 3) was low for each age group (7-8 yr olds = 15%, 10-11 yr olds = 0%, 13-14 yr olds = 1.9% and 15-16 yr olds = 8%). This suggests that the majority of intense self-generated fears reflected the items included in the closed-response scale. Examples of reported fears not on the scale include 'clowns', 'when I am having a fight', 'when I watch something scary on television', 'when I have to read aloud in class', and 'flying'.

2.3.3 The nature of childhood worry

Table 2.3 presents descriptive results relating to worry.

Table 2.3 Mean worry ratings (maximum = 3), percentage of 'always' (3) ratings, and rank order for each item (maximum = 15) by age group

Worry Item	7-8 yrs (n=31)	10-11 yrs (n=31)	13-14 yrs (n=40)	15-16 yrs (n=40)
	Mean	Mean	Mean	Mean
	%3	%3	%3	%3
	Rank	**Rank**	**Rank**	**Rank**
Being told off	1.2	0.7	0.8	0.5
	22.6	0.0	2.5	0.0
	10	**14**	**9**	**15**
Bad marks at school	1.0	0.8	1.1	1.4
	16.1	3.2	10.0	12.5
	12	**12**	**4**	**6**
Harm to loved one	2.5	1.9	1.8	2.0
	58.1	29.0	17.5	30.0
	1	**1**	**1**	**1**
Being bullied	1.8	1.2	0.5	0.4
	45.2	19.4	2.5	2.5
	3	**4**	**9**	**13**
Being criticized/ others complaining about me	1.8	1.1	0.8	0.5
	35.5	6.5	7.5	2.5
	6	**9**	**6**	**13**
Losing friends	2.0	1.5	1.1	1.3
	48.4	19.4	12.5	15.0
	2	**4**	**2**	**5**
Appearance	0.6	0.8	0.9	1.0
	6.5	9.7	5.0	17.5
	15	**7**	**7**	**3**
Whether other children like me	1.5	0.8	0.9	0.9
	29.0	0.0	2.5	5.0
	9	**14**	**9**	**11**
Germs/dirty things	1.8	1.1	0.8	0.9
	38.7	22.6	2.5	10.0
	5	**3**	**9**	**7**
Iraq War	1.3	1.1	0.8	0.9
	32.3	29.0	2.5	10.0
	7	**1**	**9**	**7**
Whether I've done things properly	1.4	1.3	1.2	1.3
	16.1	12.9	10.0	10.0
	12	**6**	**4**	**7**
Going to school	0.8	0.4	0.3	0.4
	9.7	6.5	0.0	5.0
	14	**9**	**15**	**11**
Being clean enough	1.3	1.0	0.8	1.4
	32.3	6.5	15.0	17.5
	7	**9**	**2**	**3**
Meeting someone for the first time	1.2	0.9	0.9	1.4
	22.6	3.2	5.0	27.5
	10	**12**	**7**	**2**
Friends talking about me behind my back	2.0	1.2	1.4	0.9
	45.2	9.7	15.0	7.5
	3	**7**	**2**	**10**

In parallel with findings relating to fear, the experience of worry appears to decrease in intensity with increasing age, and this decrease is similarly most apparent between 7 and 11 years. Extreme worry relating to being told off, harm to a loved one, being criticized, losing friends or being betrayed by friends, and being liked is less often reported after 7-8 years. Intense worry about germs and being bullied continues to decrease strongly until 13-14 years, levelling off thereafter and receiving lower relative rankings from the two older age groups.

Worries about receiving poor marks, whether things have been done properly, being clean enough, and meeting someone for the first time also decrease during middle childhood. However, the difference with this group of items is that, after 11 years of age, these concerns show an increase. For example, worry about poor marks dramatically increases in rank at 13-14 and 15-16 years of age, despite the fact that this concern is reported with greatest intensity at 7 years. Similarly, social evaluative worries concerning appearance, being clean enough, and meeting someone for the first time all increase in relevance, achieving notably higher rankings among older children.

While there is greater variability in the ranking of intense worries compared to intense fears across age groups, concern about harm befalling a loved one was the most commonly expressed extreme worry at all ages. Unexpectedly, the war in Iraq received an equivalent ranking among 10-11 year old children. At the time of data collection (December 2004), insurgency attacks were escalating, following the recent US military assault on Falluja, and news coverage of this violence was widespread. However, worry concerning the war was not ranked as highly in any other age group, despite all data being collected within the same two-month period.

Comparison of self-generated replies versus closed-response items supported the content validity of the worry scale. The percentage of self-generated worries not included on the closed-response scale and rated as 'always worry' (i.e. receiving a maximum rating of 3) was low for each age group (7-8 yr olds = 5%, 10-11 yr olds = 0%, 13-14 yr olds = 8.2% and 15-16 yr olds = 7.9%). This suggests that the majority of intense self-generated worries reflected the items included in the closed-response scale. Examples of reported worries not on the scale include 'my pet being harmed', 'that I've left the door unlocked', 'being attacked', 'my relationship', and 'the future'.

2.3.4 The nature of childhood ritualistic behaviour

Table 2.4 presents descriptive results relating to ritualistic behaviour.

In line with the pattern of results relating to fear and worry across childhood, the habitual performance of ritualistic behaviours appears generally to decline. Repetitive counting, intrusive thoughts, the performance of rigid behaviours, a need to keep certain belongings in special places, and preference for symmetry and arranging objects in straight lines, decreases sharply between 7 and 11 years of age.

Table 2.4 Mean ritualistic behaviour ratings (maximum = 3), percentage of 'always' (3) ratings, and rank order for each item (maximum = 15) by age group

Ritualistic Behaviour Item	7-8 yrs (n=31)	10-11 yrs (n=31)	13-14 yrs (n=40)	15-16 yrs (n=40)
	Mean %3 **Rank**	Mean %3 **Rank**	Mean %3 **Rank**	Mean %3 **Rank**
Routine I must do before getting into bed	1.3 25.8 **6**	1.1 29.0 **1**	0.8 20.0 **3**	1.2 32.5 **1**
Check doors or windows are shut/locked or taps are turned off more than once	1.0 19.4 **10**	0.8 6.5 **8**	1.3 17.5 **5**	1.1 17.5 **5**
Arrange objects to be in straight lines	1.2 19.4 **10**	0.8 3.2 **10**	0.5 7.5 **11**	0.5 5.0 **14**
Prefer objects to be symmetrical/ arranged in patterns	1.6 35.5 **3**	0.8 3.2 **10**	0.9 10.0 **9**	0.7 7.5 **11**
Need to keep certain toys/ belongings in special places	1.9 54.8 **1**	1.1 16.1 **5**	1.1 25.0 **1**	1.3 22.5 **3**
Wash hands/body repeatedly	1.1 12.9 **13**	1.0 0.0 **15**	0.8 7.5 **11**	1.4 17.5 **5**
Keep bedroom very tidy – a fixed place for everything	1.2 25.8 **6**	0.7 12.9 **6**	1.2 20.0 **3**	1.2 25.0 **2**
Need to do things again and again before they feel 'right'	1.3 12.9 **13**	1.1 6.5 **8**	0.6 5.0 **14**	1.0 10.0 **8**
Count over and over/repeat numbers in mind	1.1 22.6 **8**	1.0 3.2 **10**	0.4 7.5 **11**	0.7 7.5 **11**
Keep things I don't really need	1.8 29.0 **5**	1.8 25.8 **2**	1.4 17.5 **5**	1.7 15.0 **7**
Superstitious games (e.g. don't walk under ladder/step on crack)	0.9 19.4 **10**	0.3 3.2 **10**	0.9 22.5 **2**	1.0 22.5 **3**
Lucky number/word to keep away bad luck	1.3 22.6 **8**	1.1 22.6 **3**	0.1 0.0 **15**	0.6 10.0 **8**
Thoughts that go over and over in your mind even though you don't want them to	1.8 38.7 **2**	1.5 19.4 **4**	1.0 12.5 **7**	1.3 10.0 **8**
Count up to a special number/need to do something a specific number of times	0.7 6.5 **15**	0.5 3.2 **10**	0.7 10.0 **9**	0.5 5.0 **14**
A special way of doing something you cannot change, even if you wanted to	1.4 32.3 **4**	1.0 12.9 **6**	0.6 12.5 **7**	1.0 7.5 **11**

Interestingly, while a preference for symmetry and straight lines appear to be relatively similar concerns, these tendencies are ranked very differently at their peak. Indeed, while symmetry receives a ranking of 3 at 7-8 years, the tendency to arrange objects into straight lines is ranked at 10, suggesting the latter behaviour is performed less often at this age, despite its apparent similarity. While the need always to keep belongings in special places decreases with age, this behaviour continues to rank highly, suggesting that, while this tendency may decrease in regularity across childhood, it remains relatively common within each age group. Bedtime routines also rank highly across age groups.

Checking and washing behaviours, superstitious games, and the need to repeat an action until it feels 'right' similarly decrease in intensity between 7 and 11 years. However, the regular performance of these behaviours begins to increase again around 13 years. For example, the tendency to check steadily increases at 13 and ranks higher with age. In this way, while checking is at a peak during the early years, this behaviour becomes relatively more commonplace within the older age groups. This pattern is identical for washing rituals and superstitious game-playing. In addition, while the tendency to keep one's bedroom very tidy and have 'a place for everything' is similar across all age groups, this behaviour also ranks considerably higher between the ages of 13-16 years.

2.3.5 Intensity of childhood fear, worry, and ritualistic behaviour

As noted in the Method, mean intensity scores representing the sum of all closed-response item ratings for each scale were calculated for each age group. Fear, worry, and ritualistic behaviour intensity scores had a possible range of 0–45. Kolmogorov-Smirnov tests showed that all three intensity scores were normally distributed.

Inspection of the descriptive data in Table 2.5 suggests that the intensity with which fear, worry, and ritualistic behaviour are experienced in childhood tends to decrease with age. This is uniformly the case up to 14 years of age although, interestingly, each variable shows a slight increase in intensity between 14 and 16 years. The early decrease in intensity is most apparent between 8-10 years of age, particularly concerning the experience of fear. Higher fear, worry and ritualistic behaviour scores are reported by girls across the age range studied.

Table 2.5 Mean fear, worry, and ritualistic behaviour scores by age and gender

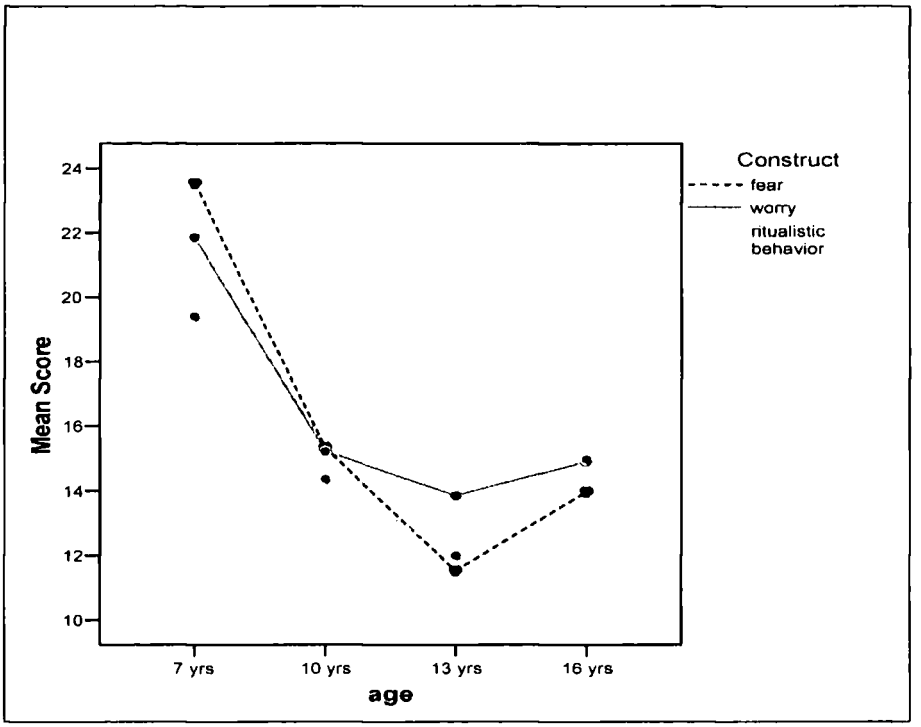
Scale	7-8 yrs Mean *s.d.*	10-11 yrs Mean *s.d.*	13-14 yrs Mean *s.d.*	15-16 yrs Mean *s.d.*
Fear				
Girl	24.78 *8.32*	19.22 *6.70*	13.90 *8.60*	17.40 *5.70*
Boy	22.31 *9.47*	11.46 *6.62*	9.15 *5.46*	10.55 *6.70*
Total	23.74 *8.76*	15.97 *7.63*	11.53 *7.50*	13.98 *7.06*
Worry				
Girl	24.78 *7.57*	17.61 *7.20*	16.35 *6.33*	18.20 *7.65*
Boy	18.92 *9.28*	12.85 *6.74*	11.35 *6.82*	11.60 *6.11*
Total	22.32 *8.69*	15.61 *7.30*	13.85 *6.97*	14.90 *7.61*
Ritualistic Behaviour				
Girl	21.28 *6.72*	15.33 *5.46*	14.60 *8.20*	18.50 *9.06*
Boy	17.54 *7.95*	13.38 *4.90*	9.40 *6.94*	11.45 *6.50*
Total	19.71 *7.38*	14.52 *5.24*	12.00 *7.95*	14.98 *8.56*

As the three scales were conceptually and methodologically related, differing only in the target variable (i.e. intensity of fear, worry, or ritualistic behaviour), a 4 (Age) x 2 (Gender) x 3 (Scale: Fear, Worry and Ritualistic Behaviour) mixed analysis of variance was conducted to examine possible group differences. There were two between-subjects factors (Age and Gender) and one within-subject factor (Scale).

Large main effects were found for Age, $F(3, 134) = 14.12$, $p < .001$, $\eta^2 = .240$, observed power = 1.000, and Gender, $F(1, 134) = 25.39$, $p < .001$, $\eta^2 = .159$, observed power = .999. Simple effects analyses suggested that the main effect of Age was exclusively caused by significantly higher intensity scores in the 7-8 age group compared to all other age groups, $p < .001$. The main Gender effect reflected higher fear, worry, and ritualistic behaviour scores for girls at all ages (see Table 2.5). The Age x Gender interaction was not significant, $F < 1$, $\eta^2 = .008$, observed power = .118.

The Scale main effect, the Gender x Scale interaction, and the Gender x Age x Scale interaction were not significant, Fs < 1, and each had a small effect size: Scale: $\eta^2 = .019$, observed power = .492; Gender x Scale: $\eta^2 = .004$, observed power = .133; Gender x Age x Scale: $\eta^2 = .025$, observed power = .430. The Age x Scale interaction was significant, F (5.69, 254.16) = 2.29, $p = .039$, $\eta^2 = .049$, observed power = .776 (Greenhouse-Geisser adjustment for violation of sphericity) and is presented below in Figure 2.1.

Figure 2.1 Developmental trends in fear, worry, and ritualistic behaviour between 7-16 years of age



To further investigate the Age x Scale interaction, a series of repeated measures analyses of variance were conducted within each age group. There was a significant effect of Scale, $F(2, 58) = 4.77$, $p < .05$, among 7-8 year olds only, which post-hoc analyses showed to be due to higher intensity scores for fear compared to ritualistic behaviour, $t(30) = 2.75$, $p = .01$, and higher intensity scores for worry compared to ritualistic behaviour, $t(30) = 2.36$, $p = .025$ (Bonferroni adjustment to alpha = .025). No effects of Scale were found in the other age groups, Fs between 0.44 – 2.52, *n.s.*

2.3.6 Relations among fear, worry, and ritualistic behaviour

Correlations among fear, worry, and ritual scores are reported in Table 2.6.

Table 2.6 Correlations among fear, worry, and ritualistic behaviour by age

Age (yrs)	Fear	Worry
Worry		
7-8	.617**	
10-11	.579**	
13-14	.578**	
15-16	.690**	
Ritualistic Behaviour		
7-8	.498**	.717**
10-11	.473**	.615**
13-14	.539**	.643**
15-16	.542**	.725**

**p<.001 (2-tailed)

From the matrix it is apparent that fear and worry are highly correlated. Perhaps most worthy of note, however, are the significant relations between fear and ritualistic behaviour, and between worry and ritualistic behaviour. It appears therefore that, regardless of age, children prone to anxiety (in the form of fear or worry) are also likely to report performing ritualistic behaviours.

As both fear and worry are highly correlated with rituals, and with one another throughout childhood and adolescence, regression analyses were constructed as follows. Data initially split according to age were collapsed and age was included, along with gender, in the first block of the analyses. Fear and worry were entered into the second and third blocks, respectively (see Table 2.7). To test specificity, the analysis was then repeated, entering worry instead to the second block, and fear to the third (see Table 2.8).

Table 2.7 Summary of hierarchical regression analyses for variables predicting ritualistic behaviour – first analyses

	Analyses 1 Variable	**B**	SE *B*	β
Step 1	Age	- 1.4	.56	- .20*
	Gender	- 4.7	1.24	- .30***
Step 2	Age	.07	.53	.01
	Gender	- 2.1	1.56	- .13
	Fear	.49	.07	.54***
Step 3	Age	.29	.46	.04
	Gender	- .70	1.01	- .04
	Fear	.17	.08	.19*
	Worry	.56	.08	.58***

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

Note. $R^2 = .14$ for Step 1 ($p<.001$); $\Delta R^2 = .22$ for Step 2 ($p<.001$); $\Delta R^2 = .17$ for Step 3 ($p<.001$).

Table 2.8 Summary of hierarchical regression analyses for variables predicting ritualistic behaviour – second analyses

	Analyses 2 Variable	**B**	SE *B*	β
Step 1	Age	- 1.4	.56	- .20*
	Gender	- 4.7	1.24	- .30***
Step 2	Age	- .00	.45	- .00
	Gender	- 1.04	1.01	- .07
	Worry	.66	.07	.69***
Step 3	Age	.29	.46	.04
	Gender	- .70	1.01	- .04
	Worry	.56	.08	.58***
	Fear	.17	.08	.19*

*$p < .005$, ***$p < .001$.

Note. $R^2 = .14$ for Step 1 ($p<.001$); $\Delta R^2 = .37$ for Step 2 ($p<.001$); $\Delta R^2 = .02$ for Step ($p<.05$).

The regression analyses show that fear and worry predict ritualistic behaviour at a greater than chance level. However, while bi-variate correlations suggested that both fear and worry relate strongly to ritualistic behaviour, the regression analyses implied that worry may be particularly relevant. Worry made a greater unique contribution when entered either alone (37%) or after fear (17%) into the analyses compared to when fear was entered alone (22%) or after worry (2%). Additional regression analyses involving the inclusion of interaction terms accounting for age and gender influences were non-significant.

Subsequent partial correlation analyses within age groups revealed further evidence of specificity once overlaps between worry and fear were controlled. Once the influence of worry was accounted for, fear no longer related to the performance of ritualistic behaviour (7-8 yrs: r = .10, *n.s.*; 10-11 yrs: r = .18, *n.s.*; 13-14 yrs, r = .27, *n.s.*; 15-16yrs, r = .084, *n.s.*). In contrast, when fear was controlled for, worry remained highly significantly correlated with ritualistic behaviour (7-8 yrs: $r = .60$, $p < .001$; 10-11yrs: $r = .48$, $p < .01$, 13-14yrs, $r = .48$, $p < .01$; 15-16yrs: $r = .58$, $p < .001$).

2.4 Discussion

The present study investigated fear, worry, and ritualistic behaviour in a non-clinical sample of children aged 7-16 years by means of a normatively framed, semi-structured interview. The first hypothesis, that the content of fear, worry, and ritualistic behaviour would be coloured by typical developmental themes throughout childhood and adolescence, was supported. Partial support was found for Hypothesis 2, in that the youngest children in the sample (aged 7-8 years) reported the greatest intensity of fear, worry, and ritualistic behaviour. However, while scores on these measures decreased with increasing age, this decline was only significant between 7 and 10 years of age. In line

with Hypothesis 3, intensity of fear, worry, and ritualistic behaviour was significantly higher in girls than boys, regardless of age. Finally, in support of Hypothesis 4, fear and worry were positively related throughout childhood, and the regular performance of ritualistic behaviour was related to fear and worry across middle childhood and adolescence (Hypotheses 5 and 6). However, the association between worry and rituals appeared stronger than that between fear and rituals.

The present study replicates and extends a number of previous findings. The nature and intensity of all three classes of behaviour was consistent with previously published reports across childhood and adolescence (e.g. Evans et al., 1997; Gullone & King, 1997; Muris et al., 2002; Ollendick et al., 1991; Silverman et al., 1995; Zohar & Bruno, 1997). For example, the current results are consistent with prior work suggesting that the content of fear and worry changes qualitatively with age (e.g. Gullone & King, 1997; Ollendick et al., 2001; Silverman et al., 1995; Vasey et al., 1994), and are in accordance with the notion that the expression of anxiety phenomena is somewhat dependent on developmental status (e.g. Marks, 1987). In line with Bauer's (1976) findings, early fears concerning imaginary phenomena, nightmares, and animals decreased substantially as development progressed. It is generally accepted that many common early fears emerge because the child is increasingly able to anticipate danger, but has not advanced to the point of fully understanding it, or being able to exert control over it (Jones & Jones, 1928). This decline in imaginary, improbable fear has therefore been attributed to cognitive and physical maturation, in that, with increased knowledge and experience, children are progressively more able to realistically evaluate and deal with potentially threatening stimuli and scenarios (Gullone & King, 1997). While this decrease in intensity generalizes to most fears, concern over injections/blood, visiting the dentist, and insects increased with age.

Previous research has similarly noted that fear relating to medical situations escalates over time (e.g. Gullone & King, 1997).

In contrast to previous fear-schedule studies, fear of insects, specifically spiders, was found to increase over development. Interestingly, past research requiring participants to list fears in an open generation task, as opposed to a closed-response task, has similarly yielded a predominance of spider-related fears during adolescence (Gullone, 1999). One possible explanation is that participants typically rate the long lists of closed-response items presented in fear schedules comparatively. Several of these items pertain to extreme danger, and no doubt evoke a strong emotional response. Older children, with their increased reasoning and cognitive abilities in particular, may therefore rate items such as insect fears with less intensity in the context of other, more dangerous items included within a closed-response questionnaire. Relying on this methodology alone could therefore give a distorted view of the true experience of childhood fear and worry. In contrast, asking children initially to self-generate anxieties in the current study probably went some way to attenuating the extent of the cueing function of the closed-response items, and possibly reduced the likelihood of comparative ratings. For example, if a fear of spiders was firstly self-generated, then the participant would presumably be more likely to rate this item similarly during the closed-response component of the interview, without considering this item in the context of any other closed-response item ratings. The present findings thus suggest that a combination of open and closed methods may produce the truest picture of anxiety throughout childhood and adolescence.

In terms of worry, the current data also replicate established developmental patterns. Past research has found that concern over peer relations and behavioural competence are most prominent during middle childhood (e.g. King, 1993; Vasey et al., 1994). This is presumably due to the increasing importance that children place on how

others perceive them, and how they appear in social interactions at this time (Ollendick & Hirshfeld-Becker, 2002). These concerns escalate during adolescence, with worry about physical appearance, personal hygiene, and meeting new people becoming comparatively more prominent, and perhaps reflecting the 'adolescent egocentrism' referred to by Elkind (1978).

Possibly related to the increase in social evaluative concerns during adolescence, and in line with the findings of Zohar and Bruno (1997), washing rituals also intensified with advancing age. Checking behaviours were similarly more prominent during this developmental epoch, perhaps reflecting the increased independence and responsibility expected of older children. Arranging and symmetry rituals substantially diminished during middle childhood. As a result of their greater understanding of the contingencies of daily life, older children may feel less compelled to simplify and impose a personalized structure on the surrounding environment (Evans et al., 1997). Reflecting this increase in behavioural flexibility, older children also report considerably less rigid problem solving, whereas younger children appear to be more likely to perseverate with familiar, and possibly less successful, strategies. This pattern of increasing behavioural control across middle childhood is complemented by an increase in cognitive control. In parallel with previous research (Zohar & Bruno, 1997), children in the current study also reported a decreasing susceptibility to intrusive, uncontrollable thoughts at this time.

These findings demonstrate how the salience of certain fears, worries and ritualistic behaviours alter as children mature, and, in line with the developmental psychopathology approach, may provide some insight into the changing manifestations of clinical anxiety and rituals across development. It has often been reported that compared to adults with the disorder, the symptoms experienced by children and adolescents with OCD have a tendency to change over time (e.g. Hanna, 1995; Rettew et al., 1992). For example,

concerns over contamination, numbers, superstitions and symmetry, as well as washing/cleaning, counting and arranging compulsions, can become less prevalent as OCD progresses (Geller et al., 2001; Sobin et al., 1999; 2000). While prior research has claimed that these changes occur in no clear sequence (e.g. Leonard et al., 1990), this developmental pattern clearly corresponds with the findings of the current study. The aforementioned clinical obsessions and compulsions were commonly reported during typical childhood and showed a similar decrease with maturation. This suggests the possibility that there are ages of vulnerability for certain manifestations of obsessive-compulsive symptomatology, and that age-specific variability in OCD presentation may be coloured by common and fluctuating typical developmental themes in anxiety and ritualistic behaviour. For a later point in time, it would therefore be interesting to analyse the long-term stability of item responses (i.e. number of concordant responses at t1 and t2).

Developmental variation in fear, worry, and rituals is presumably common because the significance of specific stimuli and situations alters across childhood and adolescence. However, with reference to anxiety, the salience of certain fears and worries appears to prevail, and these concerns continue to be commonly experienced throughout ontogeny. In the present study, while the intensity of specific fears or worries generally reduced with age, the most commonly expressed anxieties throughout the sample related to danger and physical injury. Thus, fear of being in a car accident, fire, strangers, and concern over harm to a loved one were among the most strongly endorsed items for children of all age levels. This predominance of anxiety surrounding harm and danger-related events has previously been reported in studies with children and adolescents (e.g. Gullone & King, 1997; Ollendick et al., 1991; Ollendick & King, 1994), as well as adults (Mizes & Crawford, 1986), and has been linked to our biological propensity to experience fear in response to stimuli that threaten survival (Gullone, 1999). This conclusion remains equivocal, however

(e.g. McNally, 1987), and depends on the assumption that high levels of fear or worry are actually evinced by these concerns, and that the anxiety reported does not simply reflect a negative attitude towards the thought of such events occurring (McCathie & Spence, 1991).

As noted in Chapter 1, McCathie and Spence (1991) have suggested that previous findings may have distorted our view of childhood anxiety through the cueing effect of closed-response prompted items. Specifically, they reasoned that, as the probability of encountering life-threatening, dangerous situations is relatively low, the frequency and intensity of fear commonly reported for such items should also be low. However, the current research replicated prior findings using a semi-structured format which combined open- and closed-response methodologies, reducing the likelihood that the prevalence of these concerns is merely a by-product of closed-response methodology. Fear and worry concerning harm or danger to self or loved ones was extremely prevalent regardless of the reporting format. Furthermore, previous research using a similar, semi-structured approach has also found fear and worry over low-frequency events to be ubiquitous among both non-clinical and clinical samples of children and adolescents (e.g. Gullone, 1999; Weems et al., 2000). It appears that children understand, at a cognitive level, that dangerous events are unlikely to occur, and yet this understanding does little to attenuate any associated anxiety (Silverman et al., 1995). A possible mechanism to explain this phenomenon, known as 'ex-consequentia reasoning', has been reported among clinically anxious samples (Beck & Emery, 1985). For example, patients sometimes argue that their subjective experience of anxiety is clear evidence for the danger of a specific situation. Thus, not only does realistic danger imply feeling anxious, but feeling anxious also implies realistic danger (Arntz, Rauner, & van den Hout, 1995). This tendency may extend to non-clinical childhood anxiety. The apprehension elicited at the thought of serious harm

befalling a loved one, or being trapped in a house fire, for example, may serve as some proof of the likelihood of its occurrence (e.g. 'I am anxious so there must be a realistic chance of this happening'). Obviously, if danger is not objectively determined, but instead implied on the basis of an anxious response, false alarms will remain unrecognised and anxiety will persist. This could explain the relative constancy and persistence of concerns regarding danger and harm throughout childhood, adolescence and beyond, and remains to be empirically explored.

Progressing from the content of fear, worry and ritualistic behaviour, the general intensity with which each of these constructs is experienced also appears to vary across childhood, becoming less intense as development progresses. As in previous longitudinal and cross-sectional studies (e.g. Gullone & King, 1997; Muris et al., 2000; Ollendick et al., 1996; Zohar & Bruno, 1997), fear, worry, and ritualistic behaviours were found to be particularly intense during middle childhood, decreasing most rapidly between 7 and 10 years of age, and stabilizing thereafter. With maturation, children typically become increasingly habituated to anticipatory anxiety and the surrounding environment, have more experience to discount less realistic concerns, and develop alternative, more appropriate coping strategies to deal with initially unknown stimuli and situations (Marks, 1987). Accordingly, the stimuli and situations that generate extreme fearfulness, worry, and rituality presumably decline. Interestingly, this developmental pattern also mirrors the dwindling number of obsessions and compulsions reported as OCD evolves, as well as the fewer symptoms reported by individuals with later onset of the disorder (Hanna, 1995).

Also of relevance to the current research are previous reports suggesting a trait component to anxiety (e.g. Gullone & King, 1997). For instance, although normative fears and worries are typically transient and generally decrease with maturation, individuals express stability over time in their propensity to experience anxiety. The present study

reported a constancy over 9 months between initial and follow-up reports of fear, worry, and ritual intensity scores, and further supports suggestions that individual differences in anxiety are relatively stable. While prior research has not examined the permanence of normative ritualistic behaviours over time, it is possible that rituals merge into a person's normal repertoire of behaviours as a means of coping with stressful life circumstances and conditions (Hafner, 1988). Young children reporting high levels of fear and worry and ritualistic behaviour may therefore be more likely to remain susceptible to these experiences throughout ontogeny.

While this notion is speculative, it is supported by findings relating to gender differences in anxiety. A wide range of studies, and indeed the present data, overwhelmingly suggest that elementary school girls self-report higher levels of excessive fear and worry than boys, and that this susceptibility to extreme anxiety continues into adolescence (e.g. King, 1993; Ollendick, 1983; Ollendick et al., 1991; Silverman et al., 1995). While these differences could, to some extent, reflect sex-role expectations or a response bias, clinical studies with children and adolescents similarly report that girls manifest higher levels of anxiety and anxiety disorders than boys (Craske, 1997; Muris & Merckelbach, 2001). Thus, while the experience of moderate fear and worry is normal, and even adaptive in childhood (Gullone & King, 1997; Muris et al., 1998), a continuity may exist whereby a propensity for severe fear and worry promotes an increasing vulnerability to clinical anxiety. Indeed, intense normative anxiety is similarly associated with serious distress, uncontrollability, and interference in everyday life, as well as resistance, avoidance, and maladaptive problem solving (Dugas et al., 1995; Ialongo et al., 1995; Muris et al., 1998; Ollendick & King, 1994; Ollendick et al., 1991).

In addition to providing thorough descriptive data on the development of fear, worry, and ritualistic behaviour in typical childhood, the design permitted an exploration

of interrelations between these variables throughout middle childhood and adolescence. In line with previous findings (e.g. Evans et al., 1997; Zohar & Bruno, 1997; Zohar & Felz, 2001), more anxious children engaged in more ritualistic behaviour, and this was true throughout the age range studied. From the standpoint of ritualistic behaviour as a response, the experience of intense worry was found to have greater relative influence, than the experience of intense fear, in predicting the propensity to perform ritualistic behaviour.

This is a previously unexplored finding in the empirical literature, and possibly originates from an underlying similarity between the process of worry and obsessions, as opposed to the process of fear and obsessions. While fear relates to the apprehension that arises as a response to present, realistic danger (Marks, 1987), both worry and obsessions similarly involve negative and relatively uncontrollable anticipatory thought processes (APA, 1994; Borkovec, Robinson, Pruzinsky, & Pree, 1983). Empirical research has also widely reported significant associations between measures of worry and obsessional symptoms (e.g. Freeston et al., 1994; Wells & Papageorgiou, 1998). Furthermore, it has been proposed that in non-clinical populations intense obsessions, like intrusive thoughts and worries, are both associated with problem focused and escape/avoidance strategies (Langlois, Freeston & Ladouceur, 2000). This suggests that individuals may employ similar strategies as means of coping with them (Dugas et al., 1995; Langlois et al., 2000; Szabo & Lovibond, 2002). Considering these parallels, and the specific relationship between worry and rituals in the current study, normative ritualistic behaviour may similarly represent efforts to relieve tension and anxiety (Kopp, 1989; Marks, 1987).

The ritualistic behaviours of early childhood may thus facilitate the ability to deal with anxiety and stress by providing increased feelings of self-efficacy in an environment typically perceived to be unpredictable and out of control (Mineka & Kelly, 1989;

Ollendick et al., 1997). Rituals may therefore become integrated into children's coping responses from an early age. However, while ritualistic behaviour might perhaps be an adequate response to anxiety in early life, more flexible, sophisticated strategies are required successfully to deal with the complex environmental demands of later childhood. Accordingly, ritualistic behaviour becomes a typically less frequent activity as development progresses.

Yet despite this decrease, ritualistic behaviour remains strongly tied to intense anxiety throughout childhood. As such, extreme worry may increasingly become a pre-requisite to its occurrence. For instance, only high levels of worry may create sufficient levels of stress to impair developmentally appropriate coping strategies. This may in turn imperil the child's sense of mastery and control, activating the previously successful, though increasingly maladaptive, response of ritualistic behaviour (Tallis & de Silva, 1992). This initial, though fleeting, attenuation in anxiety may convince the child of the ritual's success, increasing the likelihood that such behaviours are repeated during subsequent bouts of intense stress and anxiety (Franzblau, Kanadanian & Rettig, 1995). The cycle of anxiety and ritualistic behaviour could spiral from here on, evolving until it is no longer in the normative range of functioning.

It is important to note at this juncture, however, that while the cross-sectional design of the present study provides suggestive evidence on the relations among intense childhood fear, worry, and rituals, as well as the stability of these constructs over time, the data only allows for speculation regarding the above theoretical possibilities. Indeed, the present research was subject to several limitations that deserve some comment. While the use of a semi-structured interview, incorporating both an open- and closed-response format, is certainly a strength in terms of promoting the reliability and validity of this study, findings are limited due to the reliance on a single informant. Although children's

internalizing symptoms and problems are widely acknowledged to be more reliably reported by children themselves, as opposed to other informants (Silverman & Eisen, 1992), and the current study reported good estimates of test-retest reliability, additional information from parents would have yielded further relevant information. Furthermore, while limiting the fear, worry and ritual scales to 15 items each was expected to minimise any fatigue across tasks, the fact they were presented in a fixed order may have produced carry-over effects across scales that could possibly influence responding. The use of visual rating scales with regard to the fear and worry items could have also influenced responding, in that younger children in particular may have been attracted to the points on the scales that had faces next to them (although see Appendix 4 for evidence against this). Given the associations reported here, it would also be useful to further investigate the potential causal processes that underlie the development of relations between fear, worry and ritualistic behaviour throughout childhood and adolescence. For example, does ritualistic behaviour develop as an increasingly maladaptive response to intrusive fears and worries, or are all three phenomena underpinned by a single causal anxiety process? Only longitudinal, prospective replication with larger samples of healthy and sub-clinical participants could aim to provide direct empirical confirmation of such models.

Despite these limitations, the present study represents a first step in investigating fear, worry and ritualistic behaviour throughout typical development, and demonstrates the potential utility of taking a developmental psychopathology perspective in the study of OCD. In particular, a further understanding of the typical manifestation of these constructs has the potential to improve earlier identification of psychopathology, as well as encourage developmentally sensitive assessment and intervention. Since OCD commonly onsets by adolescence (Flament et al., 1988), and prognosis dramatically degenerates without effective, early treatment, the importance of timely recognition cannot be over-emphasised.

CHAPTER THREE: COGNITIVE APPRAISALS OF FEAR, WORRY, AND RITUALISTIC BEHAVIOUR IN CHILDHOOD

3.1 Introduction

The findings of the previous study suggested that anxiety predicts ritualistic behaviour throughout typical childhood. While early conceptualisations of OCD postulated a simplistic link between anxiety and rituals, suggesting that compulsive behaviours are employed to reduce the distress associated with intrusive anxieties (Rachman & Hodgson, 1980), more recent models of the disorder, with a strong cognitive element, have proposed an intermediate step involving the way in which meaning is given to an intrusive thought. For example, according to Salkovskis' (1985, 1999) cognitive model of OCD, obsessions represent the extreme end of a continuum of normal, unwanted intrusive cognitions. For a typical intrusive thought to turn into a clinical obsession, the individual must have faulty or dysfunctional beliefs surrounding the importance and consequence of this thought. In this way, it is the interpretation or appraisal of an intrusive thought, not merely the anxiety-provoking thought itself, which underlies the aetiology and/or maintenance of OCD symptoms, and which needs to be addressed in therapy.

Three main types of atypical cognitive appraisal have been implicated in the development of OCD and other anxiety disorders: inflated personal responsibility, thought-action fusion, and intolerance of uncertainty. Empirical findings relating to the manifestation of these appraisals in clinical populations will now be discussed in turn, followed by a review of evidence regarding the presence of similar/related constructs in the typical developmental literature. This will serve to additionally highlight the continuum between normative and pathological, as well as underscore the altering clinical significance of these phenomena at different stages of atypical and typical development.

3.1.1 Inflated responsibility in OCD

Responsibility has been defined as the belief that one has the power which is pivotal to bring about or prevent subjectively crucial negative outcomes. Outcomes may be actual, that is, having consequences in the real world, or at a moral level (Salkovskis, 1996). It is proposed that the individual appraises an intrusive thought as having serious consequences for which he or she is personally and solely accountable, leading to self-condemnation, anxiety, and guilt, which in turn provokes a motivation to engage in neutralising behaviours or thoughts (Salkovskis et al., 2000). On the basis of this formulation, inflated personal responsibility is regarded as a driving force in the mediation of obsessive-compulsive behaviours, and a necessary feature of the disorder (Salkovskis, 1985, 1999).

A number of studies with adult samples have tested the central components of Salkovskis' (1989, 1999) theory and have found strong support for a responsibility bias. Through the use of self-report methodologies, responsibility has been shown to be elevated in OCD patients compared to normal controls and other patient groups (Arntz, Voncken & Goosen, 2007, Bouvard, Harvard, Ladouceur & Cottraux, 1997; Cartwright-Hatton & Wells, 1997; Freeston, Ladouceur, Gagnon & Thibodeau, 1993; Salkovskis et al., 2000; Steketee, Frost & Cohen, 1998), particularly for low risk, ambiguous situations (Foa, Amir, Bogert, Molnar, & Przeworski, 2001; Foa, Sacks, Tolin, Prezworski & Amir, 2002). Salkovskis et al. (2000) have also demonstrated specificity of responsibility cognitions in OCD by comparing patients with the disorder to patients with another anxiety disorder and non-anxious controls.

Experimental studies have also provided evidence to support a causal role for responsibility beliefs. Lopatka & Rachman (1995) found that decreasing perceived responsibility in obsessional patients (mainly checkers) was followed by decreased discomfort and a decline in the urge to carry out compulsive checking. Shafran (1997)

extended these findings to obsessional patients with a range of symptoms. Furthermore, cognitive treatments targeting inflated responsibility, without exposure or response prevention, can lead to reductions in OCD symptomatology (Ladouceur, Leger, Rheaume & Dube, 1996).

It is widely held in the empirical literature that clinical obsessions have their origins in the unwanted intrusive thoughts commonly experienced within the general population (Rachman & Hodgson, 1980; Salkovskis, 1985), with the inherent implication that the study of normal obsessions and compulsions can shed light on the mechanisms of OCD (Taylor, 2002). However, studies examining responsibility appraisals in analogue samples have yielded mixed results. While some have reported significant correlations between inflated responsibility and self-reported OCD symptoms (Rheaume, Freeston, Dugas, Letarte & Ladouceur, 1995), as well as increased distress and checking behaviours following experimental manipulations to increase responsibility (Ladouceur et al., 1995), others have found no such relationship (Gwilliam, Wells & Cartwright-Hatton, 2004; Myers & Wells, 2005; Rachman, Thordarson & Woody, 1995). Although these inconsistencies partially confirm Salkovskis' (1985) assertion that inflated responsibility cognitions are unique to OCD, research investigating this construct in young people with the disorder has produced similarly equivocal results, somewhat questioning the central role of responsibility appraisals in OCD during childhood and adolescence.

In support of Salkovskis' (1999) theory, Libby, Reynolds, Derisley and Clark (2004) found that children and adolescents with OCD self-report higher levels of responsibility than young people with other anxiety disorders and typically developing children, and that inflated responsibility is an independent predictor of obsessive-compulsive symptomatology. Research from Barrett and Healy (2003), however, provided only limited support for the Salkovskis' model, in that children with OCD aged 7-13 years

reported significantly higher responsibility ratings than a non-clinical comparison group, but not compared to an anxious comparison group. Evidence of non-specificity in this study was particularly remarkable given the potentially biased idiographic methodology used to assess the hypotheses. Responsibility was assessed via a sentence stem, whereby the OCD group received a highly personally salient, individualised version relating to their most prominent concern and associated ritual, while the anxious and non-clinical groups received a standardised typical OCD threat (e.g. 'If I think I have germs on my hands and don't wash them over and over then I will get really sick'). As the stimuli the OCD group received were individually tailored, and thus presumably more relevant for each participant, it would be expected that these inconsistencies in methodology alone would promote higher responsibility ratings compared to the anxious comparison group, regardless of purported specificity. The authors suggest that the age of the participants may have contributed to the failure to find the expected results, in that a mean participation age of 9-10 years may have meant that children lacked the cognitive sophistication to make/and or articulate the appraisals central to the cognitive model.

Further research from Barrett and Healy-Farrell (2003) similarly failed to confirm the importance of responsibility in OCD during childhood and adolescence. This study involved experimentally manipulating levels of responsibility (i.e. low, moderate and high) to test the hypothesis that recognising a greater responsibility for harm would be associated with increased perceptions of harm and severity, avoidance, and ritualistic behaviours. Although an association with perceived probability and severity of harm was confirmed, this was only the case in the low and moderate responsibility conditions, and responsibility did not relate to avoidance behaviours or ritualising at any level. Interestingly, there were no differences in the results obtained between children (aged 7-11 years) and adolescents (aged 12-17 years), suggesting that age of participants may not be critical in considering

why the Barrett and Healy (2003) study failed to find the expected support for the cognitive theory. This led the authors to suggest that inflated responsibility is neither critical, nor unique, to the presentation of OCD in childhood.

3.1.2 Overestimating the importance of thoughts in OCD: Thought-action fusion

It has been proposed that patients with OCD experience thought-action fusion (TAF), in which intrusive thoughts are interpreted to have special significance (Rachman, 1993, 1997, 1998; Shafran, Thordarson & Rachman, 1996). According to Shafran et al., there are two components to TAF. The first component is known as a likelihood or probability bias, and implies that just thinking of a particular unpleasant situation will increase the likelihood of such an event occurring to oneself (TAF Likelihood-Self) or others (TAF Likelihood-Other). The second component involves the notion that having immoral thoughts (e.g. of a sexual or violent nature) is equivalent to acting immorally, and is referred to as a morality bias (TAF Moral). TAF is believed to be especially relevant for understanding the aetiology of obsessive-compulsive symptoms: believing that thoughts of a negative event increase the probability of its occurrence, and questioning one's morality for having such harmful thoughts, is suggested to lead to distress, thought suppression (Rachman, 1998b) and neutralising behaviours in an attempt to prevent any negative consequences (Amir, Freshman, Ramsey, Neary & Brigidi, 2001).

There is a variety of empirical evidence to support the relevance of TAF in OCD (e.g. Emmelkamp & Aardema, 1999; Rachman, Thordarson, Shafran & Woody, 1995; Shafran et al., 1996). In adult samples, a concern over the likelihood of harm to others due to one's negative thoughts appears to be particularly important in discriminating patients with OCD from non-clinical individuals, with significant differences more consistently

reported for Likelihood-Other TAF than for Likelihood-Self or Moral (Abramowitz, Whiteside, Lynam & Kalsy, 2003; Ferrier & Brewin, 2005; Rassin et al., 2001; Shafran et al., 1996). Shafran et al. (1996) attribute these findings to the unique lack of a fundamental, rational bias underlying Likelihood-Other TAF, resulting in an exclusive relation with obsessional thinking. For example, while it is reasonable in some circumstances to believe that one's thoughts can influence one's own actions (e.g. 'If I just think of moving my arm, then my arm will move'), it is less plausible to believe that one's thoughts can influence another's actions (e.g. 'If I just think of another individual moving his/her arm, then his/her arm will move').

The specificity of the TAF bias to OCD has been questioned, however. A number of studies have found that whereas OCD patients report higher levels of TAF than normal controls, they report similar TAF levels to patients with other anxiety disorders (Abramowitz et al., 2003; Barrett & Healy, 2003; Rassin, Merckelbach, Muris & Schmidt, 2001; Rassin, Diepstraten, Merckelbach & Muris, 2000). While these results suggest that TAF is a pervasive bias that may occur in a variety of anxiety disorders, analyses controlling for depression and/or trait anxiety have suggested that the ramifications of TAF are comparatively more relevant in OCD (Muris, Meesters, Rassin, Merckelbach & Campbell, 2001; Tolin, Worhunsky & Maltby, 2006). This may be the case during childhood in particular, where a specific relationship between TAF Likelihood-other and OCD presentation, as opposed to other anxiety diagnoses, has been reported (Libby et al., 2004). Analogue research with adult samples has also revealed that TAF is not only easily evoked and aversive, but also drives thought suppression (Rassin, Muris, Schmidt & Merckelbach, 2000), an urge to neutralise (van den Hout, Kindt, Weiland & Peters, 2002), and predicts obsessional symptoms (Rassin et al., 2000) in non-clinical individuals, suggesting the possibility of an antecedent role.

3.1.3 Intolerance of uncertainty

It has long been reported that people with OCD can have difficulty making decisions (Beech & Liddell, 1974; Guidano & Liotti, 1983) and commonly exhibit pathological doubt (Reed, 1985), leading to the proposition that intolerance of uncertainty (IOU) is a central concept in OCD (Carr, 1974; Steketee, Frost & Cohen, 1998). IOU has been defined as the tendency to have beliefs about the necessity of being certain, about the capacity to cope with unpredictable change, and about adequate functioning in situations that are inherently ambiguous (OCCWG, 2001; Sookman, Pinard & Beauchemin, 1994). Considering that everyday life necessarily involves uncertainty, a need for certainty is expected to originate from heightened danger expectancies, resulting in a strong need to control and predict events in an attempt to guarantee safety, as well as reduce any resulting anxiety, discomfort and doubt (Beech & Liddell, 1974; Guidano & Liotti, 1983; Makhlouf-Norris & Norris, 1972). As OCD patients commonly view rituals and avoidance as their only viable coping strategy (Steketee, Frost & Cohen, 1998), compulsive behaviours typically manifest to achieve this aim.

Evidence to support the role of IOU in OCD derives from research showing that individuals with the disorder, compared to controls, are more cautious, take longer to categorise objects, request information to be repeated more frequently, and doubt decision-making choices (Frost, Lahart, Dugas & Sher, 1988; Steketee, Frost, Rheaume & Willhelm, 1998). Furthermore, a need for certainty and obsessive-compulsive symptomatology are apparently closely linked (Steketee, Frost & Cohen, 1998; van den Hout & Kindt, 2004). For example, in a non-clinical sample of adults, van den Hout and Kindt (2004) found that encouraging participants repeatedly to check whether a gas tap had been left on in a computer simulation led to OCD-like cognitions such as memory distrust and the sense that one has acted responsibly.

As with the TAF construct, however, the ability of the IOU construct to differentiate OCD from other anxiety disorders has been questioned (e.g. Foa & Kozak, 1986; Salkovskis & Forrester, 2002). This derives, perhaps, from the strong evidence base supporting a relationship between IOU and symptoms of Generalised Anxiety Disorder (GAD) and worry (Freeston, Rheaume, Letarte, Dugas & Ladouceur, 1994; Dugas, Freeston & Ladouceur, 1997; Ladouceur, Gosselin & Dugas, 2000), as well as studies finding equivalent levels of IOU in OCD patients and anxious controls (OCCWG, 2005; Taylor et al., 2002). An important issue to consider when interpreting these results, however, is the fact that studies investigating IOU in OCD have tended to use broad measures, including questionnaires that were originally constructed to examine IOU within the context of GAD (e.g. Tolin, Abramowitz, Brigidi & Foa, 2003). While the IOU witnessed in GAD is likely to reflect the general, divergent nature of worry in the disorder, resulting in an intolerance of any form of ambiguity, the IOU experienced in OCD is likely to be less diffuse, instead relating specifically to the patient's idiosyncratic concerns (van den Hout & Kindt, 2004). Thus, the equivalent scores obtained by OCD and GAD patients on general uncertainty measures may reflect a stable, shared trait underlying all anxiety disorders (Krohne, 1993), whereas extreme, concern-specific IOU may be more characteristic of, and unique to, OCD. This observation has led Freeston (personal communication, 2006) to distinguish between Convergent, Intermediate and Divergent IOU, with Convergent referring to IOU regarding circumscribed anxieties, Intermediate referring to anxieties within the same theme, but less specific (e.g. contamination), and the latter relating to a more diffuse range of anxieties.

3.1.4 The relative contribution of responsibility, TAF, and IOU to OCD presentation

Perhaps unsurprisingly, a considerable amount of overlap has been reported between Responsibility, TAF and IOU (e.g. Freeston, Rheaume, & Ladouceur, 1996; Steketee, Frost & Cohen, 1998). Interestingly, however, the degree of unique specificity that each dysfunctional belief contributes to obsessive-compulsive symptomatology has not always been consistent across studies examining the relative importance of each cognitive domain.

Along with a variety of other variables, Libby et al. (2004) assessed Responsibility and TAF in relation to OCD, reporting that, in a mixed sample of typically developing children and children with anxiety disorders (including OCD), inflated responsibility is the only significant predictor of symptomatology. While little research has examined the applicability of the cognitive model to children with OCD, this is somewhat at odds with previous findings that have failed to confirm the importance of responsibility in the disorder in childhood (Barrett & Healy, 2003; Barrett & Healy-Farrell, 2003). Furthermore, a diagnostically diverse sample, and the use of general as opposed to idiosyncratic measures, reduce the sensitivity of Libby et al.'s study, and may obscure the role of concern-specific responsibility in childhood OCD, as opposed to general feelings of inflated responsibility in other anxiety problems.

In adult OCD samples, the centrality of the Responsibility construct has been also been called into question. While some report a specific association between Responsibility, TAF and OCD with no specific role for IOU (OCCWG, 2001, 2005; Taylor et al., 2002), others report a specific link between TAF, IOU and OCD, with no specific role for Responsibility (Tolin et al., 2003; Tolin, Worhunsky, & Maltby, 2006). Research with analogue samples has tended to support the latter finding. Rachman, Thordarson, Shafran & Woody (1995) found that, when comparing the relative contribution of Responsibility

and TAF, only TAF correlated with obsessive-compulsive symptomatology. Furthermore, Steketee, Frost, & Cohen (1998) examined the relative contribution of a number of belief domains thought to be relevant to OCD presentation, including Responsibility and IOU, and report that only IOU predicts OCD beyond mood and worry. These discrepancies are difficult to reconcile, and perhaps reside in differing methodological approaches, differing patterns of symptomatology and/or comorbidity issues.

Notwithstanding these empirical inconsistencies, treatment of OCD is commonly based on the cognitive model (Salkovskis, 1989, 1999). Indeed, cognitive behavioural therapy (CBT) is the only psychological treatment currently recognised to be effective in the treatment of both adults and children with OCD (Turner, 2006), despite the fact that there is only limited direct evidence to suggest that the dysfunctional cognitions associated with OCD in adults are similarly present in young people with the disorder. Study of this area in childhood to date has also primarily involved an exploration of the severity of cognitive distortion in young people with OCD, with little attention given to the nature or development of the appraisal process. As such, researchers have typically focussed on examining variations from the norm, without understanding the norm itself.

In line with a developmental psychopathology perspective, however, and the cognitive model of OCD (Salkovskis, 1989, 1999), the cognitive errors identified in clinical samples are likely to show continuities with normal appraisal patterns. As such, information concerning the appraisal process in typical childhood may provide valuable insight into the mechanisms influencing anxiety and ritualistic behaviour at different ages, as well as the cognitive developmental factors important to the aetiology and maintenance of OCD. While relations between biased cognitive appraisals and obsessive-compulsive symptomatology remain to be specifically explored in typical childhood, the developmental literature has devoted some empirical attention to the origins and

potentially changing prominence of inflated responsibility, TAF/magical thinking and need for certainty/desire for control, throughout ontogeny.

3.1.5 Inflated responsibility in typical childhood

An important aspect of normal cognitive development involves the child gradually dissociating the external world from his/her own activity (Piaget, 1955). Prior to this differentiation, it has been argued that there is a period of 'omnipotence' during which infants feel that they not only control themselves, but also the world (Hoffman, 1982). This perceived omnipotence, together with cognitive limitations, might be expected to encourage feelings of misplaced culpability, leading infants to typically view outcomes as a consequence of their own actions. For example, the earliest instances of responsibility can be witnessed at the end of the first year, and are often based on the simple contiguity of events, regardless of personal causation (Heider, 1958). Zahn-Waxler et al. (1979) have usefully illustrated responsibility at this level, providing examples of children aged 15-20 months, who, after encountering their mother looking sad or sobbing for no apparent reason, would look sad themselves, ask if it was their fault, and commonly express reparative (e.g.: "I sorry, did I hurt you Mommy?") and self-punitive behaviours (e.g. hit themselves), both of which may be symbolic substitutes for an irresolvable negative situation. It appears, therefore, that very young children can have difficulty distinguishing between the harm they cause and harm they observe, as well as an unrealistic idea of their ability to cause or be effective in ameliorating another's difficulties (Kochanska, 1991, 1993; Zahn-Waxler & Kochanska, 1990).

As cognitive reasoning abilities improve and children develop a more lucid sense of identity (Hoffman, 1982), the attribution of blame exclusively to self typically becomes less likely, and consideration of the potential role of outside factors increases (Fishbein &

Ajzen, 1973). However, such complex attributional appraisals of blame are not consistently made until well into middle childhood, and the tendency non-discriminately to accept blame for negative outcomes persists for some time. For example, until the age of 8, attributions of blame tend to be determined on the basis of outcome severity, as opposed to actual controllability or intentionality (Harris, 1989; Tangney, 1998). Thus, even accidental wrongdoing elicits guilt in 6- to 7-year-olds, whereas older children tend to report feeling responsible for controllable transgressions and situations (Graham, Doubleday & Guarino, 1984; Hasan & Power, 2004). This is perhaps the result of an increased ability to logically judge intent and accountability in blame assessments (Darby & Schlenker, 1982), meaning that the range of scenarios that can provoke intense feelings of personal culpability and guilt typically decreases (Williams & Bybee, 1994). As such, when older children do accept blame, the motivation appears to be rational and may promote effective problem solving and prosocial behaviours, suggesting an adaptive function (Ferguson & Stegge, 1995; Hasan & Power, 2004).

It appears, therefore, that the rudimentary sense of responsibility witnessed during early childhood bears closest resemblance to the pathological responsibility commonly witnessed in OCD, with both manifestations involving considerable confusion over personal causality and a willingness to accept blame. This similarity perhaps resides in the fact that, in contrast to older children and adults, both young children and individuals with OCD tend to assume personal blame based on an irrationally perceived notion of influence, as opposed to actual influence (Hoffman, 1982; Shafran, 1997). As perceptions of influence typically become increasingly realistic with maturity, the acceptance of sole culpability in ambiguous, low-responsibility situations may therefore become increasingly associated with pathology as development progresses.

There is some evidence to support this suggestion. For example, anxiety is thought to promote a focus on the self in later childhood, as well as increased concern about one's own imperfections and living up to one's standards (Kochanska, 1993). Temperamentally anxious children therefore tend to experience more intense affective discomfort over even trivial transgressions (Seligman et al., 1984), and continue to be more prone to misplaced responsibility and guilt as they mature (Kochanska, 1993; Kagan, 1998). It has been suggested that anxious individuals may persist with attributional patterns of self-blame in an attempt to extend the comforting early view of the self as being in control (Ferguson & Stegge, 1998). This false sense of control would negate the unpredictability of a severely negative event and create an illusion of safety, as assuming sole responsibility for the occurrence of a negative event would foster the perception that an unpleasant situation is predictable and can be averted in the future (Weiner, 1986). Self-blame and guilt are increasingly maladaptive when used as a defence against one's inability to control unwanted events (Lindsay-Hartz et al., 1995), and therefore such attributional tendencies presumably become progressively more aligned with the misplaced perception of personal influence and responsibility witnessed in OCD.

3.1.6 Thought-action fusion and magical thinking in childhood

The ability to distinguish between actual and mental events is a major developmental task during typical childhood, the blurring of which is commonly witnessed as magical thinking (Bolton, 1996). In early childhood, as with misplaced responsibility, such confusion between thoughts and the physical world is thought to reside in faulty beliefs regarding personal efficacy. Along with self-blaming tendencies, this inclination is assumed to result in flawed reasoning concerning the causal links between thoughts or desires and actions.

This includes the perception that reality can be modified by a thought, or that a mental operation, such as counting to 10, can exert an influence on a desired object (Piaget, 1929). Rothbaum and Weisz (1989, p. 20) describe a 'magical stage' between 2 and 6 years of age, during which "the fate of external objects and events is determined by various thoughts (e.g. wishes) and actions (e.g. not stepping on cracks in the pavement) that in reality, have no influence over the outcome." For example, it has been found that 3-6 year olds typically tend to believe that imagination reflects or creates reality, in that, after imagining an object inside an empty box, these children tended to claim, or act as though, the object would actually appear inside (Harris, Brown, Marriot, Whittall & Harmer, 1991; Woolley & Wellman, 1993). Children within this age range have also been reported to believe that they can influence others by wishing (Vikan & Clausen, 1993). Such faulty attitudes to mental–physical causality obviously bear a strong resemblance to the TAF bias in OCD, which as previously outlined, includes a similar perception that one is able to influence real world events through thought alone.

As development proceeds, children increasingly understand that beliefs may be independent of reality (Perner, 1991), and related changes with respect to imagination and fantasy presumably occur alongside this. In this way, children may progressively understand that just as beliefs are not necessarily a direct reflection of current reality, neither is reality directly influenced by fantasy (Harris et al., 1991). Thus, children increasingly acknowledge that any effect of one's mental state on the physical world is mediated by behaviour, and as late childhood draws near, it is generally understood that direct mind–world causality is not an effective way of altering the physical world (Piaget, 1929; Rosengren & Hickling, 2000). Interestingly, however, while this understanding is rapidly apparent in the case of ordinary, everyday objects and situations, such clarity remains less evident in emotionally charged situations, or where supernatural entities are

concerned (Harris et al., 1991; Lillard, 1994). For example, confusion is likely to prevail when potential outcomes or events are perceived as frightening (Samuels & Taylor, 1994), and the number of teenagers claiming to believe in imaginary, fantastical creatures is surprisingly similar to the percentages reported for children (Frazier, 1989). This may be attributed to the fact that, while children are able to validate the laws of permanence with ordinary physical objects, in turn disproving any magical assumptions, such validation is impossible in the case of supernatural creatures or rarely occurring negative events. It has also been proposed that when considering the likelihood of danger, as opposed to rationally deducing risk, children have a tendency to use their emotions as a cue to reality (Harris et al., 1991). This raises the possibility that certain emotionally charged ideas are not subjected to rigorous reality testing, in that something perceived as threatening may be treated as a more serious possibility than something which is neutral. As such, when highly negative emotions are evoked, young people may be tempted to conclude that such emotional cues could only be precipitated by realistic threat, and the threshold for treating the occurrence of an event as plausible may be lowered (Harris, 1989).

Thus, while magical thinking is typically most prevalent during early childhood, when a negative emotional context is created, older individuals may also have a propensity to entertain such beliefs (Woolley & Phelps, 1994). Presumably, however, if the emotional salience of a phenomenon is less marked, magical perception cannot compete with older children's heightened rational understanding, and thus simply disappears from children's minds. It may be, therefore, that magical beliefs co-exist with more rational methods as development progresses, and that styles of thinking vary as a function of situational and individual differences (Cottrell, Winer & Smith, 1996). As magical explanations are increasingly disproved over development, becoming less and less entrenched, anxiety may

have to be especially intense to provoke phenomenalistic perceptions or explanations (Subbotsky, 2000) in later childhood.

While little research of this ilk has been conducted with older children and adolescents, there is extensive evidence that psychological stress undermines an individual's sense of control (Lazarus & Folkman, 1984), often leading to increased efforts to regain such a sense (Friedland, Keinen & Regev, 1992). Thus, it could be expected that anxiety provokes magical ways of thinking in an aim to make the world more meaningful, predictable, and controllable (Keinen, 1994). In line with this reasoning, it has been found that even adults show behaviours compatible with magical thinking if they are faced with threat, or when put in a context where disregarding the possibility of magical causality involves a potentially high cost (Rozin, Markwith & Ross, 1990; Rozin, Millman & Nemeroff, 1986; Woolley, 1997). These sorts of situations include illness (Taylor, 1983), stress (Keinen, 1994) and death (Persinger & Makarec, 1990), all of which are highly salient circumstances where a perception of control is otherwise lacking (Langer, 1975). As magical beliefs represent causal connections, albeit of an extraordinary nature, this style of thinking may provide the anxious individual with an illusion of control in the absence of real control (Bolton, Dearsley, Madronal-Luque & Baron-Cohen, 2002). Thus, akin to the presence of misplaced responsibility in later childhood, magical thinking may similarly represent a coping strategy intended to maintain control, constituting a resource for coping with high anxiety, and becoming increasingly aligned with obsessive-compulsive symptomatology as development progresses.

3.1.7 Intolerance of uncertainty and desire for control in childhood

A desire to control and predict outcomes may be one of the strongest, and most basic, human motivations (Bandura, 1977). Such control expectancies are most generalised, and

most apparent, during early typical childhood, when uncertainty is at a premium and the drive to attain competence and influence the environment is most powerful (Kagan, Kearsley & Zelazo, 1975). For example, the reaction of 1-year-olds to an arousing event appears to be a function of their control over the event. When infants learn that they have behavioural control over the movement of a novel overhead mobile, positive affect increases (Watson, 1979). Thus, when the occurrence of a new or strange event clearly depends on the young child performing an action, it may be more comfortable for the infant to assimilate the event to the action, thus reducing its threat (Gunnar-Vongnechten, 1978). Conversely, perceived lack of control, and the uncertainty that typically results, leads to fear, wariness (Gunnar, 1980), and an avoidance of novelty (Gunnar-Vongnechten, 1978). It seems, therefore that early experience with control, perhaps through instilling a sense of mastery, often has beneficial effects in reducing the impact of unknown situations (Mineka & Kelly, 1989).

While young children find uncertainty intimidating, and react by reducing the environment to a simplistic, controllable level so as not to become overwhelmed, this tendency recedes over development as familiarity with the environment increases (Piaget, 1955). As late childhood approaches, the gap between new and known continues to lessen, and thus novelty, instead of constituting a threat, is embraced and begins to be pursued for its own sake (Piaget, 1955; Weisz, 1986). Moreover, by early adolescence, young people typically become comfortable with, and accepting of, the notion that certain outcomes are personally non-contingent, uncontrollable, and can occur completely randomly (Piaget & Inhelder, 1975; Weisz, 1986).

It seems that the adaptive need for certainty and control common in early childhood, once again, bears close similarity to the manifestation of these constructs in OCD. However, while assuming control during early childhood corresponds with

decreased personal distress (Weiner, Kun & Weiner, 1980), in OCD, which typically onsets during pre-adolescence in youth (Flament et al., 1988), a false perception of control provokes psychological distress and symptom exacerbation (Salkovskis et al., 2000). As with misplaced responsibility and magical thinking, therefore, it may be that, beyond a developmentally appropriate point, a strong intolerance of uncertainty, and the need for control that results, becomes increasingly aligned with psychopathology. While there is no research examining the above proposition during late childhood and adolescence, there is evidence to suggest that, compared to their less anxious counterparts, highly anxious adults tend to view a wider range of situations as threatening or dangerous (Spielberger, 1972). This commonly leads such individuals to feel less capable of coping with uncertainty, and promotes feelings of uncontrollability and further anxiety (Archer, 1979).

Keinen (1994) suggest that control is regained in anxious individuals by adopting a causal view of events, which makes the environment less uncertain, better structured and more understandable, in turn alleviating anxiety. The implication, however, is that high anxiety, coupled with a low tolerance of uncertainty, may initiate a motivation to perceive cause-effect relations where, in fact, there might be none. This could lead to the perception that uncontrollable events are actually controllable and the adoption of inappropriate, problem-focused coping strategies (e.g. defining the problem, generating alternative solutions and weighing the options) (Lazarus & Folkman, 1984). With maturity, the demands of the environment and everyday life continue to increase. Thus, to be able to effectively cope with these new demands it becomes increasingly important to know when to appraise a situation as uncontrollable, to be comfortable with this realisation, and to abandon efforts directed at altering that situation, turning instead to emotion-focused processes (e.g. avoidance, selective attention and 'looking on the bright side') (Collins, Baum & Singer, 1983; Janoff-Bulman & Brickman, 1982). This would lead to a cognitive

reappraisal of the situation, changing the child's construction of the event without actually altering it. This is crucial, as active attempts at mastery are most effective when events are controllable and, when a situation is actually uncontrollable, problems may be exacerbated by persistent efforts to assert influence (Shapiro, Schwartz & Astin, 1996). Thus, high anxiety and a low tolerance for uncertainty beyond middle childhood may impede effective, age-appropriate coping strategies, increasing the risk of psychopathology (Shapiro, Schwartz & Astin, 1996), and perhaps, in some cases, promoting the expression of obsessive-compulsive symptomatology.

While intriguing, the empirical findings from the typical developmental literature have not specifically examined the constructs of Responsibility, TAF and IOU as they are recognised and defined in OCD. One exception is a study by Muris et al. (2001), who developed a TAF questionnaire for adolescents aged between 13 and 16, and found that TAF was not only associated with symptoms of OCD, but also symptoms of other anxiety disorders and depression. When controlling for levels of trait anxiety, only symptoms of OCD and GAD remained significantly related to TAF. Another study by Bolton et al. (2002) involved a self-report questionnaire for children aged between 5 and 17, demonstrating that children across the age range showed evidence of magical thinking, with no decline with age. Levels of magical thinking were significantly correlated with OCD-like cognitions and behaviours as measured by the relevant items on the Spence Children's Anxiety Scale. Both the studies of Muris et al.. and Bolton et al. relied on nomothetic self-report methodology and only limited ranges of relevant cognitive processes. No research to date has examined the relevant cognitive processes together during middle childhood and adolescence, the stage in development when OCD typically onsets (Flament et al., 1988). Thus, the relative prevalence of these variables, as well as

any interrelations between Responsibility, TAF, IOU, anxiety, and ritualistic behaviour remain undocumented at present.

The study reported in this chapter was therefore motivated by a desire to sensitively determine how inflated responsibility, TAF and IOU are involved in the appraisal of anxiety-related cognitions across middle childhood and adolescence, thus involving a much wider age range of children and young people than has previously been studied. Additionally, the study set out to address these questions using a semi-idiographic approach (i.e. tailoring questions to each participant's individual concerns), with an aim to provide further insight into why only certain anxieties are interpreted with significance and associated with distress. Research with adult OCD patients suggests that the strength of faulty cognitive interpretation depends on the personal salience of the intrusion for the individual (Rowa & Purdon, 2003). Thus, thoughts rated as highly personally distressing are also rated as more meaningful, and in turn activate more skewed interpretations. Conversely, thoughts experienced as only minimally distressing are appraised as less important, and are therefore less likely to be associated with faulty beliefs. Despite the obvious importance of salience in this regard, previous studies with either clinical or non-clinical samples of children have not taken account of this variable when assessing cognitive appraisals of anxiety-related thoughts.

By asking participants in the current study to appraise fears and worries of varying salience in terms of Responsibility, TAF and IOU, it was expected that further knowledge would be gained into the specific processes that are thought to drive the development of normal anxieties into clinical obsessions. In line with previous developmental findings, it was expected that the tendency to report high levels of misplaced Responsibility, TAF and IOU would decrease with age (Hypothesis 1). Highly salient anxieties were also expected to provoke more extreme cognitive appraisals than less salient anxieties (Hypothesis 2). As

Chapter Two suggested that high worry is more strongly associated with ritualistic behaviour than high fear, faulty cognitive appraisals were expected to show a stronger association with worries than with fears (Hypothesis 3). It was also expected that children who had generally higher levels of fear and worry would be more likely to interpret their fears/worries with a cognitive bias (Hypothesis 4), and that Responsibility, TAF and IOU would be positively related to each other, and to Ritualistic behaviour (Hypothesis 5). Finally, reflecting the cognitive model of OCD (Salkovskis, 1999), the relation between Worry and Ritualistic Behaviour previously reported in Chapter Two, is expected to be mediated by more extreme cognitive appraisals.

3.2 Method

3.2.1 Participants

Eighty typically developing children were recruited from the sample of 142 that had taken part in the previous study investigating fears, worries and ritualistic behaviours in childhood. Details of recruitment are further outlined below. The current sample was similarly divided into four age groups: 7-8 years (M = 7.5 years, SD = .47), 10-11 years (M = 10.4, SD = .45), 13-14 years (M = 13.4, SD = .47) and 15-16 years (M = 15.3, SD = .40). There were 20 children (10 girls) in each group. The proportion of pupils eligible for free school meals ranged from broadly in line with the national average, to above average. Only 3% of children were from minority ethnic groups, and all participants spoke English as a first language. Given the link between the current and previous study (in that all children participating in Study 2 had already taken part in Study 1), ethical approval for Study 2 was applied for and granted by the University of Durham Ethics Committee in parallel with Study 1.

3.2.2 Elicitation and linkage of highly salient and marginally salient fears, worries and ritualistic behaviours

Prior to participation in the current study, all participants had taken part in Study 1 and had therefore been individually interviewed with the Fears, Worries, and Ritualistic Behaviours Interview, the development and content of which is outlined in Chapter 2. To re-cap, this involved participants self-reporting fears and worries, and/or endorsing fears, worries and ritualistic behaviours from closed-response lists. Participants were also required to rate each item in terms of severity via Likert-type scales. Each Likert-type scale ranged from 0 (Not scared or Never) to 3 (Very scared or Always), thereby indicating either strength of fear or frequency of worry or ritualistic behaviour.

As previously highlighted, participants were also required to report the ritualistic/coping behaviours and strategies they employed to deal with fears and worries rated with a 1 (A little scared or Sometimes worry) or a 3 (Very scared or Always worry); these anxieties could be either self-generated or from the closed-response list (see flowchart in Appendix 1 for further details). Although the standardised comparability of fear, worry and ritualistic behaviour content was emphasised for the study reported in Chapter Two (promoting a necessary focus on the use of the closed-response data and limiting the use of self-generated responses to reliability/validity checks), in line with the cognitive model of OCD (Salkovskis, 1985), intensity of fear or worry was judged to be the appropriate basis for primary comparison in the present study. as it is the intensity or relevance of an intrusive thought that determines the extremity of cognitive appraisal, as opposed to the content of the thought. This is reflected in the heterogeneous presentation of the disorder.

Participants reporting any ritualistic behaviours were also asked whether they performed this ritual in response to any fear or worry they had, and were then asked to rate

how frightening or worrisome they found this related anxiety. Rituals and corresponding anxieties were only recorded as a linked pair if the fear or worry was rated with a 1 or a 3. Only ratings given to the fear or worry influenced whether the linked pair was recorded, as it is the intensity of the anxious experience that is thought to influence strength of biased cognitive appraisal (Rowa & Purdon, 2003). The rationale for using only items with ratings of 1 or 3 was that these scores represent pragmatic extremes of personal salience. For example, although on each rating scale 0 is the lowest value and 3 the highest, a rating of 0 is not useful in this case; if a participant claimed they had no fear or never worried about an item, then they obviously could not provide an example of how they might deal with that concern. This was also a practical decision in that data from Chapter Two indicated that the majority of children within the original sample reported a range of '1' and '3' ratings across the fear and worry items. Lastly, participants were asked to describe what they thought would occur if they didn't employ the ritualistic/coping behaviour they make use of when dealing with a reported fear or worry. The current study thereby established additional functional linkage between anxiety concerns and ritualistic behaviours.

To be selected from Study 1 for the present study, participants were required to have reported at least two marginally salient anxieties (one fear and one worry each rated with a score of '1') with associated ritualistic/coping behaviours, and at least two highly salient anxieties (one fear and one worry each rated with a score of '3') with associated ritualistic/coping behaviours (Further information on the inter-linking of Study 1 and 2 procedures can be found in Appendix 1) If a range of eligible pairs were conveyed, participants were asked to qualify which fear and worry was most upsetting, and which fear and worry was least upsetting for them. These four pairings would then be used to inform the interview for the present study (see Appendix 2), as this procedure was tailored to each individual participant on the basis of their responses to the fears, worries and

ritualistic behaviours interview in Study 1. In each age group, 70% or more of the children that had taken part in the first study met the criteria to take part in the follow-up (7-8 yrs = 74%; 10-11 = 77%; 13-14 = 70%; 15-16 = 73%). Ten girls and ten boys were then randomly recruited from the eligible sub-sample within each age group to participate in the second phase.

3.2.3 The cognitive appraisal of fears, worries and ritualistic behaviours

The current study examined the cognitive appraisals associated with two highly personally salient (rating of '3') and two marginally personally salient fears, worries and ritualistic/coping behaviours (rating of '1') by means of a semi-idiographic approach. Thus, the questions used in this study to assess levels of responsibility, thought-action fusion (likelihood-self, likelihood-other and moral) and intolerance of uncertainty (convergent and intermediate) were tailored to each participant according to the suitably linked, and differentially salient, fears, worries and associated ritualistic behaviours reported previously. Given the heterogeneity of anxieties and ritualistic behaviours, an idiographic approach provides the most accurate assessment by focusing on the specific concerns unique to each individual.

Using standardised sentence stems for each cognitive appraisal, the most salient fear, worry and corresponding ritualistic/coping behaviours, and the least salient fear, worry and corresponding ritualistic/coping behaviours, were added for each participant prior to interview. In this way, appraisals were individualised for each participant, using a standardised format. This resulted in enhanced validity, while also allowing for comparison across participants. As each interview was personal to the individual, it is unfeasible to provide an exhaustive list of fears, worries, ritualistic/coping behaviours and relevant appraisals. As such, an example concerning repeated hand-washing due to a fear

of illness through germ contamination is provided below to demonstrate how appraisals were placed into each standardised sentence stem.

Responsibility: 'If you didn't (*wash you hands over and over again*) do you think it would be all your fault and nobody else's (*if you caught germs and started to feel ill*)?'

Three forms of Thought-action fusion:

Likelihood self: 'If you just think (*about catching germs and feeling ill*), do you think it is then a lot more likely to come true in real life?'

Likelihood other: 'If you just think about a good friend (*catching germs and feeling ill*), do you think it is then a lot more likely to come true for them in real life?'

Moral: 'Do you feel that just thinking about a good friend (*catching germs and feeling ill*) is just as bad as wanting it to come true in real life?'

Two forms of Intolerance of uncertainty:

Convergent: 'Do you need to be totally sure (*you wash your hands over and over*) to be certain that (*you don't catch germs and start to feel ill*)?'

Intermediate: 'Do you need to do anything else to be totally sure (*you don't become ill*)?'

Participants were asked to rate on a four-point Likert-type scale how much they agreed with each statement read out by the interviewer, with 0 = No, not at all, 1 = Probably not, 2 = Maybe, and 3 = Yes, very much. A large card scale (approx. 1 metre x

30 cm) depicting this Likert format was used to help participants anchor their responses. Participants were required to point to, or say, the place on the scale that best described how they felt about each question.

3.2.4 Procedure

Children were seen exactly one week following their participation in the first study. Interviews took place individually within a private room in school and standardised instructions explained the aim and content of the procedure. It was emphasised that questions had no right or wrong answers, and that is was acceptable to withdraw from the study at any time. Children were also encouraged to ask questions if they did not understand, and it was stated that the researcher would try to explain more clearly if this was the case. Once assent was received (no objections were given), the interview commenced. Likert ratings were written down verbatim. The procedure is further outlined in Appendix 2.

Initially, the researcher reminded the participant of one of the four anxieties and coping behaviours previously drawn from the participant's answers during the Fears, Worries and Ritualistic Behaviours Interview (e.g. 'Can you remember when I saw you last week and we talked about the things you might fear or worry about, and what you do when you feel this way? You mentioned that you are scared of/worry about... and that when you feel this way you... to feel less scared/worry less about it. Is that right? Would it be OK if we talked about this some more?').

Following this re-cap, the Likert scale to measure strength of cognitive appraisal was introduced (e.g. 'OK, now I'd like to ask you a few questions about this fear/worry, and to help me understand how you feel about it, I wonder if you could point to this meter to let me know exactly what you think. So, for example, if you totally agree with what I

say, you would point to number 3. But, if you think what I say is not right, then you would point to 0. Do you understand? Have you got any questions?')

When it was ascertained that the participant understood the rating system, the standardised sentence stems including this particular concern were read out in a random order. The participant rated each cognitive appraisal accordingly. When each sentence stem had been rated, the participant was asked if they were happy to continue *(e.*g. 'How are you doing, was that OK? Would it be all right to talk about some other things you mentioned last time?'). The procedure was then repeated until participants had rated all of the cognitive appraisals associated with their own four eligible anxiety and coping behaviour pairings.

The whole procedure lasted around 20 minutes. Once the formal interview was over, participants were thanked for taking part and asked if they had any questions. Finally, they were asked to describe an activity they enjoyed, to end on a positive note.

3.3 Results

3.3.1 The cognitive appraisal of differentially salient fears, worries and coping behaviours in childhood

As noted in the Method, cognitive appraisal scores had a potential range from 0-3. Table 3.1 presents an overview of cognitive appraisal ratings according to Age, Salience and Form of Anxiety (i.e. fear or worry). In the following section, these ratings will be used to determine whether the Salience and/or Form of an Anxiety influences cognitive appraisal, as well as to examine evidence of developmental change in these constructs.

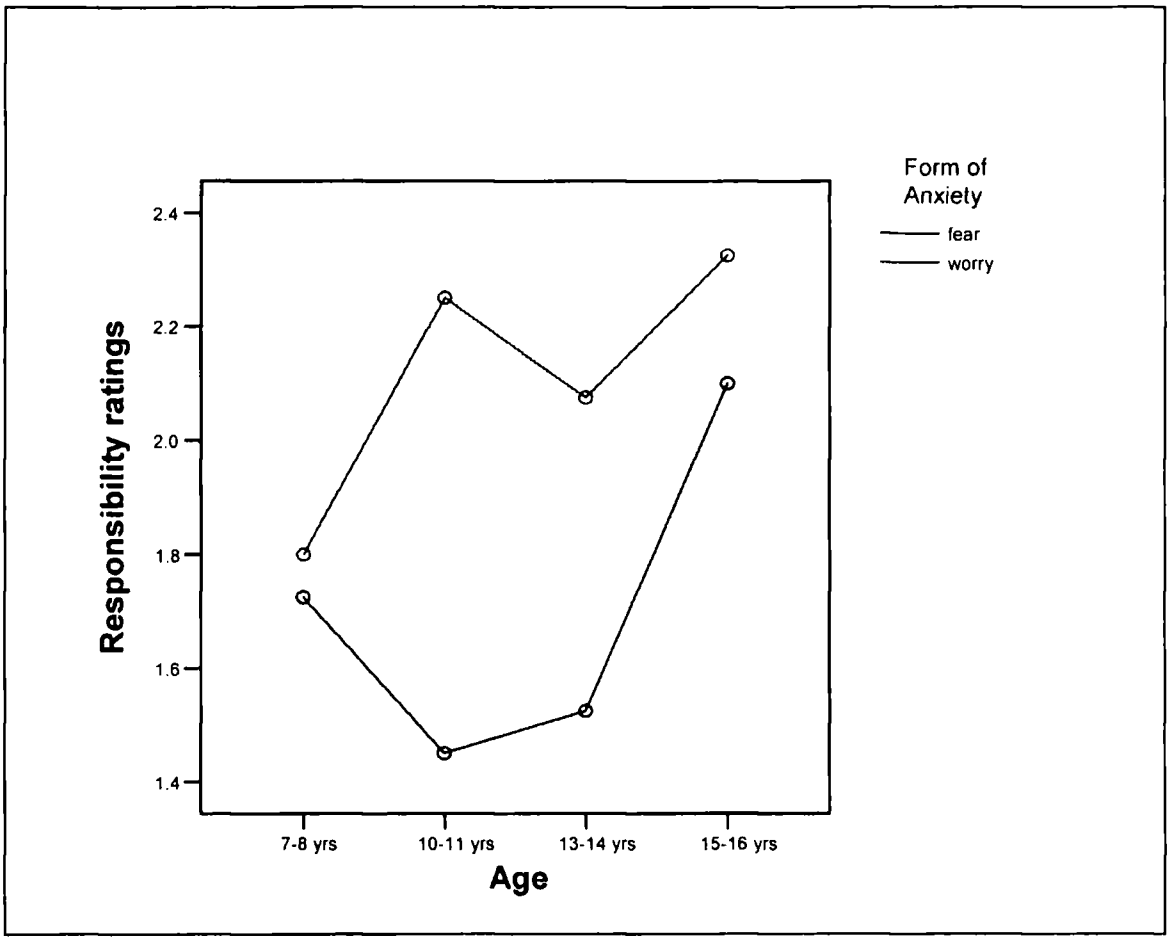
Table 3.1 Means and standard deviations of cognitive appraisal ratings (minimum = 0, maximum = 3) by age group

Cognitive appraisal	7-8 yrs		10-11 yrs		13-14 yrs		15-16 yrs	
	M	SD	*M*	SD	*M*	SD	*M*	SD
Responsibility								
Low-salience fear	1.55	1.19	1.20	1.01	1.20	0.95	1.65	0.93
High-salience fear	1.90	1.02	1.70	1.03	1.85	0.93	2.55	0.69
Low-salience worry	1.65	1.27	2.20	1.01	2.00	1.12	2.10	0.85
High-salience worry	1.95	1.19	2.30	0.86	2.15	0.81	2.55	0.76
TAF – Likelihood Self								
Low-salience fear	1.05	1.10	1.35	0.75	0 .95	0.95	1.55	0.94
High-salience fear	1.75	1.02	1.45	0.69	1.15	1.18	1.35	1.09
Low-salience worry	1.15	1.14	1.40	0.94	1.30	1.17	1.40	0.94
High-salience worry	1.45	1.15	1.55	0.83	1.35	1.09	1.70	0.86
TAF-Likelihood Other								
Low-salience fear	1.25	0.97	1.25	0.79	0.25	0.63	0.65	0.81
High-salience fear	1.60	0.94	1.50	0.69	0.40	0.82	0.90	0.91
Low-salience worry	1.55	0.83	1.30	0.92	0.30	0.73	0.70	0.86
High-salience worry	1.75	0.96	1.45	0.60	0.65	0.98	1.15	0.93
TAF – moral								
Low-salience fear	1.60	1.10	1.50	0.95	0.95	1.10	1.20	1.15
High-salience fear	1.70	1.17	1.80	1.05	1.00	0.97	1.40	0.99
Low-salience worry	1.75	1.01	1.35	0.93	0.95	1.10	1.10	0.97
High-salience worry	1.60	1.23	1.60	1.14	0.80	1.11	1.55	1.00
IOU – convergent								
Low-salience fear	1.75	1.64	2.25	0.64	1.75	1.21	1.60	1.19
High-salience fear	2.05	1.15	2.40	0.75	2.30	0.80	2.40	0.88
Low-salience worry	2.20	1.06	2.55	0.60	1.80	1.01	2.25	0.79
High-salience worry	2.55	0.89	2.65	0.49	2.30	0.98	2.80	0.52
IOU – intermediate								
Low-salience fear	1.45	1.09	1.65	0.81	0.75	1.07	0.80	0.95
High-salience fear	1.60	1.14	2.00	0.85	0.45	0.75	0.70	1.17
Low-salience worry	2.05	0.89	1.90	0.85	0.90	1.07	0.95	0.99
High-salience worry	1.75	1.06	2.35	0.87	1.05	1.19	1.35	1.31

3.3.2 Responsibility

A 4 (Age: 7–8, 10–11, 13–14 and 15–16 yrs) x 2 (Gender) x 2 (Salience: high salience – rated as 3, low salience – rated as 1) x 2 (Form of Anxiety: fear, worry) mixed ANOVA with two between-subjects factors (Age and Gender) and two within-subjects (Salience and Form of Anxiety) showed no main effect of Age, $F(3, 72) = 2.20$, $p = .10$, $\eta^2 = .084$, observed power = .536, or Gender, $F(1, 72) = 0.13$, $p > .10$, $\eta^2 = .002$, observed power = .064. Large main effects were found for Salience, $F(1, 72) = 15.22$, $p < .001$, $\eta^2 = .175$, observed power = .971, and Form of Anxiety, $F(1, 72) = 17.61$, $p < .001$, $\eta^2 = .197$, observed power = .985. Greater feelings of responsibility were attributed to salient anxieties ($M = 2.12$) than less salient anxieties ($M = 1.69$), and that worries ($M = 2.11$) were rated with more responsibility than fears ($M = 1.70$). A significant Age x Form of Anxiety interaction, $F(3, 72) = 2.74$, $p < .05$, $\eta^2 = .103$, observed power = .642 (see Figure 3.1), was investigated further with a series of repeated measures ANOVAs (Bonferroni adjustment to alpha = .01) within age group, showing that the main effect of Form of Anxiety was carried by the 10–11 yr olds, $F(1, 19) = 16.54$, $p = < .01$, $\eta^2 = .465$, observed power = .971, and 13–14 yr olds, $F(1, 19) = 9.62$, $p < .01$, $\eta^2 = .336$, observed power = .837, only. No other interactions were significant, *Fs* between .013 – 3.49, η^2 between .000 – .044.

Figure 3.1 Responsibility ratings by Age and Anxiety



3.3.3 Thought-action fusion

A 4 (Age) x 2 (Gender) x 2 (Salience: high salience– rated as 3, low salience – rated as 1) x 2 (Form of Anxiety: fear, worry) x 3 (Form of TAF: Likelihood self, Likelihood other, Moral) mixed ANOVA was conducted on TAF appraisal ratings. There were two between-subjects factors (Age and Gender) and three within-subjects factors (Salience, Anxiety and Form of TAF).

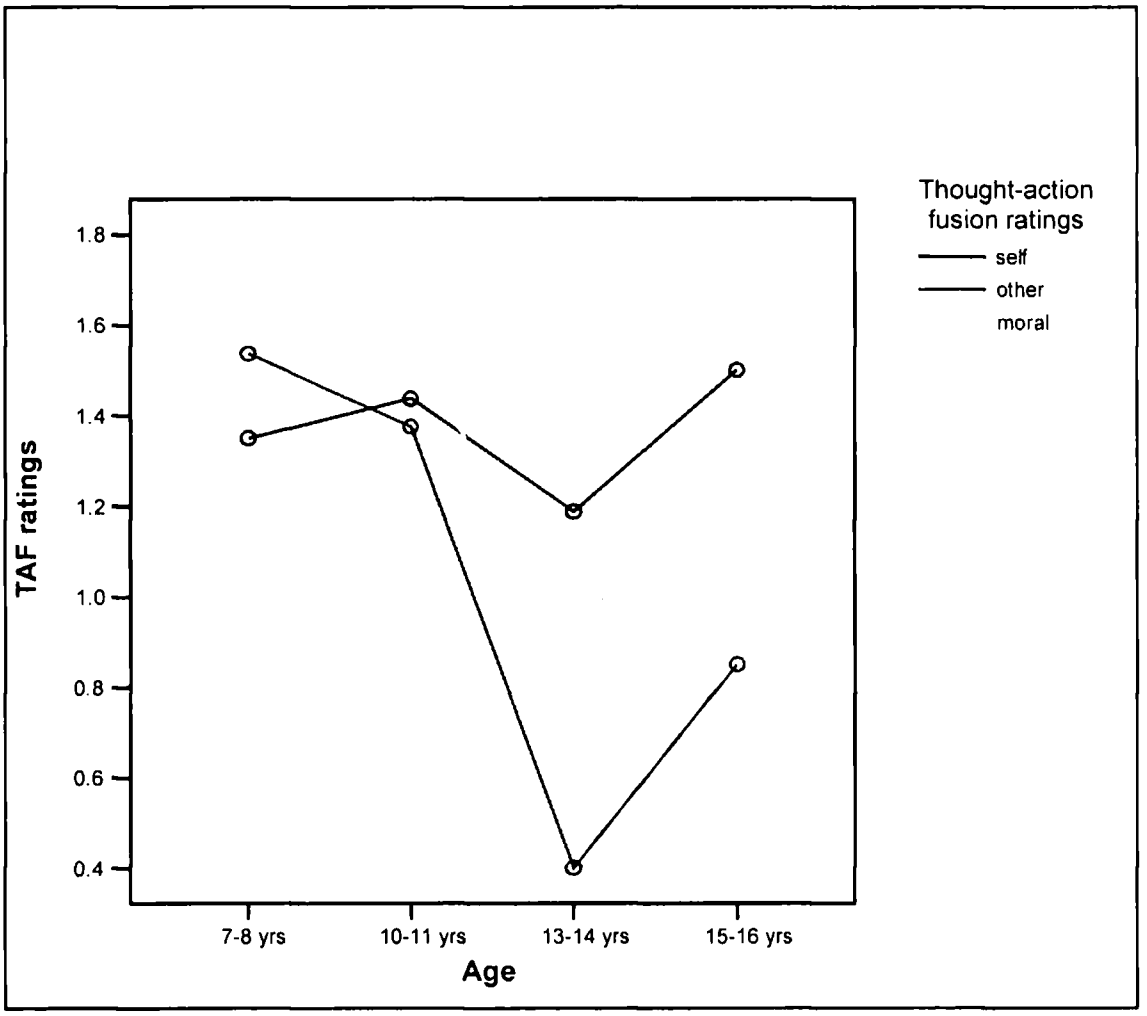
A large main effect was found for Salience, $F(1, 72) = 15.7$, $p < .001$, $\eta^2 = .179$, observed power = .974. Inspection of means revealed that salient anxieties ($M = 1.34$) were more associated with biased TAF appraisals than less salient anxieties ($M = 1.16$). Large

main effects were found for Age, $F(3, 72) = 6.22$, $p = .001$, $\eta^2 = .206$, observed power = .956, and Form of TAF, $F(1.83, 137.23) = 10.16$, $p < .001$, $\eta^2 = .124$, observed power = .978 (Greenhouse Geisser adjustment for violation of sphericity), but not Gender, $F(1, 72) = .89$, $p > .10$, $\eta^2 = .012$, observed power = .154, or Form of Anxiety, $F(1, 72) = .73$, $p > .10$, $\eta^2 = .010$, observed power = .134. Follow-up analyses using Tukey's HSD showed the main age effect to be due to 7–8 yr olds ($M = 1.52$) and 10–11 yr olds ($M = 1.46$) reporting higher levels of TAF than 13–14 yr olds ($M = .84$), $p < .01$. Within-subjects contrasts revealed the main effect of Form of TAF to be carried by higher ratings of Moral $F(1, 76) = 11.40$, $p < .01$, $\eta^2 = .130$, observed power = .915, and Likelihood-self $F(1, 76) = 20.42$, $p < .001$, $\eta^2 = .212$, observed power = .994, variants of TAF compared to Likelihood-other. A significant Age x Form of TAF interaction, $F(6, 144) = 3.92$, $p = .001$, $\eta^2 = .140$, observed power = .965 (see Figure 3.2) was further investigated with a series of repeated measures ANOVAs for each age group, with Form of TAF as the independent variable. The significant effect of Form of TAF was carried by the two older age groups only: 13–14 yr olds, $F(2, 38) = 11.38$, $p < .001$, $\eta^2 = .375$, observed power = .989; 15–16 yr olds, $F(2, 38) = 6.00$, $p < .01$, $\eta^2 = .240$, observed power = .855. Follow-up within–subjects contrasts (Bonferroni adjustment to alpha = .01) found that while only 13–14 yr olds attributed higher ratings to Likelihood-self than Moral TAF, $F(1, 19) = 11.49$, $p < .01$, $\eta^2 = .377$, observed power = .895, both age groups attributed higher ratings to Likelihood-self than Likelihood-other TAF: 13–14yrs: $F(1, 19) = 21.12$, $p < .001$, $\eta^2 = .536$, observed power = .992, 15–16 yr olds: $F(1, 19) = 15.98$, $p < .01$, $\eta^2 = .457$, observed power = 966).

A significant Gender x Form of TAF interaction, $F(2, 72) = 3.80$, $p = < .05$, $\eta^2 = .050$, observed power = .683, was explained by lower scores for girls (but not boys) in ratings of Likelihood-other compared to Likelihood-self and Moral TAF, $F(1, 36) = 22.99$,

$p < .001$, $\eta^2 = .390$, observed power = .997, for the distinction between Likelihood-other and Likelihood-self. No other interactions were significant, *F*s between .01 – 2.34, η^2 = between .000 – .085.

Figure 3.2 Thought-action fusion ratings by Age



3.3.4 Intolerance of uncertainty

A 4 (Age) x 2 (Gender) x 2 (Salience: high salience – rated as 3, low salience – rated as 1) x 2 (Anxiety: fear, worry) x 2 (Form of IOU: convergent, intermediate) was conducted on

IOU appraisal ratings. There were two between-subjects factors (Age and Gender) and three within-subjects factors (Salience, Anxiety and Form of IOU).

A large main effect was found for Form of Anxiety, $F(1, 72) = 26.42$, $p < .001$, $\eta^2 = .268$, observed power = .999, with participants reporting a greater need for certainty concerning worries ($M = 1.96$) compared to fears ($M = 1.62$). Large main effects were also found for Age, $F(3, 72) = 9.52$, $p < .001$, $\eta^2 = .284$, observed power = .996, and Form of IOU, $F(1, 72) = 104.72$, $p < .001$, $\eta^2 = .593$, observed power = 1.000. Follow up analyses using Tukey's HSD revealed the main Age effect to be due to 7–8yr olds ($M = 1.93$) reporting a greater intolerance of uncertainty than 13–14 yr olds ($M = 1.41$, $p < .05$), and 10–11 yr olds ($M = 2.22$) reporting a greater intolerance of uncertainty than both 13–14 ($p < .001$) and 15–16 yr olds ($M = 1.61$, $p < .01$). Convergent IOU ($M = 2.23$) received significantly higher ratings, and was therefore associated with a greater cognitive bias, than intermediate IOU ($M = 1.36$). There was a significant Age x Form of IOU interaction, $F(3, 72) = 7.92$, $p < .001$, $\eta^2 = .248$, observed power = .987, investigated further with a series of repeated measures ANOVAs for each age group. After Bonferroni corrections (alpha = .01), ratings of convergent IOU were found to be significantly higher than ratings for Intermediate IOU at 10–11 yrs, $F(1, 19) = 5.21$, $p < .05$, $\eta^2 = .215$, observed power = .581, 13–14 yrs, $F(1, 19) = 76.61$, $p <. 001$, $\eta^2 = .801$, observed power = 1.000, and 15–16 yrs, $F(1, 19) = 29.28$, $p < .001$, $\eta^2 = .606$, observed power = .999, only.

A significant main effect of Salience, $F(1, 72) = 11.82$, $p = .001$, $\eta^2 = .141$, observed power = .924, reflected the tendency for highly salient anxieties ($M = 1.92$) to be associated with a greater intolerance of uncertainty than less salient anxieties ($M = 1.66$). A significant Salience x Form of IOU interaction, $F(1, 72) = 7.01$, $p = .01$, $\eta^2 = .089$, observed power = .743, suggested that this tendency may alter according to the Form of

IOU being rated. A series of repeated-measures analyses within each Form of IOU showed the main effect of Salience to be carried only by ratings of Convergent IOU, $F(1, 76) = 18.01$, $p < .001$, $\eta^2 = .192$, observed power = .987. A significant Age x Salience x Form of IOU effect, $F(3, 72) = 2.88$, $p < .05$, $\eta^2 = .107$, observed power = .664 (see Figures 3.3a and 3.3b), further suggested that the tendency for salient anxieties to be rated significantly higher only when the Convergent form of IOU was being assessed may not be true across age groups. Further within-subjects contrasts within age groups, following Bonferroni corrections (alpha = .01), revealed significant effects among 15–16 yr olds only, $F(1, 19) = 20.05$, $p < .001$, $\eta^2 = .513$, observed power = .989, although analyses for 13–14 yr olds approached significance, $F(1, 19) = 5.74$, $p = .03$.

There was no main effect of Gender, $F(1, 72) = 1.43$, $p < .10$, $\eta^2 = .019$, observed power = .218. A significant Gender x Anxiety interaction, $F(1, 72) = 10.10$, $p < .01$, $\eta^2 = .123$, observed power = .880, was accounted for by lower IOU ratings of fear (compared to worry) for boys (but not for girls), $F(1, 36) = 32.81$, $p < .001$, $\eta^2 = .477$, observed power = 1.00. A significant Gender x Form of IOU interaction, $F(1, 72) = 7.83$, $p < .01$, $\eta^2 = .098$, observed power = .788, was accounted for by higher convergent IOU scores for girls (compared to boys), $t_{(78)} = 3.33$, $p < .05$. No other interactions were significant, Fs between .08 – 2.60, η^2 between .001 – .097.

Figure 3.3a Convergent Intolerance of Uncertainty ratings by Age and Salience

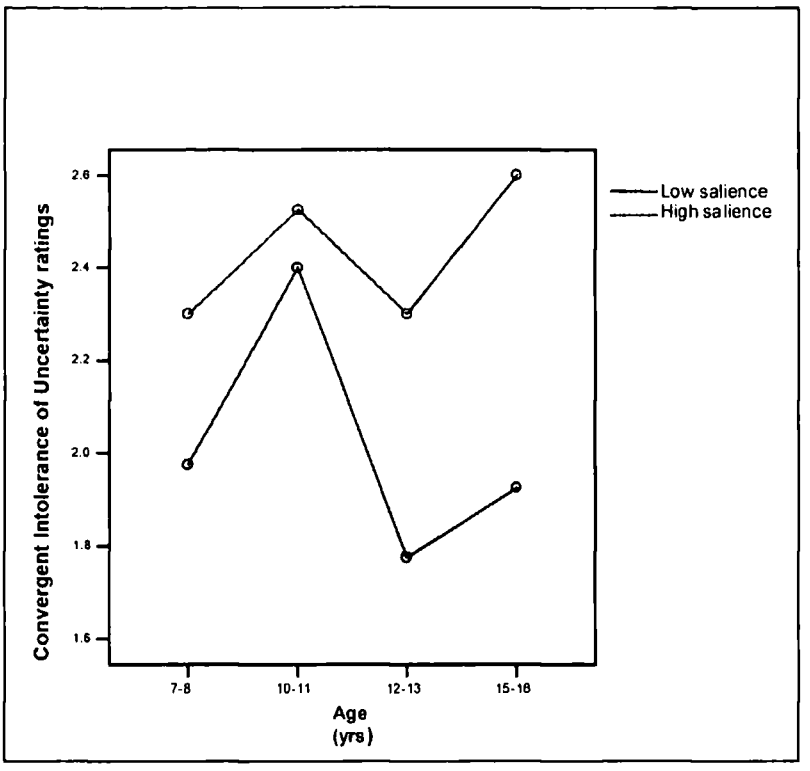
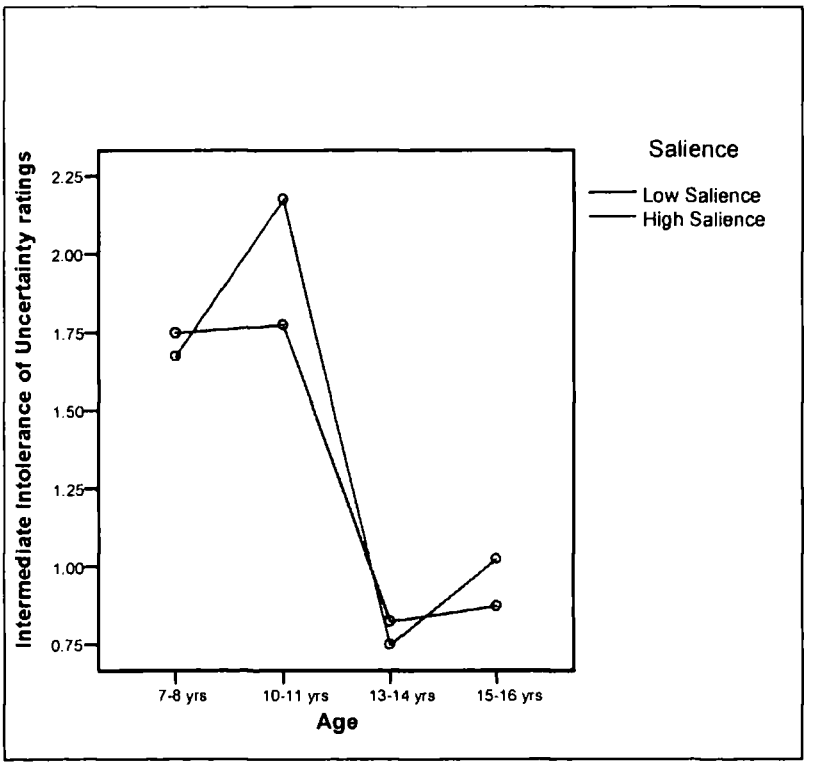


Figure 3.3b Intermediate Intolerance of Uncertainty ratings by Age and Salience



3.3.5 Relations among cognitive appraisals, fear, worry, and ritualistic behaviour

When examining relations among variables, appraisal ratings (relating to either self-generated items or items from the closed-response lists) were collapsed across Form of Anxiety and Salience. Ratings for the three forms of TAF (Likelihood-self, Likelihood-other, Moral) and the two forms of IOU (Convergent, Intermediate) were also collapsed, resulting in three composite scores for Responsibility, TAF and IOU. These measures were taken for a number of reasons. Firstly, the following analyses assess relations between more general, broad-based measures, such as total fear, worry and ritual scores (calculated by summing overall fear, worry and ritualistic behaviour closed-response item ratings from the Study 1 interview), as opposed to the prior idiosyncratic focus on individual anxieties and ritualistic behaviours. Secondly, by collapsing each variable to form just one total score for each cognitive appraisal, reliability and power are increased.

Reliability estimates for each composite cognitive appraisal score were adequate to very good, ranging from a Cronbach's Alpha of .50 for Responsibility (4 items), to .71 and .84 for IOU (8 items) and TAF (12 items) respectively. Partial correlations among cognitive appraisals, fear, worry and ritualistic behaviours, controlling for age, are reported in Table 3.2.

The matrix suggests that children with generally higher levels of worry were also more likely to make more biased cognitive appraisals of their anxieties. High levels of ritualistic behaviour were also associated with more biased Responsibility, TAF and IOU appraisals. Fear was related to more extreme IOU appraisals only. All cognitive appraisals were positively related to each other. Fear, Worry and Ritualistic Behaviour were also positively related, replicating the findings of Chapter Two with a smaller sub-sample of participants.

Table 3.2 Partial correlations among cognitive appraisals, fear, worry and ritualistic behaviour, controlling for age

	Fear	Worry	Ritualistic Behaviour	Responsibility	Thought-action fusion
Worry	.66***				
Ritualistic Behaviour	.42***	.67***			
Responsibility	.15	.23*	.25*		
Thought-action Fusion	.20	.39***	.43***	.42***	
Intolerance of Uncertainty	.25*	.34**	.46***	.23*	.58***

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

Hierarchical regression analyses were conducted to determine the value of overall fear and worry levels in predicting the tendency to make biased cognitive interpretations in childhood. For each cognitive appraisal (Based on composite Responsibility, TAF, and IOU ratings), Age was entered into the first block of the analyses. Fear and worry were entered into the second and third blocks respectively. If anxiety was found to make a significant contribution, the analyses were repeated, entering worry to the second block, and fear to the third, to test for specificity.

In each of the three models the assumption of independence of residuals was assured (Durbin-Watson values between 1.68 and 2.09). Kolmogorov-Smirnov tests indicated that the standardized residuals did not deviate significantly from normality,

Examination of plots of standardized residuals against standardized predicted values suggested no violation of the assumption of homoscedasticity.

The regression model for Responsibility had an R^2 of .10, $F(3, 76) = 2.86$, $p < .05$. Only Age made a significant contribution, with neither Fear nor Worry levels predicting Responsibility appraisals. Fear and worry predicted TAF, $R^2 = .22$, $F(3, 76) = 7.21$, $p < .001$, with analyses suggesting that high worry may particularly contribute to such appraisals (see Table 3.3). Worry made a greater contribution when entered either alone (14%) or after Fear (11%) into the analyses compared to when Fear was entered alone (4%) or after Worry (1%).

Table 3.3 Summary of hierarchical regression analyses for variables predicting biased Thought-action fusion appraisals

	Analyses 1				*Analyses 2*			
	Variable	*B*	**SE B**	β	Variable	*B*	**SE B**	β
Step 1	Age	-.30	.12	-.28*	Age	-.30	.12	-.28*
Step 2	Age	-.21	.13	-.20	Age	-.23	.11	-.21*
	Fear	.03	.02	.20	Worry	.07	.02	.38***
Step 3	Age	-.26	.12	-.24*	Age	-.26	.12	-.24*
	Fear	-.02	.02	-.11	Worry	.08	.03	.45**
	Worry	.08	.03	.45**	Fear	-.02	.02	-.77

* p <.05, ** p <.01

Analyses 1:

$R^2 = .07$ for Step 1, $p < .05$; $\Delta R^2 = .04$ for Step 2, $p < .05$; $\Delta R^2 = .11$ for Step 3, $p < .001$.

Analyses 2:

$R^2 = .07$ for Step 1, $p < .05$; $\Delta R^2 = .14$ for Step 2, $p < .001$; $\Delta R^2 = .01$ for Step 3, $p < .001$.

Fear and Worry predicted IOU appraisal, $R^2 = .21$, $F(3, 76) = 6.88$, $p < .001$. As with TAF, Worry made a greater unique contribution when entered alone (10%) or after fear (5%) into the analyses, compared to when fear was entered alone (6%) or after worry (0%). This suggests that high levels of worry in particular may be important with regard to needing a feeling of certainty (See Table 3.4).

Table 3.4 Summary of hierarchical regression analyses for variables predicting biased Intolerance of Uncertainty appraisals

	Analyses 1				Analyses 2			
	Variable	*B*	**SE B**	β	Variable	*B*	**SE B**	β
Step 1	Age	-.35	.11	-.33**	Age	-.35	.11	-.33**
Step 2	Age	-.24	.12	-.23*	Age	-.29	.11	-.27*
	Fear	.04	.02	.26*	Worry	.06	.02	.32**
Step 3	Age	-.27	.12	-.25*	Age	-.27	.12	-.26*
	Fear	.01	.02	.05	Worry	.05	.02	.29*
	Worry	.05	.02	.29*	Fear	.01	.02	.05

* p <.05, ** p <.01

Analyses 1:

$R^2 = .11$ for Step 1, $p < .01$; $\Delta R^2 = .06$ for Step 2, $p < .01$; $\Delta R^2 = .05$ for Step 3, $p < .001$.

Analyses 2:

$R^2 = .11$ for Step 1, $p < .01$; $\Delta R^2 = .10$ for Step 2, $p < .001$; $\Delta R^2 = .00$ for Step 3, $p < .001$.

The range of findings reported above suggest that anxiety, particularly worry, is related to biased TAF and IOU appraisals in childhood, and that biased cognitive appraisals are positively correlated with ritualistic behaviour. Chapter Two previously suggested that high anxiety, particularly high worry, predicts childhood ritualistic behaviour. The current study used bootstrapping (Preacher & Hayes, 2004), a form of

multiple mediational analyses, to a) determine whether cognitive appraisals transmit the effect of worry to rituals, and b) investigate the specific indirect effect of each cognitive appraisal. The bootstrap estimates presented are based on 5000 samples and Age was included in the analysis as a covariate. Taken as a set, Responsibility, TAF and IOU mediated the effect of worry on rituals. The total indirect effect of the cognitive appraisals together had a point estimate of 0.119, and a Bias Corrected and Accelerated (BCa) bootstrap 95% Confidence Interval (CI) of 0.0360 to 0.2380 (the effect is therefore significant as the CI is different from zero). This is consistent with the interpretation that more biased cognitive appraisals mediate the relationship between worry and rituals. Examination of specific indirect effects indicated that only IOU is a unique mediator, as its 95% CI did not contain zero (IOU CI = 0.0103 to 0.1961). While the specific indirect effect of IOU can only be interpreted as conditional on the inclusion of the other cognitive appraisals in the model, it appears that neither Responsibility nor TAF uniquely contribute to the indirect effect above and beyond IOU.

3.4 Discussion

The aim of this study was to investigate developmental change in Responsibility, Thought-action fusion (TAF), and Intolerance of Uncertainty (IOU) during middle childhood and adolescence, using a semi-idiographic approach. In partial support of Hypothesis 1, both TAF and IOU biases decreased by adolescence. However, the tendency towards a Responsibility bias remained constant across age groups. As expected (Hypothesis 2), high-salience anxieties were associated with more biased Responsibility and TAF appraisals than low-salience anxieties, although in the case of IOU, a Salience effect only existed with regard to the Convergent IOU during late adolescence. All age groups demonstrated greater IOU for worries than fears (Hypothesis 3). Against prediction, this

finding was only partially repeated for the remaining cognitive appraisals. More biased Responsibility ratings for worries (cf. fears) were reported among the 10-11 and 13-14 yr olds only and there was no effect of Form of Anxiety on TAF ratings. Worry appeared to be particularly important in predicting TAF and IOU throughout the developmental epoch studied (Hypothesis 4), though fear and worry appeared unrelated to Responsibility. Cognitive appraisals were strongly intercorrelated and covaried with ritualistic behaviour (Hypothesis 5). Supporting Hypothesis 6, the relation between worry and ritualistic behaviour was mediated by biased cognitive appraisal, particularly IOU. The finding that overall levels of TAF and IOU decrease after late childhood mirrors previous research from the typical developmental literature suggesting that both magical thinking and a general need for certainty recede as adolescence draws near (Piaget, 1929, 1955; Rosengren & Hickling, 2000; Weisz, 1986). It is plausible that the attenuation of TAF and IOU as development progresses reflects an increasingly mature understanding of personal causality and an increasing acceptance of random, non-contingent events (Piaget & Inhelder, 1975; Weisz, 1986).

The predominance of each component of TAF and IOU also appeared to alter with maturity. For example, prior to adolescence, ratings for each form of TAF were undifferentiated. However, from the onset of adolescence, children reported greater TAF Likelihood for self than TAF Likelihood for others. Thus, while the more rational belief that thoughts may influence mental or physical events intraindividually (e.g. if one thinks of a sad event, one may feel sad, or if one thinks of closing one's eyes, then one may do so) may continue, following late childhood these beliefs are less likely to be extended interindividually. In accordance with an increased understanding of the distinction between the mental and physical domains, teenagers are therefore less likely to believe that their own thoughts can directly cause another individual to feel or behave in a certain way

(Woolley, 2000). Interestingly, like the younger children in the current study, OCD patients report a belief in TAF Likelihood for others to a similar extent (or slightly more) than they report TAF Likelihood for self, while anxious and analogue comparison groups, like older children, acknowledge the difference between thoughts influencing one's own behaviour as opposed to the behaviour of others (Ferrier & Brewin, 2005; Libby et al., 2004; Rassin, Merckelbach, Muris & Schmidt, 2001; Shafran, Thordarson & Rachman, 1996). This suggests that a high prevalence of TAF Likelihood–Other beyond late childhood may be an important marker of OCD psychopathology.

Similar changes in the constitution of IOU appraisals were observed with the onset of adolescence. While prior to middle childhood, both variants of IOU were rated similarly, after 10 years of age, the Convergent IOU ratings were higher than those for the more general, Intermediate form. Semi-idiographic measurement of Convergent IOU involved a very specific description of the participant's personal anxiety (e.g. not only fear of illness, but fear of illness due to germ contamination in particular) as well as the accompanying ritualistic/coping behaviour typically applied to prevent the occurrence of this concern (e.g. repeated hand-washing). The level of specificity involved in assessing Intermediate IOU extended only to the overarching concern (e.g. fear of illness). The equivalence of ratings for both forms of IOU among 7-8 year-olds perhaps reflect the more generalised need for certainty characteristic of younger children, resulting from their relatively limited knowledge and understanding of the world (Piaget, 1955). However, enhanced experience, as well as an increased acceptance of novelty and personal non-contingency in later childhood (Piaget & Inhelder, 1975; Weisz, 1986), may result in a need for certainty regarding only very specific, personally subjective situations. Moreover, at an early stage, children are presumably developing preferences for particular coping methods, raising the possibility that strategies are less honed, or specifically applied, than

during later childhood and adolescence. Given the format of questioning in the current study relating to each form of IOU, these considerations would potentially promote higher ratings for Convergent IOU among older children only.

While Responsibility levels were predicted to alter across childhood, the prevalence of this particular cognitive bias remained constant throughout the developmental range studied. Previous research involving children with OCD has similarly failed to find developmental differences in Responsibility between middle childhood and late adolescence (e.g. Barrett & Healy-Farrell, 2003), although it is possible that these findings relate to the age range of children included in each sample. For example, previous research suggests that the process of attributing blame exclusively to the self has already begun to diminish by middle childhood, and that, by this stage, children have a more rationally perceived notion of personal blame (Graham et al., 1984; Hoffman, 1982; Tangney, 1998). It cannot be discounted, therefore, that the exclusion of children prior to age 7 prevented the detection of developmental change in Responsibility.

It may also be that methodological factors contributed to the lack of an age effect for Responsibility in the present study. Specifically, OCD patients are expected to attribute greater blame to themselves than to other people, as they consider not only actions, but also omissions to act, as the result of a deliberate and conscious choice (Salkovskis & Forrester, 2002). Thus, OCD patients typically believe that not acting in a situation that could potentially lead to harm is as bad as directly causing the harm itself. However, most other people tend to regard themselves as more responsible for what they actively do, as opposed to what they fail to do (Salkovskis, Forrester & Richards, 1998). As a lack of the normal omission bias is thought to characterise the expression of Responsibility in OCD, the sentence stems used to assess this construct asked participants to appraise how they would feel if they *did not* perform a personalised ritualistic/coping behaviour, and the

scenario they dreaded actually occurred. While it was important to achieve this level of specificity, a potential issue could involve the ability of children in the youngest age group to conceptualise responsibility over inaction. For example, responsibility over inaction requires the ability to imagine something that may happen, to envisage what could be done to prevent or alleviate another's potential distress, as well as to understand that although any distress would not be directly caused, personal inaction would contribute to it. Given this complexity, it is perhaps unsurprising that a related concept, guilt over inaction, has been reported to be a later developmental acquisition, becoming more apparent by adolescence (Williams & Bybee, 1994). As such, while the youngest children in the sample may well have greater perceptions of misplaced responsibility, the possibility remains that a potential inability to comprehend personal blame over omission prior to adolescence may have somewhat confounded the results.

The present study also found that anxiety-provoking concerns were generally appraised with a greater cognitive bias than less anxious concerns, with highly personally salient thoughts evoking heightened Responsibility concerns, as well as increased perceptions of importance and danger (in the form of stronger TAF appraisals), for all participants. While cognitive theories propose that appraisal plays a pivotal role in the escalation of normal thoughts into clinical obsessions (Rachman, 1998; Salkovskis et al., 1995), individuals typically experience a number of different intrusions, yet only a small number of these thoughts prove troublesome (Purdon & Clark, 1993). The present results extend previous work with adult samples (e.g. Clark et al., 2000; Freeston et al., 1992; Rowa & Purdon, 2003; Rowa, Purdon, Summerfeldt & Antony, 2005), and suggest that the tendency to appraise intrusive thoughts with a cognitive bias is not a general vulnerability factor, but is actually contingent upon the salience of a particular anxious thought for the individual. Thus, an individual may think that it is very likely that they have left a window

open overnight, for example, but would not feel unduly anxious unless they felt that leaving a window open was a particularly bad or dangerous thing to do.

In terms of the motivations behind accepting greater responsibility for personally negative outcomes, it has been suggested that a person's assignment of personal blame is affected by a desire to avoid the frightening possibility of its occurrence (Wortman, 1976). Thus, as perception of threat increases, it becomes increasingly unpleasant to acknowledge a lack of possible anticipation or personal control. If, however, the individual assumes personal responsibility for its occurrence, the dreaded event becomes more predictable, controllable, and somewhat possible to avert (Walster, 1966). Indeed, perceived responsibility and a belief that one's fate is determined by past behaviour are apparently prevalent among victims of crime and disease. For example, widespread feelings of guilt have been reported in cancer patients (Abrams & Finesinger, 1953), parents of terminally ill children (Chodoff, Friedman & Hamburg, 1964) and rape victims (Medea & Thompson, 1974). Such self-attributions of blame are thought to re-establish perceived control, fostering the perception that similar threatening outcomes and events can be prevented in the future (Bullman & Wortman, 1977; Shaver & Drown, 1986). The acceptance of personal responsibility for anxiety-provoking scenarios, both in OCD and throughout typical childhood, may therefore similarly operate to reduce the expected likelihood of future suffering. However, while initially functional, self-blame and guilt become increasingly maladaptive when consistently used as a defence against one's inability to control unwanted events (Lindsay-Hartz et al., 1995), and a continued reliance on this strategy perhaps plays a key role in the development and maintenance of OCD (Salkovskis & Forrester, 2002).

The finding that the TAF bias is most intense when appraising highly salient anxieties raises the possibility that such magical forms of thinking may similarly act as a

coping strategy, achieving the appearance of control, in the absence of actual control, over the occurrence of a personally negative event (Keinen, 1994). As with the process of self-blame, the notion of being able to influence a threatening outcome through one's thoughts alone would make the occurrence of such a situation somewhat more predictable and controllable (Keinen, 1994). The fact that TAF ratings for highly salient anxieties remained elevated throughout childhood, despite an overall decrease in the prevalence of TAF, also supports the notion that magical beliefs, while becoming less entrenched over time, co-exist with more rational methods of thought across the lifespan (Cottrell et al., 1996; Subbotsky, 2000). Thus, a person can believe in the universal nature of causality, yet in high-risk, emotionally charged situations, may favour magical perceptions. Presumably, the intense anxiety provoked by a highly personally salient intrusive thought is powerful enough to disrupt the typically heightened rational understanding of older children, and even adults (e.g. Rozin et al., 1986, 1990), allowing magical explanations to re-emerge, and providing an illusion of control (Bolton et al., 2002). A tendency to believe that just thinking of a highly negative situation increases the likelihood of its occurrence understandably provokes more intense attempts to suppress such thoughts (Rachman, 1998), which in turn plays a key role in the promotion of obsessive-compulsive symptoms (Rassin, Muris, Schmidt & Merckelbach, 2000). This suggests that, along with a Responsibility bias, an inclination to perceive increased control over the occurrence of a highly negative situation through TAF may additionally enhance the obsessional quality of personally salient anxieties, playing an important role in the manifestation and persistence of OCD. If this is the case, the fact the TAF and Responsibility biases can apparently be evoked in response to emotionally salient scenarios at any age could go some way in explaining why OCD can onset throughout the lifespan.

A greater need for certainty was expressed for highly specific, salient anxieties and rituals during late adolescence only. A salience effect exclusively for Convergent IOU among older children perhaps relates to the previously suggested possibility that an increasingly limited range of scenarios is able to provoke an intolerance of uncertainty as development progresses, as opposed to the widespread IOU characteristic of earlier childhood (Weisz, 1986), which would most likely attenuate such an effect. Furthermore, the presumably increased specificity of coping strategies applied by older children to deal with such threatening situations may serve particularly to strengthen the link between a high-salience anxiety and linked ritualistic/coping behaviour. Thus, only intensely negative thoughts and situations of a highly personalised nature may provoke a strong need for certainty later in development, and such increased specificity, together with increased functional linkage between anxieties and certain ameliorative strategies, may uniquely lead to a salience effect from late adolescence onwards.

Importantly, the intense need for certainty in OCD is similarly domain-specific and accompanied by explicit, though inevitably counterproductive, perseverative safety behaviours (Van den Hout et al., 2004). Furthermore, the range of scenarios able to provoke an intense need for certainty also apparently decreases in OCD, as reflected in the dwindling number of obsessions and compulsions reported between childhood and adolescence, as well as the fewer intrusions and rituals reported by individuals with later onset of the disorder (Hanna, 1995). As such, the habitual use of ritualistic behaviours to combat the domain-specific uncertainty of typical childhood may also play an important role in the escalation of typical anxieties and ritualistic behaviours into clinical obsessions and compulsions.

Overall, the results relating to salience indicate that the selection of individually relevant anxieties and ritualistic/coping behaviours is not an avoidable luxury. It seems

that, beyond very early childhood, stimuli must be highly emotionally relevant to the individual for biased cognitive appraisals to be strongly activated. In line with proposals from the Obsessive-Compulsive Cognitions Working Group (1997), these findings strongly suggest that the use of individualised, concern-relevant stimuli is a necessary step if one wants to tap into the cognitive mechanisms that provoke and maintain the highly idiosyncratic anxieties and ritualistic behaviours characteristic to both OCD and typical development.

As previously highlighted in Chapter 2, the experiences of fear and worry, while related, are associated with differing affective and cognitive states, and are therefore ultimately distinct (Gullone, King & Ollendick, 2000). For example, whereas fear arises in response to present, realistic danger (Marks, 1987), worry often occurs in the absence of actual danger, and, like obsessive intrusions, is primarily activated by threat expectancy (Borkovec, Pruzinsky & DePree, 1983; Langlois et al., 2000). MacLeod, Williams & Bekerian (1991) define worry as a cognitive phenomenon "concerned with future events where there is uncertainty about the outcome, the future being thought about is a negative one, and this is accompanied by feelings of anxiety" (p. 478). As reflected in this definition, there is an empirical consensus underscoring the central role of uncertainty in the worry process (e.g. Dugas, Freeston & Ladouceur, 1997; Tallis & Eysenck, 1994), thus it is perhaps unsurprising that idiosyncratic worries were found to be uniformly associated with a greater need for certainty than fears in the current study.

The fact that the TAF bias was equally strong for fears and worries may reflect the relation between anxiety and magical thinking in typical childhood. For example, while IOU is widely understood to have an especially strong connection to worry, negatively emotionally charged situations, whether fear- or worry-provoking, appear to enhance the capacity for magical thought during childhood and beyond (Harris et al., 1991; Woolley,

1997; Woolley & Phelps, 1994). Analogous to such non-specificity in typical development, patients with a range of anxiety disorders (e.g. panic disorder, post-traumatic stress and social phobia) have also been found to have similar TAF levels to patients with OCD (Muris, Meesters, Rassin, Merckelbach & Campbell, 2001), further signifying the potential universality of the TAF bias.

The findings relating to differential responsibility appraisals according to form of anxiety are, however, more difficult to reconcile. While 10-11 and 13-14 year olds appraised worries with greater responsibility, there was no differentiation in ratings for fears or worries either before, or after, this developmental epoch. In contrast to IOU and TAF, however, manifestations of responsibility are perhaps less widespread (Ladouceur et al., 1995), and are apparently most reliably present in OCD patients with compulsive checking behaviours (Rachman, 1993), where feelings of responsibility are proposed to be directly related to the harm that the patient is attempting to prevent (Rheaume et al., 1995). For example, Foa and colleagues (Foa, Sacks, Tolin, Prezworski & Amir, 2002) report that, unlike compulsive checkers, OCD patients without checking compulsions actually report equivalent responsibility appraisals to non-anxious controls. Given this specificity, perhaps these inconsistent findings are more to do with the actual content of anxieties and associated rituals reported across the fear and worry subgroups, with form of anxiety itself having little influence on Responsibility appraisals. Further research with larger samples of both typically developing children, and children with OCD, is required to further investigate this possibility.

In parallel with the findings relating to IOU and the appraisal of idiosyncratic fears and worries, a broader examination of overall fear, worry and cognitive appraisal levels revealed that a general tendency towards anxiety predicted an overall need for certainty, with worry in particular making an important contribution to this relationship. Again, this

close connection probably relates to the fundamental role of uncertainty in the worry process (Dugas et al., 1997). For example, worry is associated with heightened danger expectancies (Spielberger, 1972), which in turn motivates a need for certainty, leading anxious individuals actively to engage in attempts to maintain or regain control of the environment (Folkman, 1984). A deterministic, causal view of events can be a means to make future uncertainties appear more predictable and controllable, bolstering perceived coping abilities (Weiner, 1985). Thus, the functional value of causal attributions, and the resulting certainty this can achieve, is further enhanced in worry-prone individuals (Friedland & Keinen, 1991). However, the avoidance of uncertainty to evade further anxiety may actually be counterproductive in the long term (Furnham & Ribchester, 1995), as continuously striving for certainty beyond early childhood is likely to inappropriately extend a widespread perception of threat in situations that cannot be adequately structured or categorised (Piaget, 1955). As life typically becomes progressively more characterised by such situations, a strong intolerance of uncertainty is therefore increasingly likely to provoke a permanent state of anxiety as development progresses (Friedland & Keinen, 1991). It becomes clear, then, how a self-perpetuating, and increasingly pathological, cycle of worry and intolerance of uncertainty may develop and persist.

Interestingly, while there was no differentiation in the TAF appraisal of idiosyncratic fears and worries, it was found that overall worry levels were comparatively more important than overall fear in predicting a global tendency towards a TAF bias. This points to the possibility that TAF may be more implicated in anxiety disorders characterised by worry/rumination (e.g. OCD or GAD), as opposed to fear (e.g. specific phobia). While this issue merits further research with clinical samples and highlights the possible inconsistencies generated by a general, as opposed to idiographic focus, a range of evidence has accumulated to suggest that the worry characteristic of Generalised Anxiety

Disorder (GAD) exhibits a magical quality similar to that seen in OCD obsessions (Borkovec & Roemer, 1995). Positive correlations have also been reported between pathological worry and TAF during adolescence and adulthood (Coles, Mennin & Heimberg, 2001; Hazlett-Stevens, Zucker & Craske, 2002; Muris, Meesters, Rassin, Merckelbach & Campbell, 2001). These findings are perhaps unsurprising given the commonalities between the processes thought to underlie worry and obsession (Comer et al., 2004; Krochmalik & Menzies, 2003). However, while TAF is frequently proposed to be integral to OCD (e.g. Muris et al., 2001), this increased intensity may actually be a consequence of the generally higher levels of anxiety and depression in patients with the disorder (Abramowitz, Whiteside, Lynam & Kalsy, 2003). Bolton and colleagues (2002) have suggested that magical thinking functions as a coping strategy for the anxious individual, providing an illusion of control in the absence of actual control. If this is the case, and if the presence of magical thinking is somewhat proportional to anxiety, TAF may function on a continuum, with greater anxiety producing ever more distorted magical reasoning, and playing an important role in the escalation of normal worries into clinical obsessions.

Against prediction, neither fear nor worry contributed to a Responsibility bias in typical childhood. This is contrary to findings in the developmental literature, suggesting that temperamentally anxious children are more prone to experience responsibility and guilt (Kagan, 1998; Kochanska, 1993; Kochanska, Gross, Lin & Nichols, 2002; Seligman et al., 1984). One reason for this disparity may be that our operationalization of responsibility closely followed the commonly accepted definition of this cognitive appraisal in the OCD literature, and may therefore have been biased towards cognitions typical of that disorder. In support of this, both paediatric and adult OCD samples have been found to endorse general responsibility beliefs to a greater extent than anxious and

non-clinical controls (Libby et al., 2004; Salkovskis et al., 2000). This finding may not be exclusively attributable to the responsibility bias, however, as despite the assertions of Salkovskis (1985), it has been suggested that the TAF bias actually underlies increased self-blame in OCD; after all, if thoughts are believed to increase the occurrence of a negative event, this is likely to increase a person's sense of responsibility for its prevention (e.g. Shafran et al., 1996). Thus, it may be that the greater intensity of TAF in OCD (Muris et al., 2001) is the trigger for a widespread perception of heightened responsibility in the disorder. This possibility, along with the aforementioned effect of salience on responsibility cognitions in the current study, suggests that only very specific, anxiety-provoking thoughts (which, as previously mentioned, are more likely to be associated with a TAF bias) may have the power to (re-)activate self-blaming tendencies beyond early childhood in typical development. In this way, a total responsibility score may be less meaningful, or revealing, in non-clinical samples than an idiographic approach, which permits the specific interpretation of an individuals primary concern. Further work may shed light on the comparative value of each methodological approach in tapping into the Responsibility construct in both clinical and non-clinical samples.

While predictions relating to cognitive appraisal and anxiety were only partially supported, predictions relating to positive relations among Responsibility, TAF, IOU and the other main aspect of OCD, ritualistic behaviour, were all confirmed. These findings replicate previous work that has similarly proposed relations among Responsibility, TAF, and IOU (e.g. Freeston et al., 1996; Salkovskis & Forrester, 2002; Steketee et al., 1998), as well as research with both clinical and non-clinical samples, proposing a link between each of these modes of thinking and ritualistic behaviour (e.g. Amir et al., 2001; Bolton et al., 2002; Evans, Milanak, Medeiros & Ross, 2002; Ladouceur et al., 1995; Shafran et al., 1996; Salkovskis et al., 2000; van den Hout et al., 2002, 2004).

In OCD, compulsive rituals are conceptualised as efforts to neutralise intrusive thoughts, and to prevent any perceived harmful consequences (Salkovskis, 1999). Supposing a continuum between pathological and normal, the rituals of typical childhood may perform a similar function. However, while initially effective in reducing anxiety, the use of ritualistic behaviour is proposed to be inevitably futile, progressively intensifying danger expectancies and cognitive bias (Salkovskis, 1999). The positive association between anxiety and rituals in Chapter Two, and the significant relationship between biased cognitions and rituals in the present study, reflects this proposition, with the implication that the habitual use of rituals may play an integral role in the escalation of normal concerns into clinical symptomatology. For example, the rapid reduction of anxiety following the performance of a compulsive ritual appears to act as negative reinforcement, compelling the individual to persist with this coping strategy, and preventing disconfirmation of its effectiveness (Rachman & Shafran, 1998; Salkovskis, 1999). Thus, the absence of catastrophe is attributed to performance of the ritual, rather than to the inaccuracy of the anxious concern and its associated cognitive interpretation. In this way, compulsions may act to strengthen anticipated danger and distorted cognitive appraisal, as the absence of threat following a ritual would prevent disconfirmation of sole responsibility, as well as the discovery that thoughts do not have the power to cause a negative outcome. The belief that one can achieve absolute certainty over the occurrence of a negative event would also be seemingly reinforced. Each of these effects would then contribute to the prevention of anxiety reduction (Salkovskis, 1999), and the cycle of increased anxiety and perception of threat, leading to distorted cognitive appraisal and ritualistic behaviour, would presumably persist.

Further support for this notion comes from present findings suggesting that intense worry is in fact associated with more distorted cognitive appraisals, and that both are

predictive of ritualistic behaviour. The fact that biased cognitions appear to transmit the effect of high worry to rituals also supports Salkovksis' (1985, 1989) cognitive model of OCD, which suggests that it is the appraisal of an intrusive thought, as opposed to the thought itself, which provokes compulsive behaviour. The finding that a need for certainty is the most important mediator in this relationship, however, is more controversial.

While a need for certainty has been proposed to be important to the development and maintenance of OCD (e.g. Steketee et al., 1998), a comparatively greater emphasis has generally been afforded to Responsibility and TAF in the presentation of the disorder (e.g. OCCWG, 2001, 2005; Taylor et al., 2002), with cognitive-behavioural strategies to treat both adults and children with OCD tending to follow suit (e.g. March & Mulle, 1998; Salkovskis et al., 2000). However, given that a need for certainty provokes an intense desire for control (Keinen & Friedland, 1991), and both TAF and personal responsibility attributions apparently function to provide such an illusion (e.g. Bolton et al., 2002; Ferguson & Stegge, 1998; Keinen, 1994; Weiner, 1986), it may be that a strong need for certainty is actually a precursor to these other cognitive biases. For example, as previously discussed, high anxiety is thought to provoke a desire to explain events in causal terms, which may materialise as magical thinking, and/or increased attributions of blame to the self (e.g. Keinen, 1994; Shaver & Drown, 1986). Importantly, however, the effect of anxiety on the search for causality appears to be strongest among individuals with a low tolerance of uncertainty than those with high uncertainty tolerance (Friedland & Keinen, 1991; Keinen, 1994). This further supports the suggestion that IOU may be fundamental to distorted TAF and Responsibility cognitions, perhaps acting as a mediator in the relationship between intense anxiety and the perception of illusory cause-effect relations (Biner et al., 1995).

The fundamental role of IOU in obsessive-compulsive symptomatology perhaps also resides in the particularly strong link between this construct and ritualistic behaviour (Van den Hout et al., 2004). For example, a strong need for certainty, and the illusory perceptions that result, are also thought to promote the misperception that uncontrollable events are controllable, leading to the inappropriate adoption of problem-focused coping strategies (Collins et al., 1983). Ritualistic behaviour, entailing personal activity and involvement, is an example of such a strategy. It may be presumed, therefore, that, despite the limited effectiveness of rituals in real terms, a strong desire for causality would lead an individual to select rituals over alternative, emotion-focused coping responses that are less readily associated with the exercise of personal control (Friedland, Keinen & Regev, 1992). In line with this, a strong need for certainty has been found to promote the performance of superstitious rituals in normal adults in anxious circumstances (Keinen, 2002). Furthermore, the performance of rituals is thought to be sufficient to exacerbate OCD-like uncertainty further (van den Hout, 2004). Thus, the very use of rituals to combat intense uncertainty may also be a key factor in the further escalation and continued persistence of anxiety and distorted cognitions (Salkovskis, 1999).

If these theoretical propositions prove to be accurate, then cognitive interventions designed to reduce threat perception and the associated need for certainty, while also promoting the use of logical coping strategies, may be most useful in preventing the escalation of normal childhood concerns and rituals into clinical obsessions and compulsions: Presumably, the attenuation of a need for certainty would somewhat placate intense TAF and Responsibility appraisals, as well as an inappropriate, habitual reliance on compulsive rituals to deal with intense anxiety. Of course, replication with larger samples that include typically developing children, as well as children with a range of anxiety diagnoses, including OCD, is required before the role of faulty appraisal in childhood OCD

can be fully understood. The methodological limitations relating to Study 1 that were previously highlighted, for example the issue of delivering the fear, worry and ritual scales in a fixed order, and potential implications of using visual scales for fear and worry ratings (see Appendix 5 for response distributions), also obviously apply to the current study. However, despite these limitations, it seems that the study of normal anxieties and rituals throughout typical development may indeed shed light on the mechanisms involved in the manifestation of OCD during childhood and adolescence.

CHAPTER FOUR: EXECUTIVE FUNCTIONING IN TYPICAL CHILDHOOD AND RELATIONS WITH OBSESSIVE-COMPULSIVE SYMPTOMATOLOGY

4. 1 Introduction

Current approaches to OCD suggest that neurobiological abnormalities may be involved in the aetiology and persistence of this condition, raising the possibility that a stress-diathesis model of the disorder can be described in which neurological abnormalities (in turn genetically specified) act as a diathesis interacting with environmental influences and learning processes. Converging evidence for the neural basis of the disorder is provided by numerous investigations applying diverse methodological approaches. This literature is first reviewed in relation to OCD, and findings then considered in terms of their implications for the development of obsessive-compulsive symptoms in typical childhood.

4.1.1 Evidence for neurobiological abnormalities in OCD

Onset of OCD has been linked to numerous neurological disorders, including head trauma (McKeon, McGuffin & Robinson, 1984) and von Economo's encephalitis (Cheyette & Cummings, 1995). Patients with OCD often exhibit neurological soft signs (i.e. non-localising, non-standard performance on a motor or sensory test where no other sign of focal neurological disorder is present) that are specifically associated with the severity of their obsessions (Hollander et al., 1990). These soft-sign abnormalities are present in both adult and treatment-naïve paediatric OCD patients, and are not associated with illness duration (Pierri et al., 1996), supporting a link between abnormalities in neural development and the development of OCD. Comorbidity has also been reported for OCD and Sydenham's chorea (Chapman, Pilkey & Gibbons, 1958), Tourette's syndrome (Pauls et al., 1986; Hollander, Liebowitz & DeCaria, 1989) and other basal ganglia disorders (Cummings, 1996). This has led to the suggestion that abnormalities in basal ganglia–

frontal cortex interaction are implicated in the manifestation of the disorder (Insel, 1992; Modell et al., 1989). Moreover, psychosurgical lesions of ventral prefrontal cortical regions, such as the anterior cingulate or orbitofrontal cortex, can markedly reduce obsessive-compulsive symptoms (Jenike et al., 1991), further implicating these brain areas in OCD.

More direct evidence comes from functional neuroimaging studies that have revealed increased metabolic activity at the head of the caudate nucleus, anterior cingulate cortex, and particularly orbitofrontal cortex, specific to patients with OCD while at rest (Insel, 1992; Busatto et al., 2000; Saxena et al., 2001a; 2004; Lacerda et al., 2003) and following symptom provocation (Breiter et al., 1996; Cottraux et al., 1996; McGuire et al., 1994; Rauch et al., 1994). Importantly, these brain-behaviour relations in terms of hyperfrontality and symptom exacerbation appear to characterise children and adolescents with OCD, as well as adults (Rosenberg & Keshavan, 1998; Bradshaw & Sheppard, 2000). Furthermore, several of these studies also included groups with different psychiatric disorders (for example, simple phobia, post-traumatic stress disorder and major depression) as well as healthy controls. Interestingly, treatment studies of OCD imply reversible changes in metabolic abnormalities. Successful medication or behavioural therapy has shown that these irregularities are state dependent, as improvement of symptoms is associated with baseline activity normalisation (Baxter et al., 1992; Swedo et al., 1992).

4.1.2 Neuropsychological investigation in OCD

In an attempt to further understand the underlying neuroanatomical substrates involved in OCD, research has increasingly focused on the neuropsychological performance of patients with the disorder (Kuelz, Hohagen & Voderholzer, 2004). On the basis of neurobiological

findings, investigation has tended to involve tests sensitive to frontal lobe functioning. These tests tap into a suite of psychological processes involved in the conscious control of thought and action, processes generally referred to as executive functions (Stuss & Alexander, 2000). Executive functions therefore encompass a wide range of abilities thought to relate to intrusive thoughts and repetitive behaviour patterns, including sustained attention, working memory, motor inhibition and the maintenance of cognitive set and set shifting (Schultz et al., 1999).

Despite the wide-ranging neurobiological evidence implicating fronto-striatal dysfunction in OCD, results from neuropsychological investigations have revealed considerable variability. For example, while some studies have found evidence for impaired performance regarding sustained attention on the emotional Stroop (Foa, Ilai, McCarthy, Shoyer & Murdock, 1993; Lavy, van Oppen & van den Hout, 1994) other investigations do not reveal differential processing of anxiety-related Stroop stimuli (e.g., McNeil, Tucker, Miranda, Lewin & Nordgren, 1999). Empirical research has also provided a rather mixed and inconclusive picture concerning the possibility of a working memory deficit in the disorder (e.g. Purcell, Maruff, Kyrios & Pantelis, 1998; Schmidtke et al., 1998; Tallis et al., 1999). Finally, while some studies have reported executive dysfunction in patients with OCD using the Wisconsin Card Sorting Test (WCST) (Harvey, 1986; Head et al., 1989; Malloy, 1987), others have not (e.g. Abbruzzese et al., 1995a, 1995b, 1997).

One probable reason for these inconsistencies is that neuropsychological investigations have often non-discriminately used tests sensitive to prefrontal cortex function, notwithstanding indications that executive functioning is unlikely to be globally affected in OCD. Indeed, while the above studies used tasks thought to be subserved by the dorsolateral prefrontal region, the existing neurobiological evidence is consistent with a

more selective model of frontal-striatal dysfunction in OCD, in which the orbitofrontal cortex is specifically implicated (Baxter et al., 1987; Rauch et al., 1994; Whiteside, Port & Abramowitz, 2004; Zald & Kim, 1996).

4.1.3 The dorsolateral/orbitofrontal divide: 'cool' versus 'hot' executive functioning

Alexander et al.. (1986) propose that brain circuits connecting cortex to subcortical neural regions are relatively functionally specified. In this way, the prefrontal component of the corticostriatal system can be divided into segregated dorsolateral and orbital loops. Unlike the dorsolateral prefrontal cortex, the orbitofrontal cortex is part of a frontostriatal circuit that has strong connections to the amygdala and other parts of the limbic system. Thus, while the more cognitive, 'cool' aspects of executive functioning, such as affectively neutral abstract reasoning and problem solving, are associated with dorsolateral regions, 'hot' executive functioning, involving the regulation of affect and motivation, is associated with the orbitofrontal cortex (Overman, 2004).

However, while somewhat distinct, the orbitofrontal and dorsolateral prefrontal cortices are parts of a single co-ordinated system. As such, both regions normally work in unison, even in a single circumstance. For example, while anxious states are typically associated with 'hot' orbitofrontal activation (Dreets & Raichle, 1998), the reappraisal of negative emotions is associated with increased dorsal activation, and reciprocally neutralized orbitofrontal activity (Ochsner, Bunge, Gross & Gabrieli, 2002). The dorsolateral region may therefore typically act as a sort of cognitive 'control' under the direction of the orbitofrontal cortex, directly minimising the scope, intensity, or duration of negative emotions (Lewis & Steiben, 2004). In this way, successfully dealing with certain affectively charged situations may involve reinterpreting circumstances in relatively neutral, decontextualised terms, implicating 'cool' dorsolateral functioning.

It may be this process of 'cool' reappraisal that is unavailable in OCD: a continuous need to regulate anxiety may overstimulate the orbitofrontal cortex, inhibiting the regulatory capacity of the dorsolateral area, and impairing the usual complementary operation of the system as a whole. Indeed, a hypermetabolic orbitofrontal region would presumably disrupt normal cortical to amygdala inhibition, impairing the flexible regulation of emotions through reappraisal in 'cool' terms. A poorly regulated orbitostriatal system is apparently less efficient, sensitive, or available, and typically manifests as difficulties with emotion regulation (Evans et al., 2004). Consequently, the anxiety response to minimal, yet significant stimuli, would become more intrusive and chronic, and more difficult to suppress automatically. While speculative, this notion is congruent with basic OCD presentation, which typically involves an enhanced potential for becoming aroused, for exaggerated and inappropriate emotional reactions to minimal stimuli, and for problems in the natural inhibition of repetitive thoughts and actions (Mataix-Cols et al., 2003; Rosenberg et al., 1997. It becomes clear, then, how hyperactivation of the orbitofrontal area, a region that directs flexible re-appraisal and control of motivationally significant stimuli and behaviour (Zald & Kim, 1996; Rolls, 2004), may lead to these intrinsic impairments.

Perhaps predictably, the relatively infrequent use of 'hot' executive tasks tapping into these functions has provided more consistent evidence for neuropsychological impairment in OCD. For example, patients with the disorder appear to show difficulty inhibiting prepotent responses on response inhibition tasks (Rosenberg, Dick, O'Hearn & Sweeny, 1997; Bannon et al., 2002), and reveal set-shifting deficits during Object Alternation (Abbruzzese, Bellodi, Ferri & Scarone, 1995). Furthermore, performance on both of these orbitofrontal tasks appears to be linearly related to OCD symptom severity (e.g. Gross-Isseroff et al., 1996). The selectivity of this orbitofrontal deficit is further

emphasised by findings suggesting that performance on these tasks also distinguishes patients with OCD from those with schizophrenia, major depression, and panic disorder, as well as healthy controls (Abbruzzese et al., 1995; Cavedini, Ferri, Scarone & Bellodi, 1998).

4.1.4 The importance of salience

It is widely accepted that OCD as a diagnostic category entails vast heterogeneity. Patients display a variety of obsessions (e.g. contamination, harm to self or loved one, concerns with symmetry, order or exactness) and compulsions (e.g. checking, washing, ordering, repeating and counting rituals) and, furthermore, symptom themes can change over time. Given these features, some authors (e.g. Moritz, Jacobsen, Kloss et al., 2003; Tallis, 1992) have questioned the validity of a general executive deficit in the disorder. However, the orbitofrontal area responds according to the personal significance of stimuli, not according to its basic characteristics. Thus, any situation or stimulus that has strong negative personal salience will result in comparable orbitofrontal hyperactivation across individuals with differing OCD presentations, accommodating the variability of obsessive-compulsive symptomatology.

In line with this, the use of personally relevant stimuli, tailored to a patient's idiosyncratic obsessional concerns, may prove to be an especially useful means of examining 'hot' executive dysfunction in OCD. Indeed, appraisal of the significance of stimuli in OCD is crucial to their effect (Rowa & Purdon, 2003; see Chapter Three). In this manner, the personal relevance of stimuli is likely to influence their impact, potentially amplifying or attenuating a patient's ability to reinterpret information with less affective charge. It is reasonable to expect, therefore, that increased salience may lead to increased orbitofrontal activation and, in turn, greater hot executive impairment.

Accordingly, inconsistencies in the neuropsychological literature have often arisen from adding an element of personal relevance to dorsolateral prefrontal measures, effectively implicating 'hot' executive functioning during the completion of traditionally 'cool' tasks. For example, Foa et al. (1993) administered a modified Stroop task to OCD patients with and without washing rituals, and healthy controls. Results indicated that, compared to non-washers and controls, washers evidenced longer latencies, and therefore greater interference, for colour naming personally relevant contamination words. These differences between washers and non-washers arose despite the fact that both groups had equivalent symptom severity, as well as comparable scores on anxious and depressive symptomatology. Furthermore, several studies have confirmed that if ecologically valid, personally threatening stimuli are used, a memory bias in OCD is strong and detectable using either free recall (Radomsky & Rachman, 1999; Radomsky, Rachman & Hammond, 2001) or recognition tests (Ceschi, Van der Linden, Dunker, Perroud & Bredart, 2003).

While it appears crucial to consider personal relevance, tailoring stimuli to each patient's concerns is not a straightforward matter; material must be compiled carefully due to the complex and highly idiosyncratic nature of obsessional fears. For example, an individual with OCD may have a fear of blood-transmitted diseases, while another may have concerns about asbestos. Despite their differing presentations, and likely accompanying compulsions, both patients could be classed within the same contamination OCD subtype. As such, merely tailoring stimuli to the subtype level of specificity may well not be sufficient to trigger obsessive-compulsive concerns. Furthermore, although idiographic stimuli can potentially increase the relevance of the task used, researchers need to be mindful of the fact that participants are not exposed to the same stimuli, decreasing internal validity.

Although heterogeneity in OCD presentation undoubtedly complicates matters, other difficulties can also arise in neuropsychological research with patients. Factors relating to comorbidity issues, medication/treatment status and history, as well as differential age of OCD onset, could all influence task performance. For example, early onset may be associated with more pronounced executive dysfunction (Greisberg & McKay, 2003), as treatment and follow-up studies report that, independent of the length of illness, age of onset is one of the most consistent predictors of poorer pharmacological response and prognosis in OCD (Skoog & Skoog, 1999).

Different putative approaches can be adopted to overcome the aforementioned confounding factors, one of which involves the use of non-patient samples. Ritualistic behaviour and anxiety symptomatology are normally occurring phenomena in childhood, (Evans et al., 1997; Zohar & Felz, 2001; see Chapter Two) and parallels have been drawn between certain aspects of normative development and the cognitive-behavioural features of OCD (Evans et al., 1999; Werner, 1948; see Chapter Three). Moreover, beyond any phenomenological commonalities, normative and pathological obsessive-compulsive behaviours may also share some fundamental neurobiological underpinnings (Bolton, 1996). In line with a developmental psychopathology approach, addressing this issue of continuity is likely to be important as the study of OCD may be greatly informed by research concerning typical developmental patterns in hot executive functioning and its possible associations with obsessive-compulsive symptomatology. Thus, a typically developing analogue may provide a valid model for understanding the neurobiological basis of OCD in childhood, with the potential benefit of overcoming some of the methodological problems associated with the use of clinical samples.

4.1.5 Development of orbitofrontal cortex and hot executive functioning in typical childhood

As previously discussed, the orbitofrontal cortex is activated by problems that are characterised by high emotional salience, or that require the flexible appraisal of the affective significance of stimuli (Rolls, 2004). However, relatively little is known about the development of 'hot' executive functioning in childhood, as research has tended to focus on the cognitive aspects of executive functioning, associated with dorsolateral prefrontal cortex. Nevertheless, the little research that has been conducted suggests that the development of effective hot executive functioning continues across a wide age span, in line with the protracted maturation of the frontal lobes (Zelazo & Müller, 2002).

Marked developmental gains have been reported in the ability to regulate emotions, inhibit impulses, delay gratification, and suppress behaviours associated with punishment throughout childhood, with improvements often continuing into early adulthood. At around age 3, children begin to perform successfully on object reversal tasks, learning to select a previously unrewarded stimulus that becomes paired with a reward (Overman, Bachevalier, Schuhmann & Ryan, 1996). At this age, children also begin to develop the ability to inhibit prepotent responses (Geradi-Caulton, 2000), and can control distress more efficiently (Overman, Bachevalier, Schumann & McDonald-Ryan, 1997). These emerging capabilities are thought to reflect an equivalent growth spurt in the orbitofrontal region at 2-3 years of age (Chiron et al., 1997). The continued maturation of this prefrontal area is reflected in improvements in response inhibition throughout childhood, often continuing up to the age of 20, regarding Go/No-go performance (Band et al., 2000; Williams et al., 1999), respectively.

It appears, then, that the hot executive difficulties of young children, due to orbitofrontal immaturity, mirror those associated with orbitofrontal hypermetabolism in

OCD. Furthermore, maturation of the orbitofrontal region across childhood is associated with a decrease in anxiety and the performance of normative compulsive-like behaviours (Evans et al., 1997), analogous to the improvement in symptoms associated with baseline activity normalisation in OCD (Baxter et al., 1992; Swedo et al., 1992). Thus, an increasing ability to effectively regulate emotions across typical development may similarly reduce affective responding to anxious stimuli, and the resulting urge to rigidly perform rituals. In this way, while younger children may generally need to expend more effort to reappraise anxiety-provoking situations in cool terms, older children and adults, with more effective and automatic regulatory capacities, may only typically need actively to recruit cool self-control under highly anxious conditions (Lewis & Steiben, 2004). In support of this, while the orbitofrontal area is relatively less active during neutral conditions, this brain region is activated during OCD symptom-like anxiety in non-clinical adult participants (Mataix-Cols et al., 2003). Moreover, undergraduate college students scoring in the top 2% on the Maudsley Obsessive Compulsive Inventory display significant impairment during Object Alternation compared to controls and individuals reporting symptoms of schizotypy (Spitznagel & Suhr, 2002).

In typical childhood, Mischel and colleagues (Mischel, Shoda, & Rodriguez, 1989) report that children's ability to postpone immediate reward during a hot executive task relates to their ability to cope with stress or frustration. More direct evidence for an association between neuropsychological performance and obsessive-compulsive symptomatology in typical childhood has come from Evans and colleagues. In these studies, children were given a series of computer-generated tasks assessing set-shifting and response inhibition, and it was found that impaired performance related to the frequency and intensity of compulsive-like behaviours (Evans & Iobst, 2003a, 2003b). This led Evans to suggest that the underlying executive functions that appear to play a role in OCD

presentation may be similarly compromised in the display of normative compulsive-like behaviours. In this way, an inability to effectively regulate emotions, and the display of compulsive-like behaviour across typical development, may become increasingly associated with orbitofrontal dysfunction, similar to pathological OCD.

4.1.6 Rationale and overview

As noted above, previous studies of the role of executive functioning in anxiety have been limited by a lack of distinction between hot and cool executive functioning and their corresponding neural systems. Previous research on executive functioning and anxiety has been largely restricted to work with adult samples, and to tasks associated with dorsolateral rather than orbitofrontal neural systems. The principal aim of the study reported in this chapter was to investigate relations between hot and cool executive functioning and the experience of anxiety and ritualistic behaviour across typical childhood. A developmental psychopathological approach was adopted, assuming continuity between behaviour in the normal range and OCD. Drawing on previous work (Zelazo & Müller, 2002) on the development of hot and cool executive functioning in typical childhood, tasks were selected on the basis of their specificity for particular neural systems (i.e. orbitofrontal or dorsolateral). This study also aimed to determine whether adding an element of personal salience to hot executive tasks can influence performance.

The study was conducted in two phases. In the first phase, age changes in executive functioning were investigated in relation to anxiety and ritualistic behaviour in a sample of typically developing children. The second phase involved the selection of children who, in the first phase, had reported a high-intensity fear or worry whose content could readily be depicted pictorially. These children then completed 'hot' executive tasks modified to

involve highly personally salient anxiety-related stimuli. Additionally, participants were also required to complete three standardised questionnaires relating to anxiety and/or ritualistic behaviour in the second phase. Although not directly related to the aims of the present study, the purpose of this exercise was to collect further validation for the Fears, Worries and Ritualistic Behaviours Interview.

Based on the findings of previous research, the following hypotheses were investigated. For the sample studied in the first phase, it was predicted that executive function would improve with age on both hot and cool tasks (Hypothesis 1). Children scoring higher on the fear, worry and ritualistic behaviour measures were predicted to perform more poorly on hot executive tasks, with no difference in cool task performance (Hypothesis 2). With regard to the salience-manipulation sub-sample studied in the second phase, it was again predicted that executive task performance would improve with age (Hypothesis 3), and that performance would relate to anxiety and rituals (Hypothesis 4). Executive task performance in the high-salience condition of the task was predicted to be worse than in the neutral condition (Hypothesis 5). It was predicted that this salience-related deficit in performance would be particularly strong for children scoring highly on the anxiety and ritual measures (Hypothesis 6).

4.2 Method – Phase 1

4.2.1 Participants

Participants were recruited following parental consent from a school in North-East England. The sample included 83 children aged between 11 and 16 years, divided into two age groups: 11-13 years (N = 40, M = 11.7 years, SD = .55, 21 girls) and 14-16 years (N = 43, M = 15.1 years, SD = .52, 23 girls). The proportion of pupils eligible for free school meals ranged from broadly in line with the national average, to above average. Only 3% of

children were from minority ethnic groups, and all participants spoke English as a first language.

In terms of the justification for including this age-range in the present sample, it was felt that the salience manipulation in Phase 2 (see below), whereby children were presented with photographs of a personally salient fear/worry, may have been potentially less tolerable for younger children. Previous neuropsychological research has also reported significant differences in age-related performance between 11 and 17 years (e.g. Hooper et al., 2004; Welsh, Pennington, & Grossier, 1991), providing a further rationale for this developmental epoch. Age groupings follow Hooper et al. (2004). Ethical approval for this study was granted by the University of Durham Ethics committee (related documentation can be found in Appendix 7)

4.2.2 Measures

The Fears, Worries and Ritualistic Behaviours Interview (FWRBI), as outlined in Chapter Two, was administered to determine the content and intensity of children's anxieties and rituals. In brief, participants had the opportunity during this semi-structured interview both to self-generate their concerns and to respond to closed-response lists of common fears, worries and ritualistic behaviours. Children rated the intensity of their concerns and behaviours on 4-point Likert-type scales, with higher ratings representing increased anxiety/incidence of ritualistic behaviour.

For the purpose of the current study, the researcher asked participants to elaborate on any fears or worries reported with the greatest intensity to enable a full and detailed understanding of this concern (e.g. Can you tell me a little more about that? What it is exactly that scares you/worries you about...?). These fears of worries could be either self-generated or from the closed-response lists, as analogous to the idiographic approach used

in Chapter Three, it was the intensity of the fear /worry that was the primary criterion for comparison, as opposed to the content. It was also ensured that participants were comfortable discussing their concerns in greater detail to minimise potential distress. For example, children were asked, "Can we talk a little more about your fear of...." All participants were reassured that if they did not want to discuss anything further it was perfectly acceptable. Overall fear, worry and ritual intensity scores were calculated by summing the responses for each item on each closed-response scale. Participants were also administered the Vocabulary and Matrix Reasoning sub-tests from the Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999) according to the standardised instructions supplied. Full-scale IQ was obtained by collating performances on each sub-test.

4.2.3 Rationale for the selection of neuropsychological tasks

Reports of selective orbito-frontal-striatal irregularities, as opposed to general executive dysfunction in OCD (e.g. Baxter et al., 1987; Rauch et al., 1994), combined with Zelazo & Mueller's (2002) work regarding the typical development of 'hot' and 'cool' executive functioning in childhood motivated the decision to examine orbitofrontal (hot) versus dorsolateral (cool) executive performance in the current study. This required the selection of relatively functionally specified tasks that were developmentally appropriate for the age range of participants (11-16 years). The notion of functional specialisation has not currently been widely investigated within either the adult or developmental literature. Furthermore, the child literature that has made this distinction has typically involved children younger than the age range included in the current study (e.g. Evans & Iobst, 2003a, 2003b; Zelazo & Muller, 2002). Consequently, the range of tasks available for selection was relatively limited.

The Wisconsin Card Sort Test (WCST) was selected to assess 'cool' executive functioning based on its suitability for use with children aged 11-16 years (e.g. Romine et al., 2004) as well as evidence to suggest that performance on this task is most affected by dysfunction of dorsolateral prefrontal cortex circuits (Goldberg & Weinberger, 1990). Furthermore, Evans & Iobst (2003) used a simplified version of this task with 6-11 year olds to investigate set-shifting in relation to the performance of compulsive-like behaviours, providing some opportunity for replication and extension. There is also evidence from the adult literature to suggest that patients with OCD commonly display intact performance on this task (Abbruzzese et al., 1995, 1997; Cavedini et al., 2002), further supporting the use of the WCST as a comparison against 'hot' orbitofrontal executive functioning tasks.

The OAT and Go/No-go tasks were chosen as measures of 'hot' executive functioning as based on previous use in the developmental empirical literature, both were judged as suitable to be used with children within the current study's age range (e.g. Hooper et al., 2004; Overman, 2004) and are purported to selectively tap into orbitofrontal functioning (e.g. Zelazo & Muller, 2002). There is also strong evidence that individuals with OCD display impaired performance on these tasks, providing further evidence for functional specificity. In terms of the OAT, Abbruzzese, Bellodi, Ferri & Scarone (1995) compared patients with OCD, patients with schizophrenia and healthy controls on a neuropsychological battery sensitive to frontal lobe functioning. Patients with OCD displayed a specific deficit only on the OAT compared to those with schizophrenia and those without clinical diagnoses. Impaired performance on the OAT also distinguishes patients with OCD from patients with major depression (Cavedini, Ferri, Scarone & Bellodi, 1998), and deficits appear to be linearly related to OCD symptom severity (e.g. Gross-Isseroff et al., 1996). Regarding Go/No-go, response inhibition deficits have been

reported in both treatment naïve, recent onset paediatric patients with OCD (Rosenberg, Dick, O'Hearn & Sweeny, 1997) and adult patients with the disorder (Bannon et al., 2002). Significant correlations between obsessive-compulsive symptom severity and children's inability to suppress automatic responses have also been described (Cox, 1997).

Although both the OAT and Go/No-go are thought reliably to assess orbitofrontal functioning, the decision to use two tasks was made to ensure that differing expressions of orbitofrontal functioning were measured, given the expected central role of the OFC in the presentation of obsessive-compulsive symptomatology. Indeed, performance on neuro-psychological tasks is typically not perfectly correlated, and OAT and Go/No-go vary in levels of difficulty (with Go/No-go being more complex), which could obviously influence performance. Given the novelty of the current study, it is unknown whether these differing orbitofrontal tasks similarly relate to anxiety and ritualistic behaviour in typically developing children, or whether these relations vary as a function of developmental level.

4.2.4 Neuropsychological measure of 'cool' dorsolateral executive functioning

The computerised version of the Wisconsin Card Sorting Test (WCST, Psychological Assessment Resources, 2003) was used to assess dorsolateral prefrontal cortex functioning. This task is a measure of set shifting, and represents the ability to form abstract, logical concepts, and then to maintain and shift these cognitive sets.

Administration of the WCST followed conventional, standardised instructions. To complete the task, participants were required to sort cards based on colour, shape and number of geometric forms, and to learn new rules as the task proceeded, altering their responses accordingly. The task was presented according to the standardised instructions supplied. Sorting rules were not communicated, but participants were told on the computer screen whether a match was correct or incorrect. Performance was determined by the

number of perseverative errors made during the task (i.e. when the participant inflexibly persisted with a previously successful rule that was now incorrect). The task took typically 12-20 minutes to complete.

4.2.5 Neuropsychological measures of 'hot' orbitofrontal executive functioning – standard versions

Two different computerised executive tasks were used to tap into orbitofrontal executive functioning: the Object Alternation Task (OAT) and the Go/No-go task. The OAT measures a distinct aspect of set-shifting, behavioural reversal, in which a rule is learnt and then subsequently needs to be inhibited and reversed to maintain good performance. The Go/No-go task is a measure of response inhibition, tapping into the cognitive processes that enable executive control over pre-potent motor responses according to changing situational demands (Aron et al., 2003).

Participation in the OAT involved viewing two 'magic cups' situated side by side on the computer monitor. Participants were told that the computer had 'hidden' a coin in one of the cups, and were instructed to locate the coin over repeated trials. The position of the coin alternated between the two cups across trials. If the participant chose the correct location, the coin shifted to the previously unoccupied cup during the next trial. If the wrong location was chosen, the coin remained under the same cup until the correct choice was made. Verbal instructions were given as follows:

> *"I would like you to look at the two magic cups that are on the screen in front of you. Hidden inside one of these cups is a pound coin and it is your job to choose which cup the coin is under. You can point to the cup you think the coin is under by using your finger on the mouse here (experimenter points to*

mouse on keyboard) to move the arrow. You then press this button (experimenter points to button) to choose the cup. I would like you to keep trying to find pound coins under the cups until the computer tells you to stop. Do you understand? You can start now."

Performance on the OAT was determined by the number of trials required to realise the above pattern (i.e. that once the coin was found, it would shift to the alternate cup on the next trial). The participant received immediate feedback from the computer regarding the accuracy of their response in the form of abstract reward and punishment cues (i.e. the following messages appeared accordingly on the computer screen: "YOU ARE RIGHT" or "YOU ARE WRONG".) Criterion on the task was reached when participants correctly predicted coin location on 12 consecutive trials. A low score therefore indicated superior performance. The score of participants who failed to induce the solution was set to 50, the standard number of maximum trials (see Freedman et al., 1998). Time to complete this task typically ranged from 5-10 minutes.

The Go/No-go task had two stages of participation. For the first stage, participants viewed a series of identical, neutrally valenced photographs of a wooden chair presented at random locations on the computer monitor. Participants were asked to press the space bar as quickly as possible every time a photograph of a wooden chair was displayed on screen. For the second stage, participants were required to press the space bar as quickly as possible when a neutrally valenced photograph of a metal spoon was displayed, and now to withhold this response when the wooden chair appeared on screen. Each photograph was presented for 250ms, with a 1000ms interstimulus interval. Participants therefore had to inhibit the tendency they developed during the first phase to respond to a wooden chair. Verbal instructions were given as follows:

First stage:

"For this task, I would like you press the space bar as fast as you can when you see a picture of a wooden chair on the screen. You can start now".

Second stage:

"Now, what I would like you to do is ONLY press the space bar when a picture of a metal spoon comes on the screen. You must press the space bar as fast as you can. DO NOT press the space bar when you see the picture of the wooden chair. Points will be taken off if you do. Remember: only press the space bar when a picture of a metal spoon comes on screen. Do you understand? You can start now".

Performance was analysed as the percentage of commission errors for No-go stimuli (i.e. percentage of times the space bar was incorrectly pressed during the second phase of testing). Participation time was typically 10 minutes.

4.2.6 Procedure

Participants were tested individually, in a separate room away from the main classroom, in school. Standardised instructions explained the aim and content of the procedure. It was emphasised that it was acceptable to withdraw from the study at any time. Children were also encouraged to ask questions if they did not understand, and it was stated that the researcher would attempt to explain more clearly if this was the case. Once assent was received (no objections were given), the procedure commenced.

The Fears, Worries and Ritualistic Behaviours Interview was presented initially, followed by the WASI. The executive functioning tasks were then completed in a

randomised order across participants. The whole procedure lasted approximately 45 minutes. Following formal participation, children were thanked for taking part and asked if they had any questions.

4.3 Method - Phase 2

4.3.1 Participants

A sub-sample of forty children were recruited from Phase 1 of the study. The current sample was similarly divided into two age groups: 11-13 years (M = 11.7, SD = .48, N = 20, 11 girls) and 14-16 years (M = 14.9, SD = .47, N = 20, 13 girls).

To be selected for Phase 2 of the study, participants were required to have reported at least one highly salient fear or worry (rated with a '3') that could be pictorially represented and that they were comfortable talking about (i.e. children were asked: *'Can you remember the last time I saw you we were talking about the things you are scared of and the things that you worry about? You told me that you were particularly scared of/worried about (INSERT SALIENT FEAR OR WORRY). Would it be OK to talk about that a little more today?'*). As the main goal of this stage of the study was to determine whether increasing the personal relevance of stimuli impairs 'hot' executive performance, highly salient concerns that could not be represented in picture form were obviously not viable.

4.3.2 Generation of idiosyncratic, personally salient stimuli and requirements for further participation

Information collected during the Fears, Worries and Ritualistic Behaviour Interview formed the basis for collection of idiosyncratic, concern relevant stimuli for each participant. On the basis of this information, the researcher then gathered photographs to

represent this concern pictorially. Photographs used typically came from the International Affective Picture System, a bank of emotionally valenced stimuli with norms available corresponding to the mean ratings of 10-12 and 13-14 year old children. To minimise the chances of possible distress, only pictures with moderately negatively normed values were used; the purpose of using these stimuli was to increase the salience of the manipulated task, not to generate negative affect. A number of photographs were collected to represent each participant's reported anxiety. Given the heterogeneity of anxious concerns, this measure was taken to increase the likelihood of presenting stimuli that accurately reflected a participant's specific fear or worry. Thus, a participant reporting a fear of spiders during Phase 1, for example, was asked to provide further details regarding the specific type of spiders he/she found most problematic (e.g. tarantula, big, small, long legs, etc.). Following this session, a range of spider photographs matching these details would be collected and collated together and then presented to the participant during Phase 2. Children were repeatedly asked throughout the procedure whether they were happy to continue. The researcher also monitored participants' emotional status via observation. In the event that a child became distressed during this procedure, it was arranged that children would be taken to the head of year's office to regain composure before returning to class. None of the participants required the use of this safeguard procedure.

At the beginning of Phase 2 participation, it was explained:

"Can you remember the last time I saw you we were talking about the things you are scared of and the things that you worry about? You told me that you were particularly scared of/worried about (INSERT SALIENT FEAR OR WORRY). *Would it be OK to talk about this a little more today?*

If the participant agreed to this request (all participants assented), it was then explained:

> *"I have some photographs here that show your fear/worry. Would you feel OK to take a look at them and tell me what you think?"* (All children assented to this.)

The researcher then showed a collection of 5-6 photographs collected prior to testing that depicted the child's anxiety). To further ensure specificity, participants were then asked:

> *"Do any of these pictures remind you of your fear/worry? Can you choose the photograph that is most similar to your fear/worry?"* and asked a range of other questions regarding this photograph (see below).

If the participant had reported a number of intense fears/worries during Phase 1, then this procedure was repeated for each item. Four-point Likert-type scales were used to anchor responses to the questions below, with 0 = Not at all, 1 = A little, 2 = Quite a lot, and 3 = Very much.

- *How much does this picture remind you of/make you think about your fear/worry?*
- *Do you feel scared/worried when you look at this picture?*
- *Would you feel scared/worried if you were close to it/if you thought that was going to happen to you?*
- *Can you let me know on this scale how scared you are/how worried you feel when you see this picture and think about (INSERT SALIENT FEAR/WORRY)?*

Exposing participants to ecologically valid, concern relevant stimuli in this manner is apparently very effective in triggering obsessive-compulsive symptomatology (Schienle, Schafer, Stark, Walter & Vaitl, 2005). It is expected that checking how representative each photograph is for the participant, as well as asking them to describe the anxiety they feel towards the stimuli, will have further ensured this process. For example, Metcalfe & Mischel (1999) propose that hot feelings and reactions can be readily evoked through thinking and fantasy, as well as through emphasising the affective aspects of a stimulus/situation. In contrast, presenting a picture alone without evoking such accompanying mental imagery is likely to enhance purely informative cool features (e.g. shape and size). Thus, asking participants to visualise their anxiety in association with a stimulus was expected to add an effective element of personal relevance.

In line with this reasoning, participation only continued beyond this point if the pictorial representation produced satisfactorily mirrored the participant's fear or worry. This involved the photograph being given a rating of at least 2 (out of 3) on all of the questions above (3 participants from the lower age group and 4 from the upper were excluded from further participation on this basis). In the case of multiple intense anxieties, the stimuli that received the most intense scores overall on each of the above indices was used for the remainder of the procedure. If these criteria were met, children were then asked to assent to further participation:

> *"If it's OK, now I would like you to do some tasks for me on the computer. Would that be all right? Remember, if you want to stop at any time and go back to your class just let me know"* (All children opted in).

After ensuring that the participant was seated directly in front of the computer screen, the first personally salient 'hot' task was loaded. This could be either object

alternation or Go/No-go as completion order was random. Prior to presentation on screen, the researcher inserted the photograph identified by the child as being most salient into the computer program as a stimulus. Further details regarding the manipulation of each task are outlined below.

4.3.3 Personally salient object alternation task

The manipulation of this task involved replacing the coin that participants were required to locate during the standardised version into the photograph they identified as best representing their most intense fear or worry. Thus, participants were required to search for a stimulus they associated with a personally salient anxiety, challenging the natural avoidance response. The participant again received immediate abstract feedback regarding the accuracy of their choices from the computer. However, in this version of the task, incorrect responses were followed by the message "YOU ARE SAFE" (as opposed to "YOU ARE WRONG"), while correct responses, revealing the anxiety-provoking stimuli, were followed by "YOU ARE IN DANGER" (as opposed to "YOU ARE RIGHT". The rationale behind this was that incorrect responses allowed the participant to seemingly 'avoid' the aversive stimuli, promoting 'safety', whereas correct responses required participants to 'confront' their fear or worry, involving an aspect of virtual 'danger'. Verbal instructions are below:

> "*I would like you to look at the two magic cups that are on the screen in front of you. Hidden inside one of these cups is (INSERT PARTICIPANTS SALIENT FEAR/WORRY). It is your job to choose which cup the (INSERT FEAR/WORRY) is under. You can point to the cup you think the (INSERT FEAR/WORRY) is under by using your finger on the mouse here (experimenter points to mouse on keyboard) to move the arrow. You then*

press this button (experimenter points to button) to choose the cup. I would like you to keep trying to find the (INSERT FEAR/WORRY) under the cups until the computer tells you to stop."

4.3.4 Personally salient Go/No-go

Presentation of this task remained similar to the standard version. However, in this case participants were asked to press the space bar as quickly as possible every time the identified photograph of their anxiety was displayed on screen. For the second stage of the task, participants were asked instead to press the space bar when a photograph of a neutral stimulus (a metal spoon) was displayed on screen, and to withhold this response when the photograph of their anxiety was displayed. In this way, participants were required to inhibit the prepotent (and repetitive) response developed during the first phase of pressing the space bar when their personally salient stimulus appeared on screen. Verbal instructions are below:

First stage:

"*For this task, I would like you press the space bar as fast as you can when you see a picture of a (INSERT FEAR/WORRY). You can start now.*"

Second stage:

"*Now, what I would like you to do is ONLY press the space bar when a picture of a metal spoon comes on the screen. You must press the space bar as fast as you can to win. DO NOT press the space bar when you see the picture of a (INSERT FEAR/WORRY). Points will be taken off if you do. Remember; only press the space bar when a picture of a metal spoon comes on screen. Do you understand? You can start now.*"

4.3.5 Standardised measures

An additional aim of Phase 2 was to collect further validation for the Fears, Worries and Ritualistic Behaviours Interview. Thus, participants completed three standardised questionnaires relating to anxiety or ritualistic behaviour following conclusion of the hot executive tasks to enable the calculation of convergent validity estimates for each index of the Fears, Worries and Ritualistic Behaviours Interview. These questionnaires are outlined below.

Penn State Worry Questionnaire for Children (PSWQ-C: Chorpita, Tracey, Brown, Collica & Barlow, 1997): The PSWQ-C is a 14-item self-report measure suitable for use with children and adolescents between the ages of 6-18 years and possesses favourable reliability and validity (including good convergent and discriminant validity) (Chorpita, et al., 1997). Significantly higher scores have been found in children with generalised anxiety disorder compared to children with other anxiety disorders and typically developing children (Chorpita et al., 1997). Items are rated on a 4-point Likert Scale, scored from 0-3, resulting in a possible range of total scores from 0-48. Higher scores reflect a greater degree of worry.

Screen for Child Anxiety Related Emotional Disorders – Revised (SCARED-R: Muris, Merckelbach, Schmidt, & Mayer, 1998): The SCARED-R is a self-report questionnaire measuring DSM defined anxiety disorders symptoms that can be completed by children from age 7. The scale contains 66 items measuring symptoms of separation anxiety disorder (12 items; e.g. 'I don't like being away from my family'), generalised anxiety disorder (9 items; e.g. 'I worry about things working out for me'), panic disorder (13 items; e.g. 'I am afraid of having panic attacks'), obsessive-compulsive disorder (9 items; e.g. 'I have thoughts that frighten me'), post-traumatic stress disorder (4 items; e.g.

'I have frightening dreams about a very aversive event I once experienced'), social phobia (4 items; e.g. 'I don't like to be with unfamiliar people'), and specific phobia (i.e. animal phobia, 3 items; e.g. 'I am afraid of an animal that is not really dangerous'; situational-environmental phobia, 5 items (e.g. 'I am afraid of the dark'); and blood-injection-injury phobia, 7 items (e.g. 'I am afraid to go to the dentist'). Children and adolescents are required to indicate how frequently they experience each symptom on a 3-point scale. SCARED-R total and subscale scores are obtained by summing across relevant items, with higher scores reflecting higher levels of anxiety symptoms.

Short Leyton Obsessional Inventory for Children (SLOI-CV: Bamber, Tamplin, Park, Kyte, & Goodyer, 2002). The SLOI-CV is a psychometrically sound, quick, 11-item economical screening tool that discriminates OCD cases from noncases irrespective of comorbid major depressive disorder (Bamber et al., 2002). Respondents self-report on obsessive-compulsive symptoms present over the past 2 weeks. Items are scored using a 4-point measure of symptom frequency, with higher scores indicating greater severity.

4.3.6 Procedure

The overall procedure for Phase 2 (involving administration of the personally salient OAT and Go/No-go, as well as the three standardised questionnaire detailed above) took place individually exactly two weeks following initial participation within a private classroom in school. Standardised instructions explained the aim and content of the procedure. It was emphasised that it was acceptable to withdraw from the study at any time. Children were also encouraged to ask questions if they did not understand, and it was stated that the researcher would attempt to explain more clearly if this was the case. Once assent was received (no objections were given), the procedure commenced.

Initially, the personally salient photographs chosen to represent individual fears/worries were presented to ascertain relevance and specificity. If criteria were satisfied (as outlined previously), children were invited to complete the computerised executive tasks. Following this, participants completed the PSWQ-C, SCARED-R and SLOI-CV. Order of completion was randomised. The whole procedure of Phase 2 lasted approximately 45 minutes. Following formal participation, children were thanked for taking part and asked if they had any questions.

4.4 Results

4.4.1 Correlations among WCST, OAT, and Go/No-go performance

Correlations among task performance were calculated and can be seen in Table 4.1 (below). The matrix suggests that performance on the two tasks purported to tap into orbitofrontal executive functioning (OAT and Go/No-go) is significantly related among the older age group, but not among younger children. Performance on the dorsolateral functioning task (WCST) does not correlate with either of the orbitofrontal tasks across the age ranges studied.

Table 4.1 Correlations among executive tasks according to age

		WCST	OAT
WCST	11-13 yrs		0.15
	14-16 yrs		-0.02
Go/No-go	11-13 yrs	0.06	-0.04
	14-16 yrs	0.27	0.36*

* $p < .05$

4.4.2 Age-related changes in executive task performance

Table 4.2 presents an overview of executive task performance according to Age and Gender. While Object Alternation (OAT) generates only one score, several indices are available to demonstrate performance on both the Wisconsin Card Sort (WCST) and Go No-Go. For the latter tasks, scores were chosen that most closely reflected perseveration. As previously mentioned, in the case of WCST, this was the perseverative error index, and errors of commission were used to illustrate Go/No-go performance. For each task, a lower score reflects less perseveration, and thus higher performance.

Table 4.2 Means and standard deviations of WCST, OAT and Go/No-go task performance by age group and gender

Age Group (years)	**Gender**	**WCST** Mean (*s.d.*)	**OAT** Mean (*s.d.*)	**Go/No-go** Mean (*s.d.*)
11-13	Girl	10.67 (*5.07*)	19.33 (*5.87*)	35.61 (*16.70*)
	Boy	8.84 (*3.66*)	17.74 (*3.84*)	36.91 (*17.39*)
	Total	9.80 (*4.50*)	18.58 (*5.01*)	36.23 (*16.83*)
14-16	Girl	10.96 (6.21)	21.52 (10.50)	19.41 (12.69)
	Boy	9.90 (4.64)	18.30 (5.78)	13.53 (8.39)
	Total	10.47 (5.50)	20.02 (8.69)	16.68 (11.18)

The executive functioning tasks were treated as a repeated measures variable in line with the reasoning that the dorsolateral prefrontal cortex (represented by WCST

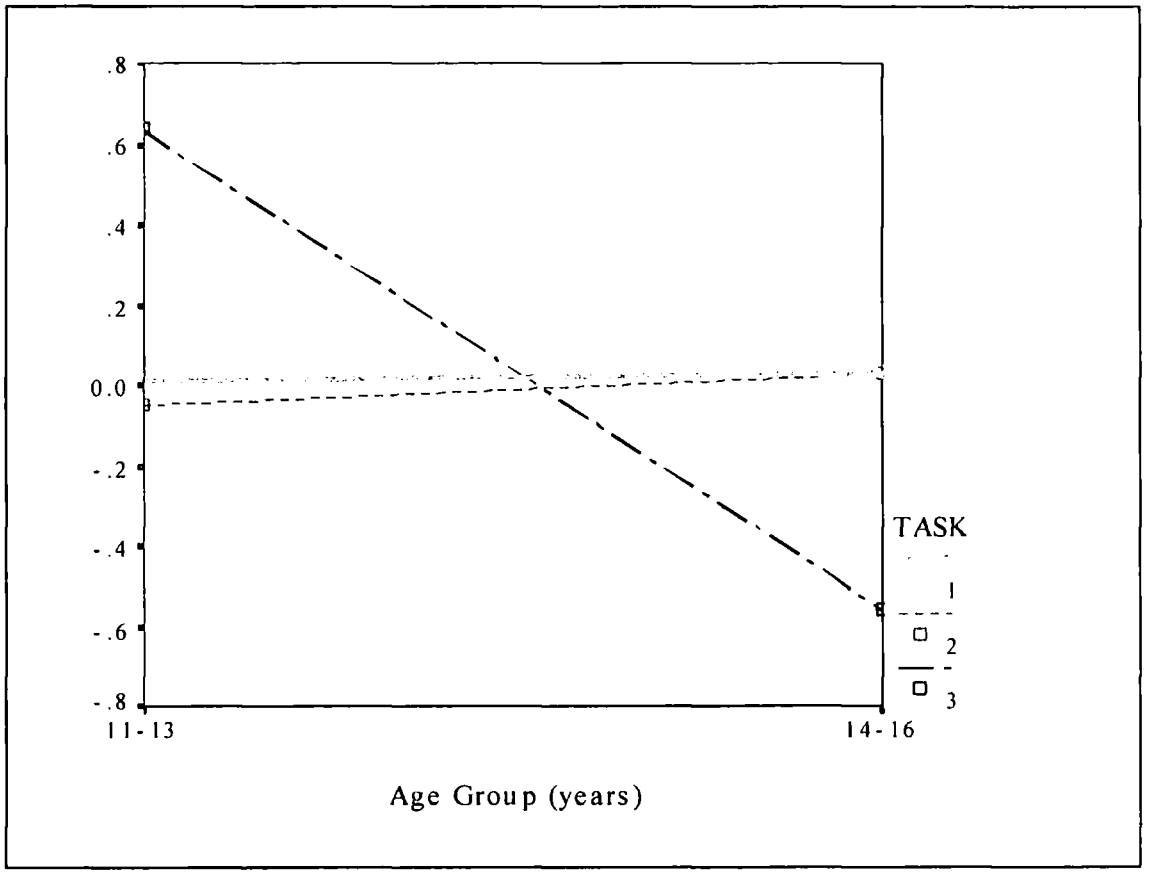
performance) and the orbitofrontal cortex (represented by OAT and Go/No-go performance function as interacting parts of the same system (the prefrontal cortex). However, these sub-systems may operate differently across development (e.g. as a function of maturation and/or task difficulty level), and according to gender. Repeated measures permits the examination of these interactions. As performance on each of the tasks was measured on differing scales (preventing relative comparability) scores were standardised using the Blom transformation. This procedure standardised the raw scores from each task, transforming each mean to 0, and the SDs to 1. As such, scores for each task became directly comparable to each other on the same scale. A consequence of this procedure, resulting from all mean scores being standardised to 0, is that any main effects are made redundant; only interactions are meaningful. Thus, interaction results will be emphasised in the following section.

A 2 (Age group: 11-13 and 14-16 yrs) x 2 (Gender) x 3 (Form of task) mixed analysis of co-variance, with repeated measures on the last variable, was performed on executive scores to further investigate possible group differences. IQ was included as a covariate. In line with the above rationale, although main effects of Form of task, $F(2, 156) = 10.05$, $p < .001$, $\eta^2 = .114$, observed power = .984, and Age group were found, $F(1, 78) = 7.70$, $p < .01$, $\eta^2 = .090$, observed power = .783, inspection of the means and a large Age group x Form of task effect, $F(2, 156) = 15.40$, $p < .001$, $\eta^2 = .165$, observed power = .999, suggested that this was an artefact of the interaction, and that improvement was uniquely due to better Go/No-go performance in the older group (see Figure 4.1).

While IQ did not have an overall effect on executive performance, $F(1, 78) = 1.87$, $p > .10$, $\eta^2 = .023$, observed power = .271, a Form of Task x IQ interaction was found, $F(2, 156) = 10.09$, $p < .001$, $\eta^2 = .115$, observed power = .984. Correlations suggested that

while lower IQ was associated with poorer performance on WCST, $r = -.38$, $p < .001$, it did not influence OAT, $r = .20$, $p > .05$ or Go/No-go performance, $r = -.11$, $p > .30$. No other interactions were significant, Fs between .30 and .89, η^2 between .004 and .011.

Figure 4.1 Performance on WCST (Task 1), OAT (Task 2) and Go/No-go (Task 3) according to Age Group



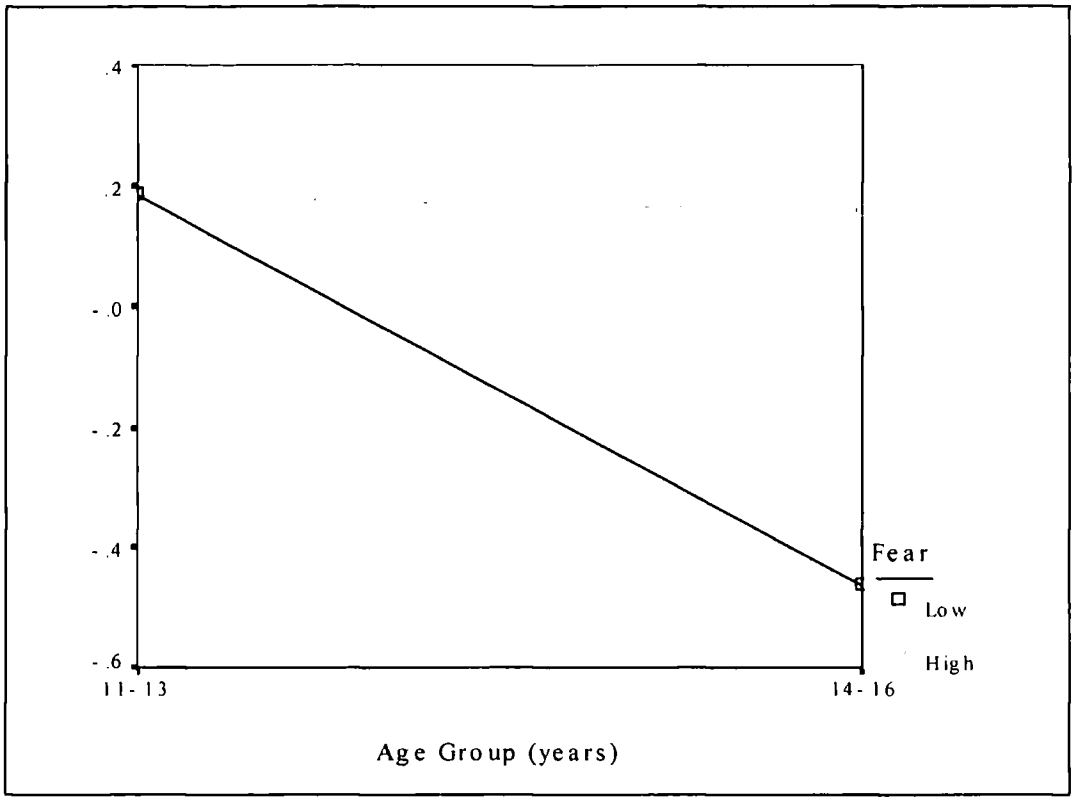
4.4.3 Do levels of anxiety or ritualistic behaviour relate to executive task performance?

To determine whether fear, worry, or ritualistic behaviour levels were associated with executive abilities (Hypothesis 2), participants were initially categorised in terms of low or high intensity for each of these constructs. Previous results have suggested that age and gender influence the intensity of anxiety and ritualistic behaviour in childhood (see Chapters One and Two). For example, a fear score judged as high intensity in older boys may be equivalent to a low intensity fear score in younger girls. Categorisation was

therefore more sensitively attained by initially partitioning the data file according to age group and gender, and then conducting median splits on fear, worry and ritualistic behaviour intensity scores (obtained by separately summing the closed-response item scores for the fear, worry and ritualistic behaviour scales included in the Fears, Worries and Ritualistic Behaviours Interview) to determine high and low intensity for each variable on this basis. Following this process, the ANCOVA reported in the previous section (see p.154 was repeated three times, with (in turn) the inclusion of Fear, Worry or Ritualistic Behaviour intensity categories as a between-subjects variable. As the effects of Age, Gender and Task have already been examined, only results involving Fear, Worry or Rituals will be reported.

Relations between Fear and executive task performance were examined by means of a 2 (Age group: 11-13 and 14-16 yrs) x 2 (Gender) x 2 (Fear category: High vs. Low) x 3 (Form of task) mixed ANCOVA, with repeated measures on the last variable and IQ as a covariate. A main effect of Fear was found, $F(1, 74) = 5.74$, $p < .05$, $\eta^2 = .072$, observed power = .657, which was due to an interaction between Age group and Fear, $F(1, 74) = 6.06$, $p > .05$, $\eta^2 = .076$, observed power = .680. This suggested that fearfulness only impaired performance among children in the older age group (see Figure 4.2), and was confirmed after repeating the analyses separately for each Age group: 11-13 yrs: $F(1, 35) = .010$, $p > .90$, $\eta^2 = .000$, observed power = .051; 14-16 yrs: $F(1, 38) = 11.31$, $p < .01$, $\eta^2 = .229$, observed power = .906. The lack of any Form of task x Fear interaction revealed that fearfulness was associated with impaired performance in this age group across each of the three tasks, $F(2, 148) = .994$, $p > .35$, $\eta^2 = .013$, observed power = .221.

Figure 4.2 The effect of Fear on executive performance by age



A significant Age group x Gender x Fear interaction, $F(1, 74) = 7.16$, $p > .01$, $\eta^2 = .088$, observed power = .752, further suggested that this pattern may not be true for both males and females. Following examination of Gender x Fear interactions within each age group (see Figs. 4.3a and 4.3b), it was found that fearful 14-16 yr olds displayed equally impaired performance regardless of Gender, $F(1, 38) = 1.98$, $p > .15$, $\eta^2 = .049$, observed power = .278. While there was a trend towards higher fear exclusively weakening male performance in the 11-13 yr old group, $F(1, 35) = 4.61$, $p = .04$, $\eta^2 = .116$, observed power = .551, this effect was not conventionally significant following Bonferroni correction (alpha = .025). No other interactions were significant, Fs between .15 – 2.01, η^2 between .002 and .026.

Figure 4.3a The effect of fear on executive performance in 11-13 yr olds by gender

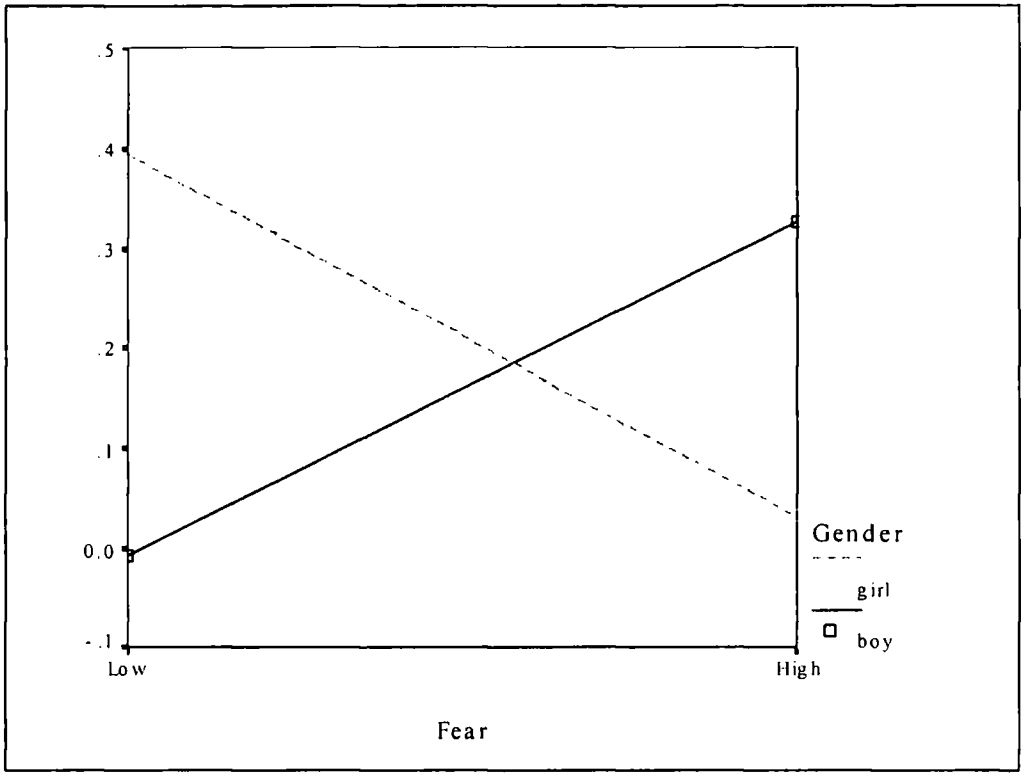
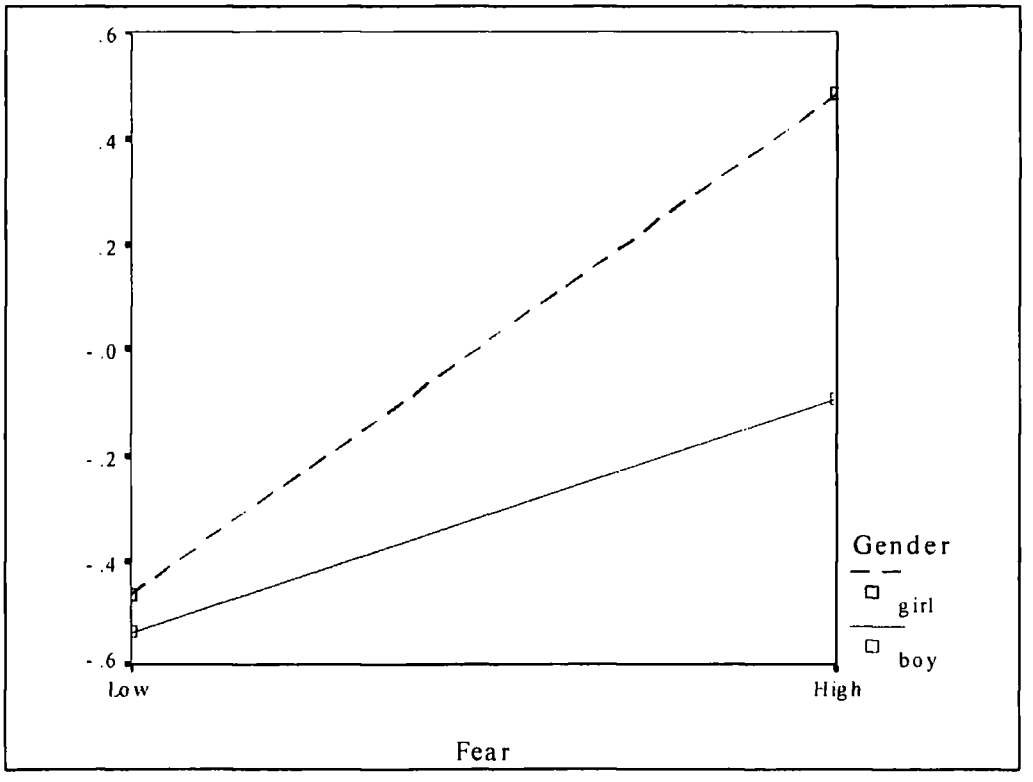


Figure 4.3b Relations between fear and executive performance in 14-16 yr olds by gender



Relations between worry and executive functioning task performance were examined by means of a 2 (Age group: 11-13 and 14 – 16 yrs) x 2 (Gender) x 3 (Form of task) x 2 (Worry category: High vs. Low) mixed ANCOVA, with repeated measures on the last two variables and IQ as a covariate. Worry was not associated with executive task performance, $F(1, 74) = 1.74$, $p > .15$, $\eta^2 = .023$, observed power = .256. No interactions were significant, Fs between .53 and 2.44, η^2 between .007 and .032.

The association between ritualistic behaviour and executive task performance was investigated through a 2 (Age group: 11-13 and 14 – 16 yrs) x 2 (Gender) x 3 (Form of task) x 2 (Ritualistic behaviour category: High, Low) mixed ANCOVA, with repeated measures on the last two variables and IQ as a covariate. The main effect of Ritualistic Behaviour was not significant, $F(1, 74) = 3.10$, $p > .05$, $\eta^2 = .040$, observed power = .413. There were no interactions, Fs between .42 – 2.37, η^2 between .006 - .031.

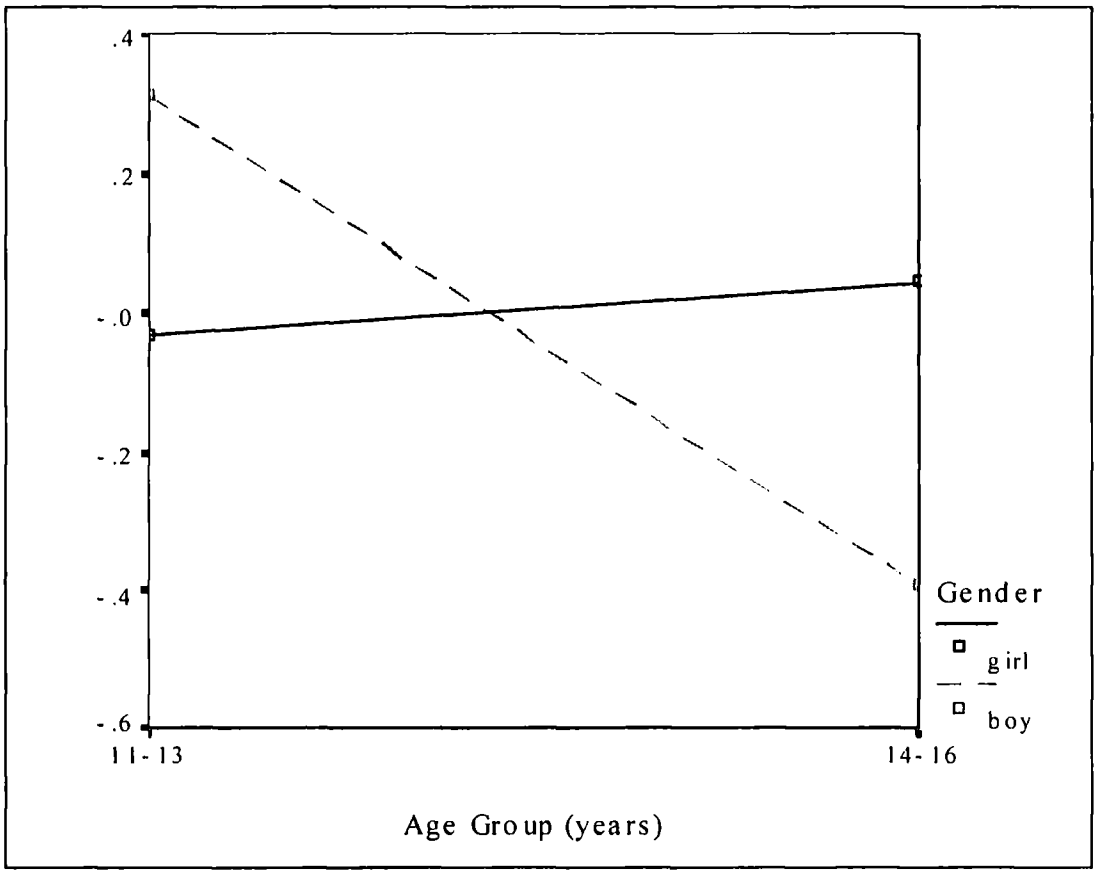
4.4.4 Does an element of personal salience impair 'hot' executive task performance?

A sub-sample of 40 participants meeting criteria (e.g. those children that had reported an intense fear or worry that could be pictorially represented, see Method, p.141, for more details) completed personally salient versions of the standardised OAT and Go/No-go tasks two weeks after initial participation as part of Phase 2.

A 2 (Age group: 11-13 and 14-16 years) x 2 (Gender) x 2 (Form of task) x 2 (Task salience: Neutral vs. Personally salient) mixed ANCOVA with repeated measures on the last two variables was performed on executive task scores to investigate possible group differences. IQ was included as a covariate. In contradiction to Hypothesis 3, there was no main effect of Age group, $F(1, 35) = 3.39$, $p > .05$, $\eta^2 = .088$, observed power = .433, nor of Gender, $F(1, 35) = .08$, $p > .05$, $\eta^2 = .002$, observed power = .058. There was, however,

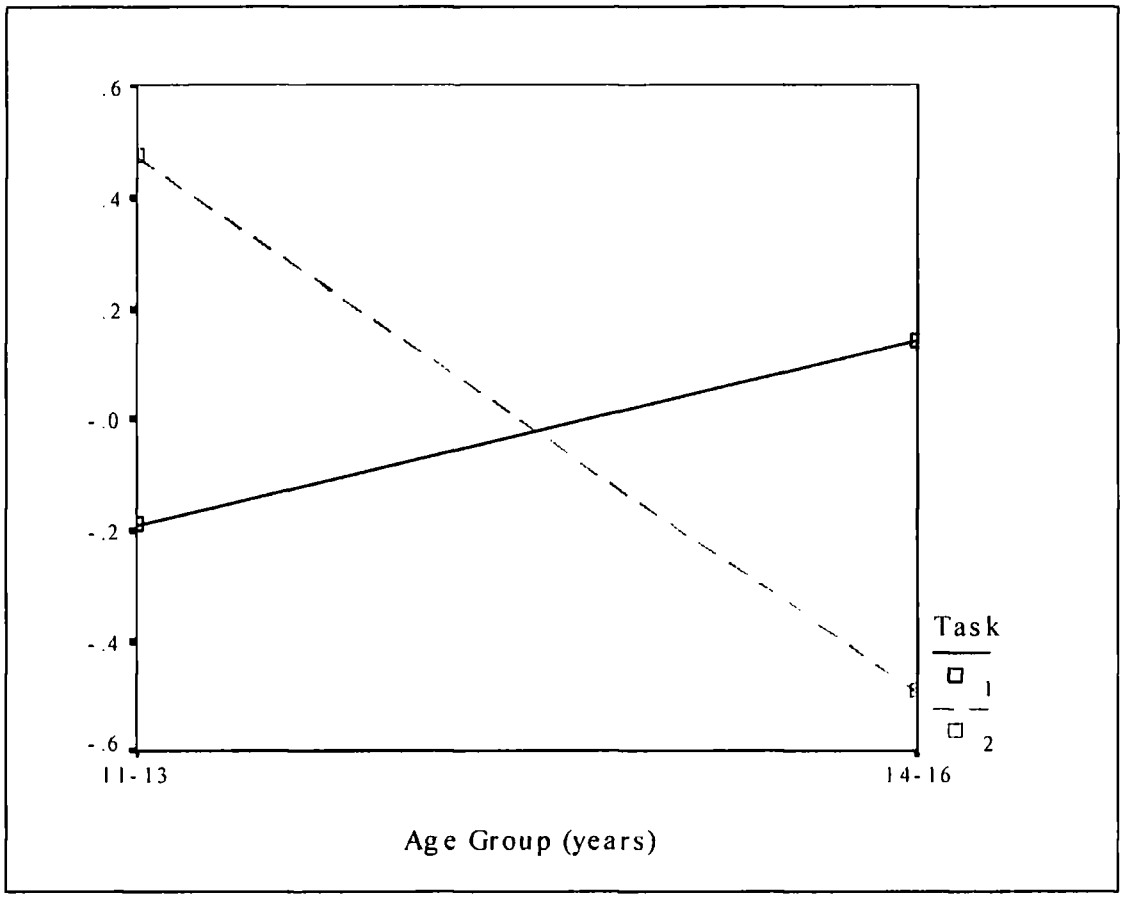
an Age group x Gender interaction, $F(1, 35) = 4.75$, $p < .05$, $\eta^2 = .120$, observed power = .564. As can be seen in Figure 4.5, while girls outperformed boys at age 11-13, this pattern was reversed at 14-16 years of age.

Figure 4.4 Executive task performance by age and gender



A main effect for Form of task, $F(1, 35) = 7.14$, $p = .01$, $\eta^2 = .169$, observed power = .738, was due to a significant Form of task x Age group interaction, $F(1, 35) = 20.27$, $p < .001$, $\eta^2 = .367$, observed power = .992, which suggested relatively superior performance on Go/No-go compared to OAT exclusively among 14-16 year olds (see Figure 4.6). In contradiction to Hypothesis 5, there was no effect of Task salience, $F(1, 35) = 1.50$, $p > .05$, $\eta^2 = .041$, observed power = .221.

Figure 4.5 OAT (Task 1) and GoNo-go (Task 2) performance by age



Within this sub-sample, IQ had a significant effect on task performance, $F(1, 35) = 5.16$, $p = .05$, $\eta^2 = .128$, observed power = .598. A Form of task x IQ interaction, $F(1, 35) = 7.16$, $p = .01$, $\eta^2 = .170$, observed power = .740, however, suggested this did not apply to both tasks. Correlations suggested that while lower IQ was related to poorer Go/No-go performance, $r = -.32$, $p < .05$, it was not associated with performance on the OAT, $r = .24$, *n.s.*, $p > .05$. No other interactions were significant, Fs between .09 – 2.87 , η^2 between .001 - .075.

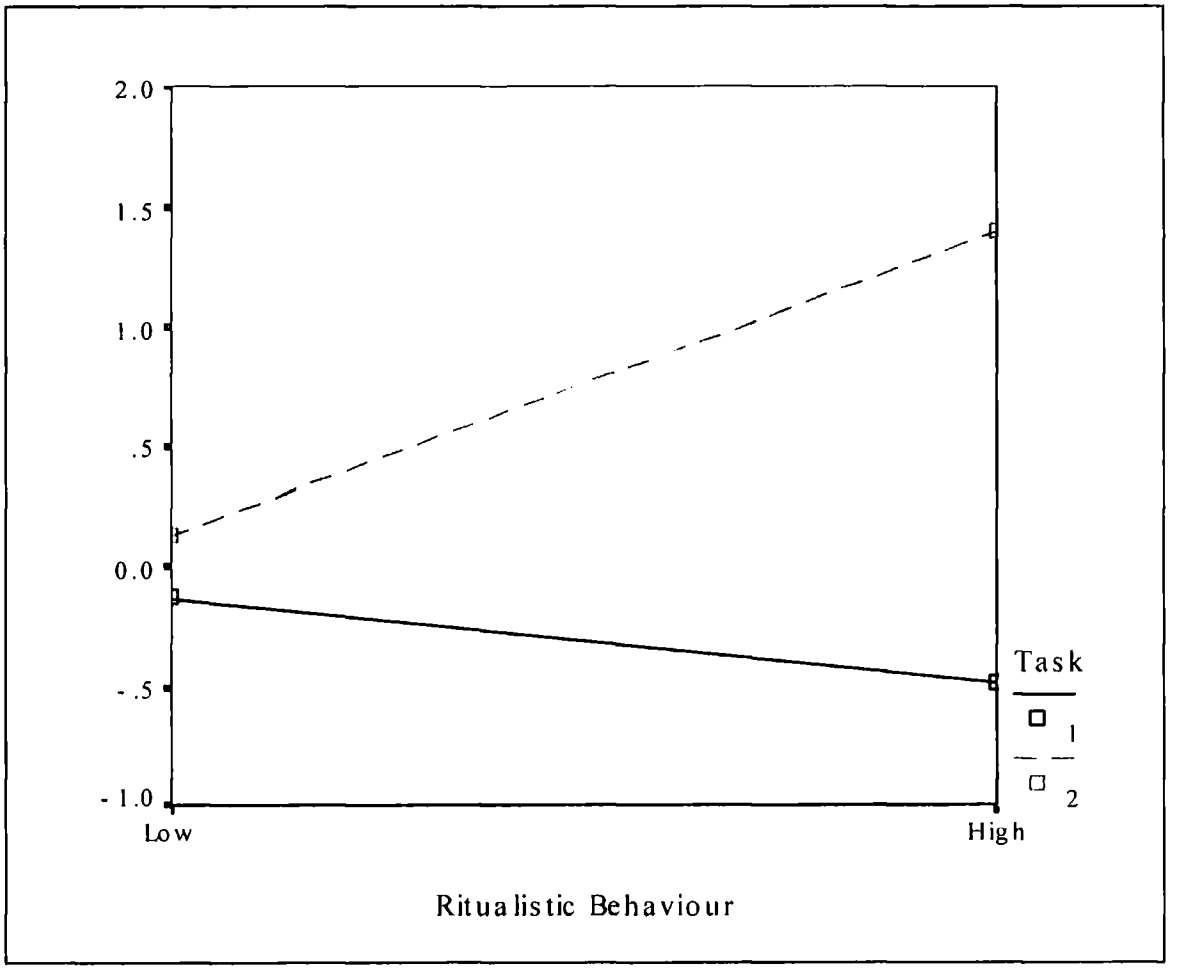
4.4.5 Do high levels of fear, worry or ritualistic behaviour relate to performance on standardised and personally salient executive tasks?

The influence of Fear, Worry or Ritualistic Behaviour was examined in turn. To determine whether Fear levels had an impact on personally salient executive performance, a 2 (Age group: 11–13 and 14–16 yrs) x 2 (Gender) x 2 (Fear category: High vs. Low) x 2 (Form of task) x 2 (Task salience: Neutral vs. Personally salient) mixed ANCOVA, with repeated measures on the last two variables, was performed. This analysis was then repeated in turn, replacing the fear variable with worry, and then ritualistic behaviour, respectively. IQ was included in each analysis as a covariate. As the main effects of Age, Gender and Task have already been examined, only results involving either fear, worry or ritualistic behaviour will be reported.

Against prediction (Hypothesis 4), there was no main effect of Fear, $F(1, 31) = .72$, $p > .1$, $\eta^2 = .023$, observed power = .131, nor were any interactions with fear significant, *F*s between .02 – 2.95, , η^2 between .000 - .087. There was no main effect of Worry, $F(1, 31) = 1.65$, $p > .1$, $\eta^2 = .050$, observed power = .238. Neither were there any interactions with worry, *F*s between .014– 3.81, η^2 between .000 - .109.

There was no main effect of ritualistic behaviour, $F(1, 31) = 1.73$, $p > .1$, $\eta^2 = .053$, observed power = .248. In partial support of Hypothesis 4, however, there was a significant Age group x Ritualistic Behaviour x Form of task interaction, $F(1, 31) = 4.66$, $p < .05$, $\eta^2 = .131$, observed power = .552. Within-subjects contrasts within each age group revealed that the ritualistic behaviour x Form of task interaction only applied to 11-13 yr olds, $F(1, 15) = 9.22$, $p < .01$, $\eta^2 = .381$, observed power = .810. This finding remained significant following Bonferroni correction (alpha = .025). As can be seen in Figure 4.7, high levels of ritualistic behaviour uniquely impaired Go/No-go performance in this age group.

Figure 4.6 The influence of high levels of ritualistic behaviour on OAT (Task 1) and Go/No-go (Task 2) performance in 11-13 yr olds



Given the disparity between the results of the above analyses when conducted with the smaller Phase 2 sub-sample (e.g. high ritualistic behaviour being associated with impaired Go/No-go performance in 11-13 year olds) compared to the results of the same analyses conducted with the larger Phase 1 sample (i.e. high fear being associated with generally impaired executive task performance), descriptive statistics comparing fear, worry and ritualistic behaviour levels (as determined by summing closed-response items on the FWRBI) in each sample were calculated (see Table 4.3). The aim of this was to gain

some possible insight into the inconsistency in results between the two samples (e.g. was there a relatively greater intensity of anxiety phenomena reported in either sub-sample?). The implications of this possibility are considered further in the discussion.

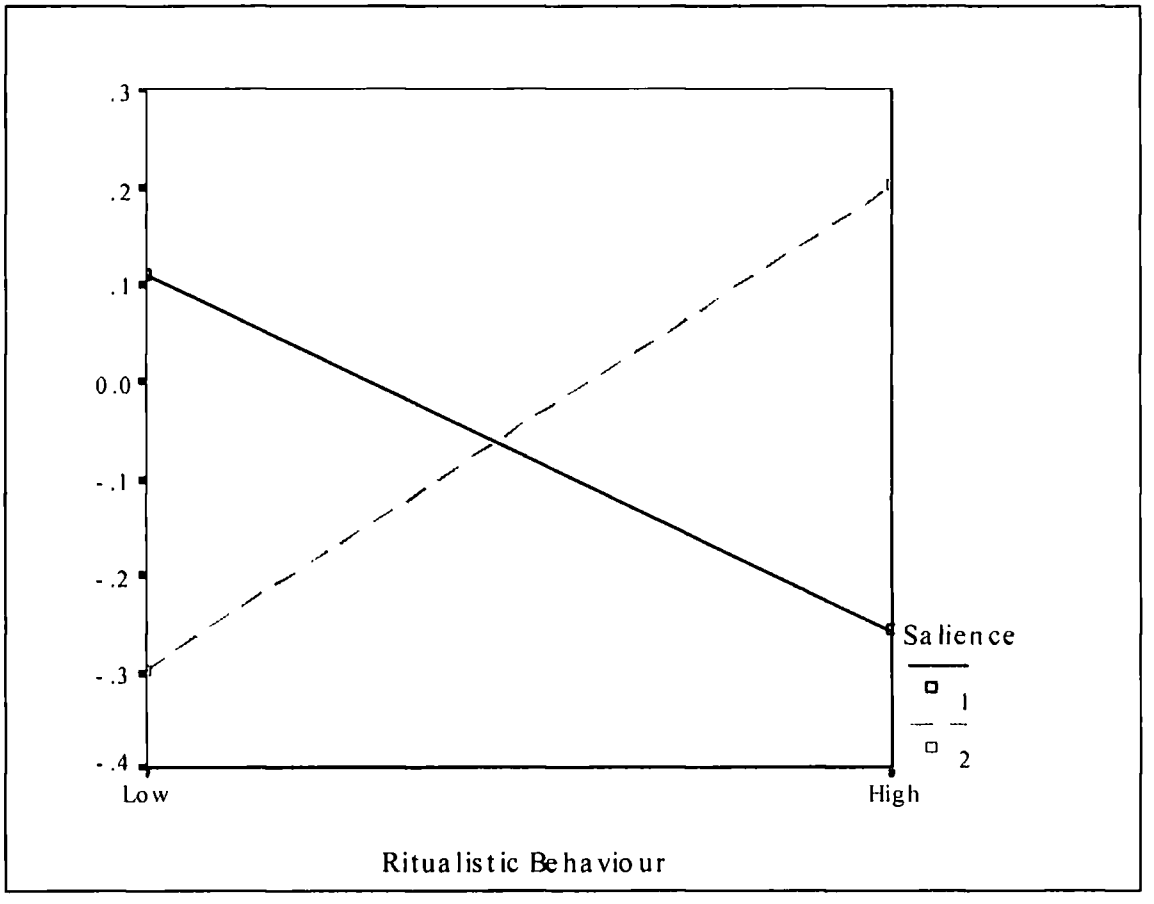
Table 4.3 Means and standard deviations of fear, worry and ritualistic behaviour intensity levels by intensity category (high vs. low), participation group (Phase 1 (P1) vs. Phase 2 (P2)), and age group

Age Group (years)	**Intensity category**	**Fear** Mean *s.d.*		**Worry** Mean *s.d.*		**Rituals** Mean *s.d.*	
		P1	P2	P1	P2	P1	P2
11-13	High	23.28	26.67	24.82	25.63	23.32	29.67
		4.69	*2.18*	*5.76*	*5.50*	*6.88*	*3.27*
	Low	13.36	16.91	12.35	14.08	8.90	13.21
		4.75	*4.81*	*5.30*	*5.35*	*3.91*	*5.15*
14-16	High	23.76	28.33	24.76	29.11	24.19	27.22
		6.50	*2.65*	*8.28*	*2.85*	*7.67*	*6.30*
	Low	11.27	17.91	12.36	15.82	10.64	16.09
		6.63	*3.45*	*5.86*	*5.47*	*5.87*	*5.70*

In partial support of Hypothesis 6, there was a significant Gender x Ritualistic Behaviour x Salience interaction, $F(1, 15) = 5.90$, $p < .05$, $\eta^2 = .160$, observed power = .653. Within-subjects contrasts within each gender suggested that the ritualistic behaviour x salience interaction applied to boys only, $F(1, 11) = 4.99$, $p = .05$, $\eta^2 = .312$, observed power = .530. Although following Bonferroni correction (alpha = .025) this finding was no longer conventionally significant, Figure 4.8 suggests a trend towards high levels of ritualistic behaviour in boys being uniquely associated with executive performance on

salient tasks. No other interactions were significant, *F*s between .00 – 3.74, η^2 between .000 - .108.

Figure 4.7 The influence of ritualistic behaviour on neutral (1) vs. salient (2) executive task performance in boys



4.4.6 Convergent validity information

An additional aim of Phase 2 of the study was to obtain further validation information relating to the FWRBI. Correlations between the Fear, Worry and Ritualistic Behaviour indices of the FWRBI and the PSWQ-C, SCARED separate indices, as well as the SLOI-CV, can be found in Table 4.4. Descriptive data for these scales can be found in Table 4.5,

followed by a commentary regarding comparisons between the current sample and normative data in the empirical literature.

Table 4.4 Correlations among FWRBI, PSWQ-C, SCARED sub-scales and SLOI-CV

	Fear	Worry	Rituals	PSWQ-C	Panic	SAD	GAD	Soc. Phob.	Spec. Phob.	OCD	T.S.
Worry	.34*										
Rituals	.16	.51**									
PSWQ-C	-.01	.29*	.45**								
Panic	.22	.33*	.39**	.42**							
SAD	.25	.43**	.51**	.46**	.55**						
GAD	.04	.47**	.37*	.68**	.60**	.40**					
Social Phobia	.21	.25	.13	.19	.24	.20	.43**				
Specific Phobia	.43**	.02	.18	.13	.54**	.30*	.31*	.30*			
OCD	.18	.31*	.69**	.54**	.55**	.49**	.58**	.19	.27*		
Traumatic Stress	-.02	.38**	.29*	.50**	.56**	.47**	.66**	.16	.14	.44**	
SLOI-CV	.16	.46**	.79**	.53**	.59**	.45**	.50**	.16	.18	.77**	.41**

* p <.05 ** p <.01

Inspection of Table 4.4 shows further evidence for the validity of the Fears, Worries and Ritualistic Behaviours Interview, as well as further support for the notion of a

delineation between fear and worry, in typical childhood. Effect sizes are given in relation to Cohen's (1988) criteria for Pearson's *r*. For example, Fear scores on the FWRBI correlated significantly with the Specific Phobia subscale of the SCARED (medium effect), while Worry scores did not. Worry (but not Fear) scores correlated significantly with PSWQ-C (small to medium effect) as well as the GAD subscale of the SCARED (medium to large effect). Ritualistic Behaviour (but not Fear) scores on the FWRBI correlated with the OCD subscale of the SCARED and the SLOI-CV (both large effects).

Table 4.5 Comparison between descriptive data for the PSWQ-C, SCARED (including sub-scales) and SLOI-CV from the current sample and published normative data

Scale	Study 3: 11-13yrs Mean *s.d.*	Study 3: 14-16yrs Mean *s.d.*	Muris et al, 2000 13-19 yrs Mean *s.d.*	Chorpita et al, 1997 12-18yrs Mean *s.d.*	Bamber et al, 2002 12-16yrs Mean *s.d.*
Screen for Child Anxiety Related Emotional Disorders-Revised (SCARED-R)	42.3 *18.3*	40.9 *20.0*	34.2 *17.5*		
SCARED-R Panic sub-scale	6.1 *4.3*	5.2 *3.1*	4.1 *3.7*		
SCARED-R Separation Anxiety Disorder sub-scale	8.8 *5.2*	7.0 *3.2*	5.5 *3.3*		
SCARED-R Generalised Anxiety Disorder sub-scale	6.5 *3.8*	7.5 *3.9*	6.5 *3.6*		
SCARED-R Social Phobia sub-scale	3.8 *2.0*	4.6 *2.3*	3.5 *2.1*		
SCARED-R Specific Phobia sub-scale	8.5 *4.4*	9.1 *6.1*	N/A		
SCARED-R Obsessive-compulsive disorder sub-scale	7.9 *3.1*	7.1 *3.8*	5.7 *3.0*		
SCARED-R Traumatic stress disorder sub-scale	3.5 *2.2*	3.6 *2.4*	1.9 *2.1*		
Penn State Worry Questionnaire (PSWQ)	17.2 *8.3*	17.4 *6.3*		19.2 *8.3*	
Short Leyton Obsessional Inventory-Child Version (SLOI-CV)	5.3 *3.7*	6.8 *4.0*			6.5 *5.3*

The above table displays descriptive data on a range of standardised measures from the sub-sample of 40 participants selected to further participate in Study 3, as well as data from normative studies in the empirical literature. In terms of the fit of this data to other studies using the same measures, it appears that the current sample tend to generally score higher than has been previously found in normative samples, which has implications for the generalisability of the results to typical development.

For example, the total SCARED-R score is 6 or more points higher in the current sample compared to that found by Muris and colleagues (2000) in a sub-sample of 603 secondary school children aged between 13-19 years of age. While Muris did not report a composite specific phobia sub-scale score, it can be seen that this sample also scored lower on each reported sub-scale than the current sample. In contrast, Chorpita and colleagues (1997) report a higher mean normative score in a community sub-sample of 133 adolescents aged 12-18 yrs on the PSWQ than was found in the current sample. However, this discrepancy can perhaps be attributed to the fact that the PSWQ was designed to tap into pure worry, as perhaps is most typically experienced in Generalised Anxiety Disorder (GAD), and as can be seen, the results from the current sample on the SACRED-R GAD sub-scale also approximate that found by Muris et al (2000) in a normative sample. This suggests that the inflated SCARED-R score in the current sample may be more fear as opposed to worry based. This would be expected, given that further participation in Study 3 was founded on the reporting of a highly salient anxiety which was typically a fear, given the concern had to be represented in picture form.

In terms of the SLOI-CV, mean values obtained in Study 3 approximated those found by Bamber and colleagues (2002) in a community sample of 253 12-16 year olds that were characterised as having a range of subclinical symptoms (e.g. depression/anxiety). This reflects the relatively elevated score on the SCARED OCD sub-

scale and would suggest that in terms of obsessive-compulsive symptomatology, the sample in the current study falls in the subclinical range

4.5 Discussion

The study reported here had three main aims. Firstly, it set out to investigate developmental change in executive function, with a particular focus on examining performance on tasks assumed to draw on orbitofrontal and dorsolateral functioning. Secondly, the study allowed an examination of associations among anxiety, ritualistic behaviour and executive functioning in a sample of typically developing children. Finally, it involved an investigation of the effect of salience manipulations on orbitofrontal task performance.

The first hypothesis, that executive task performance would improve with age, was partially supported, in that children in the older age group (14-16 years) demonstrated enhanced Go/No-go performance compared to children in the younger age group (11-13 years). The second hypothesis was that children with higher intensity scores on the fear, worry and ritualistic behaviour elements of the FWRBI would show a pattern of impaired 'hot' task performance along with intact 'cool' task performance, and that this relation would intensify with increasing age. This hypothesis was not supported. There was, however, evidence for lower executive performance among high-fear children specifically in the older age-group, but this related to all three executive tasks and was not specific to the 'hot' tasks.

The third hypothesis concerned age-related changes in executive performance in a sub-sample of children selected for the salience manipulation. In contrast to the findings for the larger sample (see Hypothesis 1 above), there was no effect of age on executive task scores. Our fourth hypothesis was that higher intensity scores on the FWRBI would be

associated with a deficit in 'hot' executive performance. This hypothesis was only partially supported. High levels of Ritualistic Behaviour were associated with impairments in Go/No-go performance in 11-13 year olds, but not in 14-16 year olds. Performance on the OAT was not associated with fear, worry or ritual intensity in either age group. Hypothesis 5 predicted that executive task performance would be poorer in the high-salience conditions of the orbitofrontal tasks. This hypothesis was not supported. Hypothesis 6 predicted that any such effect of salience would be greater for individuals with higher intensity scores on the three scales of the FWRBI. Support was not found for this prediction. However, there was a trend towards high levels of ritualistic behaviour being associated with impaired orbitofrontal task performance in the salience manipulation condition in boys only.

In discussing these findings, it is firstly necessary to consider why there was no age effect for performance on the WCST and OAT tasks. As noted in the Introduction, response inhibition performance has been found to continue to improve up to around age 20 (Band et al., 2000; Williams et al., 1999), presumed to reflect the gradual maturation of the orbitofrontal system during childhood and adolescence. Our findings of an age effect for Go/No-go performance are thus consistent with these findings of gradual improvement in response inhibition. In contrast, it may be that the major developmental changes in dorsolateral performance, as indexed by WCST, have already occurred by the time children reach the age range investigated in this study (Rosenberg et al., 1997; Zelazo & Müller, 2002), accounting for the lack of an age effect. This explanation is in line with the findings of Chelune and Baer (1986), who found an improvement in WCST performance between ages 6 and 10, with 10-year-olds performing at a level equivalent to adults.

The lack of an age effect for OAT performance may reflect the relatively lower difficulty of this 'hot' task compared to Go/No-go (Overman, 2004; Zelazo & Müller,

2002). Difficulties in executive performance occur in different situations at different ages, and these situations can be ordered according to the complexity of the inferences required (Zelazo & Frye, 1997). In line with this, it has also been found that the visual evoked potentials activated during cognitive inhibition tasks become more evident as the complexity of experimental stimuli increases (Beech, Cielski & Gordon, 1983). It is possible that the OAT is too 'low level' to highlight subtle age-related improvements in orbitofrontal functioning across the developmental trajectory studied (Overman, 2004).

The next question of interest is why the predictions of the second hypothesis, that children with higher intensity fear, worry and ritual scores would demonstrate impaired 'hot' task performance and intact 'cool' task performance, were not fully supported. In line with the developmental psychopathology notion of a continuum between normative and pathological, along with the findings of previous work (e.g. Evans & Iobst, 2003a, 2003b), it was expected that typically developing children reporting a higher intensity of anxiety phenomena would show a similar (although less severe) pattern of executive impairments to clinical OCD populations than less anxious and ritualistic typically developing children. To recap, studies of OCD in childhood and adulthood have consistently shown evidence of an orbitofrontal deficit while showing only mixed evidence for a corresponding deficit in the dorsolateral system. This is consistent with a view of OCD as resulting from a hypermetabolic orbitofrontal cortex, which inhibits the individual's capacity to reappraise anxiety-related situations and stimuli in 'cool' terms via the dorsolateral system. However, the present study found that executive task performance was impaired exclusively in older high-fear individuals (aged 14-16 yrs), with no specificity of impairment for orbitofrontal as opposed to dorsolateral tasks. There are a number of potential explanations for this finding.

With regard to the finding of impairment across all three executive tasks, one possibility is that the operation of the two systems is closely linked and difficult to fractionate in terms of functional specificity. For example, deficits in DLPFC task performance may actually be a consequence of OFC disturbance, as opposed to a primary dysfunction in itself. It has been suggested that dysfunctional orbital pre-frontal circuits result in psychopathology by disrupting the ability to suppress behavioural and ideational responses, which in turn interfere with ongoing purposive behaviour (Rosenberg et al., 1997). Thus, the OFC mediates the perceived emotional value of stimuli (Ochsner, Bunge, Gross & Gabrieli, 2002), and then, depending on the outcome of this appraisal (e.g. hot or not), directs the input of the DLPFC. In this way, an over-active OFC system may be less efficient in flexibly involving the DLPFC in the 'cool' re-appraisal of anxiety-provoking stimuli/circumstances, leading to a secondary deficit in tasks primarily requiring DLPFC input.

In addition, although set-shifting and response inhibition are considered distinct cognitive functions reflecting different brain loci (DLPFC for set shifting, OFC for response inhibition), it is important to highlight that these tasks may incorporate overlapping functions. Whereas the WCST requires the ability to adopt a new rule (e.g. a sorting principle) and attend to various stimuli dimensions, it also requires response inhibition to suppress responding to the previously learned rule. In turn, the Go/No-go task also involves working memory capacity via the DLPFC (i.e. remember not to press X). As a result, while some evidence of specificity was found in the current study (i.e. only WCST was related to IQ in the larger sample, and WCST performance did not relate to OAT or Go/No-go performance in either age group), it is unlikely that the present tasks were 'pure' measures of their target abilities (Zelazo & Müller, 2002).

This issue is further complicated by developmental implications. For example, the same tasks may differentially activate regions of the pre-frontal cortex across childhood and adolescence. With regard to response inhibition, cross-sectional data indicate that, in earlier childhood, activation is widespread throughout the pre-frontal area (e.g. involving both dorsolateral and orbitofrontal domains), with orbitofrontal and dorsolateral functioning only becoming differentiated (Casey et al., 1997). Thus, while each system is active prior to this time, the specific functional role of each is limited. In this way, younger children exhibit more extensive, less explicit metabolic activation in the prefrontal cortex when performing executive tasks, presumably due to increased cognitive demands and inefficient development/recruitment of specialised brain regions (Kwon, Reiss and Menon, 2002). In contrast, older children show increasingly specialised focal activation. In line with this proposition, the present study found a significant correlation between performance on the two hot tasks among older children, but this relation was not present in the younger age group. It may be that children of different ages completing the same task (possibly even to the same standard; see Kwon, Reiss and Menon, 2002) may be employing different areas of the brain to do so. This is in line with the developmental psychopathology concepts of multifinality and equifinality, as summarised in Chapter One. Future work of this nature incorporating brain imaging technology could help delineate this issue further.

Furthermore, as a typically developing group, the present sample will presumably have relatively age appropriate, efficient DLFPC/OFC systems. It may be that only a clinical sample of children (or perhaps adults, given the protracted time course for the emergence of functional specificity when performing executive tasks) with OCD would show the hypothesised specific OFC impairments. Indeed, previous analogue studies have reported a link between impaired performance on the WCST and non-clinical obsessive-

compulsive behaviour patterns both in children aged 6-11 years (Evans & Iobst, 2003a, 2003b) and in adults (Zohar, LaBuda & Moschel-Ravid, 1995). In contrast, work with adult OCD patients has found a specific OFC deficit (as indicated by OAT performance) and intact DLPFC (as indicated by WCST performance) (e.g. Abbruzzese et al., 1995, 1997).

The finding of a deficit in executive task performance in the older high-fear group, despite evidence for some age-related improvement in executive task performance, raises the possibility that high fear levels in children beyond 14 years may reflect an underlying executive function deficit. In the present case, this potential executive impairment was sufficient to produce a group difference in performance on tasks including the OAT, despite its relatively lower level of difficulty compared to the WCST and Go/No-go. It is important to emphasise that the author is not proposing that fearfulness in childhood and adolescence is *caused* by a pre-existing executive deficit, but rather that executive dysmaturation and high anxiety are likely to have a bi-directional influence on subsequent development. For example, reasonably persistent high anxiety combined with associated maladaptive coping responses throughout development (as suggested by the evidence for test–retest reliability on the FWRBI reported in Chapter Two) will presumably have an influence on the development and maturation of the neurological systems underlying both 'hot' and 'cool' executive functioning (Huether, 1998; Moll & Rothenberger, 2000). Supportive of this connection between neurological dysfunction and anxiety. are MRI scans from paediatric, medication-naïve, non-depressed OCD patients aged 7-16 years, signifying relative dysmaturation of fronto-striatal circuitry (Rosenberg et al., 1997), as well as studies reporting a correlation between ventral pre-frontal cortex activity, OCD symptom severity and response to treatment in childhood-onset, adult OCD patients (Baxter et al., 1992).

The fact that only older high-fear children showed executive impairments may be because the effects of enduring high anxiety and executive dysmaturation, and the alternate neurodevelopmental pathways that potentially result, do not exert their effect until later in life. Indeed, research examining the effects of early damage to the OFC and DLPFC suggests that if a lesion affects a brain structure that has yet to mature functionally, the effects of the lesion may remain silent until the structure or system matures (Machado & Bachevalier, 2003). For example, early neurological soft signs (i.e. non-localising, non-standard performance on a motor or sensory test where no other sign of focal neurological disorder is present) at age 7 are not specifically associated with the development of anxiety disorders until adolescence (Shaffer et al., 1985). In this way, the typical developmental trajectory of structural/functional brain maturation may be an important parameter in determining the onset of impairment. For example, while exaggerated emotional responses are relatively typical in early childhood, the regulation of anxiety/negative emotions should become progressively more automatic as development proceeds due to the increasingly integrated, specialised and efficient functioning of the OFC/DLPFC system. Thus, an inability to automatically (or less effortfully) re-appraise anxiety provoking situations/stimuli would only indicate impairment and become problematic in later life, when dysfunctional, more effortful emotion regulation becomes out of step with the rest of development.

Interestingly, while not conventionally significant, there was also a trend towards a relation between high fear and impaired executive function specifically in males in the younger age group ($\eta^2 = .116$, observed power = .551). This finding is also in line with the proposal of an executive dysmaturation hypothesis, in that males develop efficient OFC functioning significantly earlier than females do (Overman 2004). Presumably, an

influential factor in this advanced efficiency is the fact that callosal axons projecting from the OFC attain maximal size in men at the age of 20, whereas in women this is not attained until 40-50 years (Cowell, Allen, Zalantino & Denenberg, 1992). This would potentially imply that any effects of neurological dysmaturation (e.g. psychopathology/deficits in executive task performance) would manifest earlier in males than females. In line with this reasoning, modal age of OCD onset is 6-15 years of age for males and 20-29 years of age for females (Evans, Lewis & Iobst, 2004).

Plausible though these speculations may seem, they leave open the question of why the worry and ritualistic behaviour measures did not show the same pattern of results as fear. One possible explanation for this inconsistency is that high levels of worry and ritualistic behaviour may not be as anomalous, developmentally speaking, as high levels of fear. That said, the findings of Chapter Two, in which all forms of anxiety-related phenomena were reported at similar intensity levels post 10 years of age, would not support such a conclusion.

The next issue concerns the absence of any age effect on executive task scores for the sub-sample selected for the salience manipulation. One possible explanation for this discrepancy (compared to the larger sample) is that the reduction in sample size led to a lowering of power to detect any such effect. Alternatively, it might be concluded that the individuals selected for the salience manipulation (typically by virtue of their reporting a high-intensity fear, because fears are generally easier to represent pictorially) constitute a group that is not representative of the larger sample. Given the findings described in Chapter Two, that high-intensity fears of a concrete nature (e.g. animals, insects, etc.) tend to be increasingly replaced developmentally by more abstract, social-evaluative fears, it seems possible that the older children in the salience manipulation group were atypical in this respect.

Furthermore, as suggested in Table 4.3, mean fear intensity levels were also higher in the sub-sample compared to the overall sample. In line with the previous suggestion that high fear levels may become ever more indicative of psychopathology as development progresses, as well as the notion of a possible link between executive dysmaturation and high fear, it may be that the older children in the salience sub-sample have not made the expected developmental gains in executive performance by virtue of their high fear levels (or vice versa). In this way, the children included in the salience manipulation may be closer to a clinical sample than the sample as a whole. Further support for this view comes from the finding reported here that the older children in the salience manipulation group performed relatively better on the Go/No-go task than the OAT, which is surprising given that the OAT is considered to be the simpler task. This mirrors the findings of Abbruzzesse et al. (1995), who reported a specific OAT deficit in adults with OCD.

Another discrepancy in the smaller sample involved the lack of a relation between high fear and poor executive performance in older children, and the finding that high levels of ritualistic behaviour impaired Go/No-go performance specifically among 11-13 year olds. This is a difficult finding to explain. In terms of fear, one possibility is that the smaller sample size resulted in less power to detect an effect among older children, particularly given that there was less variability between fear intensity scores in the high- and low-fear groupings in the sub-sample (high-fear group, $M = 28.83$, low-fear group, $M = 17.91$) compared to the overall sample (high-fear group, $M = 23.76$, low-fear group, $M = 11.27$). Furthermore, in the sub-sample, the mean intensity of the low fear group was developmentally anomalous at 17.91, whereas in the overall sample, mean fear levels were more in line with expected rates for this age range at 11.27. It may be, therefore, that even the children classed as low fear in the sub-sample had less mature executive functioning than is typical for that age range, obscuring the fear effect detected in the overall sample.

The decrease in power associated with a smaller sample size also obviously applies to findings relating to ritualistic behaviour. However, inspection of the descriptive data in Table 4.3 suggested there was particularly high levels of ritualistic behaviour in the younger sub-sample (11-13 yr olds: overall sample, high group M = 23.32, subsample, high group M = 29.67, 14-16 yr olds: overall sample, high group M = 24.19, sub sample, high group M = 27.22), as well as considerably greater variability in mean ritualistic behaviour levels between the high and low intensity younger sub sample groups (11-13 yr olds: high group, M = 29.67, low group, M = 13.21, 14-16 yr olds: high group, M = 27.22, low group = 16.09). This may have lessened the impact of reduced sample size, and contributed to the finding that high levels of ritualistic behaviour impaired Go/No-go performance uniquely in 11-13 year olds. This finding reflects and extends that of Evans et al. (2004), who found that increased compulsivity was associated with impaired neuropsychological task performance (including response inhibition) in children aged 6-11 years.

Alternatively, the fact that sub-optimal executive functioning was related to anxious cognition in older children (in Phase 1), and to ritualistic actions in younger children (in Phase 2), may reflect the natural history of OCD. For example, in childhood onset OCD, compulsions tend to emerge significantly earlier than obsessions (Evans et al., 2004). The OFC is involved both in the mediation of emotional response to biologically significant stimuli and in the inhibition of behavioural responses (Zald & Kim, 1996). While undoubtedly connected, it may be that these differing functions mature at different rates, with efficient emotional regulation somewhat falling behind the automatic regulation of behaviour. Thus, in line with the notion that deficits may not become apparent until a system matures, the behavioural consequences of executive dysmaturation may manifest prior to the cognitive consequences.

It is now necessary to consider why there was no effect of the salience manipulation on executive task performance. One possibility is that the study design was underpowered (η^2 = .041, observed power = .221) to detect any such effect. Alternatively, it may be that the salience manipulation was ineffective. One possible reason for this is that mere exposure to pictures of anxiety-related stimuli was not enough to disrupt the effective working of the orbitofrontal–dorsolateral system in these typically developing adolescents. Indeed, evidence from information processing studies with clinically anxious adults suggests that bias/task impairment declines concurrently with an improvement in the patient's clinical condition (Wells & Matthews, 1994). In addition, despite the fact that the appropriateness of these images was confirmed as part of the procedure, the pictures used may not have been good exemplars of the anxiety-related stimuli.

It may also be that in healthy individuals such as these, exposure to such stimuli leads to rapid desensitization and therefore that the stimuli quickly lost their anxiety-inducing powers. While the increasing sophistication of the OFC/DLPFC system enables this process to become more automatic with age, the younger/more anxious children in the sample may have successfully completed the task by actively reconceptualising it in relatively neutral, decontextualised terms (e.g. transforming the task from hot into cool by repeating to themselves *it's just a picture of a spider, not the real thing*, until anxiety decreased). It would be useful in future work to get an account from children regarding the process of completing the salient tasks.

Although the predicted effect of the salience manipulation on executive performance did not materialise, there was a trend towards high levels of ritualistic behaviour impairing performance in the salience condition in boys only. This suggests that the salience manipulation was effective in some instances at least, and that this may be a

fruitful course for future research. Again, this finding may reflect the earlier typical maturation of the OFC in males, meaning that any deficits are quicker to manifest. Indeed, previous studies have suggested a mainly developmental subtype of OCD characterised by male preponderance, earlier age of onset and more frequent neurological features (Blanes & McGuire, 1997). The fact that the salience manipulation approached significance among males with high levels of ritualistic behaviour may indicate that these individuals are closer to a clinical population (e.g. in terms of immature executive maturation), and that they may therefore be at a higher risk of developing clinically significant levels of anxiety and ritualistic behaviour.

There are a number of limitations to the present research. As the fears, worries and ritualistic behaviours interview was used in the current study, then previously highlighted issues (e.g. fixed order of scales, use of a visual scale to rate fear and worry items – see Appendix 6 for response distributions) equally apply. There is also a need to extend on the study by including a larger sample of both typically developing children and those with clinical levels of anxiety to increase the power to detect effects and further determine any clinical implications. In terms of further elucidating any developmental implications, it would also be fruitful to assess across a wider age-range and within narrower age-groupings. Given there were no signs of participant distress within the current study, a younger sample could potentially be included with less ethical concern. Secondly, the observed limitations in the salience manipulation might be overcome through the development of more effective manipulations. Although the ethical implications of eliciting highly-salient anxieties in children will of course limit what such research can achieve, it is possible that higher levels of anxiety could safely be induced through the use of video presentation or other stronger stimuli.

In conclusion, this study provides preliminary support for the notion that the anxiety and rituals common to typically developing childhood are not only phenomenologically similar to those associated with OCD, but may also share some common underlying neurological underpinnings.

CHAPTER FIVE: GENERAL DISCUSSION

The overarching aim of this thesis has been to take a developmental psychopathological approach to fear, worry and ritualistic behaviour in typical childhood. The first empirical chapter examined developmental trends in, and interrelations between, fear, worry and ritualistic behaviour in typical childhood and adolescence. Subsequent chapters investigated the potential contribution of both cognitive-behavioural (Chapter Three) and neurobiological (Chapter Four) factors to the presentation of normative fears, worries and rituals within a developmentally sensitive framework.

The results of each these studies are briefly summarised below, followed by discussion of a range of salient issues that have arisen from this work. Firstly, I evaluate the utility of the developmental psychopathology approach for the understanding of anxiety phenomena and behaviour in childhood. Secondly, I will consider how the studies reported here are able to shed light on specific issues in the literature on anxiety in childhood. Finally, the limitations of the present research, as well as possible directions for future investigations into anxiety across typical and atypical development, are outlined.

5.1 Summary of findings

In Chapter Two, a study was described in which content and intensity of fear, worry, and ritualistic behaviour were assessed through a semi-structured interview designed specifically for this study. The interview was individually administered to 142 typically developing children aged 7 to 16 years. The design allowed for the developmental trends and interrelations among fear, worry and ritualistic behaviour to be described using response modes appropriate to the age group concerned and sensitive to individual variation in content of anxiety phenomena. It was hypothesised that content and intensity of anxiety-related phenomena would vary in foreseeable ways over the age range studied.

In line with previous findings, it was expected that fear and worry would be related across the age range, and that both would in turn correlate with levels of ritualistic behaviour.

The results of this study showed that common themes in the content of fear, worry and ritualistic behaviour varied predictably with age. Fear, worry and ritualistic behaviour decreased in intensity with age, although this decline was only significant between 7 and 10 years. Levels of fear, worry and ritualistic behaviour were higher in girls than boys, regardless of developmental level. Fear and worry were positively related, and the regular performance of rituals was related to anxiety across middle childhood and adolescence. In regression analyses, it was found that the experience of intense worry was more strongly related, than the experience of intense fear, to the propensity to engage in ritualistic behaviour.

In Chapter Three, a sub-sample of 80 of these children were followed up in a study designed to assess cognitive appraisals of anxiety-related thoughts. Using a semi-idiographic methodology, participants rated personally significant high- and low-salience fears and worries for inflated Responsibility, Thought-Action Fusion (TAF) and Intolerance of Uncertainty (IOU). Effects relating to personal salience and anxiety type were investigated, in addition to relations between anxiety phenomena and biased cognitive appraisals. It was predicted that the tendency to experience high levels of these appraisals would decrease with age, and that highly salient anxieties would produce more biased appraisals than less salient ones. Reflecting the cognitive model of OCD, it was expected that any relation between anxiety and ritualistic behaviour would be mediated by biased cognitive appraisals. This study constituted the first attempt systematically to investigate such cognitive appraisals in typical childhood.

The results of this study showed predicted age-related decreases in strength of appraisals for TAF and IOU, but not Responsibility. Salience effects were observed for

Responsibility and TAF. Worries had a stronger association with extreme IOU appraisals than fears, however the effects of form of anxiety for Responsibility and TAF were mixed. Worry intensity was a strong predictor of TAF and IOU. Cognitive appraisals were strongly intercorrelated and co-varied with ritualistic behaviour. The relation between worry and ritualistic behaviour was mediated by biased cognitive appraisals, particularly IOU.

In Chapter Four, a separate sample of 83 typically developing children aged 11 to 16 years reported on fear, worry and ritualistic behaviour and also completed tasks designed to assess executive functioning. In line with evidence that OCD is characterised particularly by abnormal processing in the orbitofrontal system, tasks were chosen to be specific to assessing functioning in the orbitofrontal and the distinct but related dorsolateral neural systems. It was predicted that executive performance would generally improve with age, and that children scoring higher on the fear, worry and ritualistic behaviour measures would perform more poorly on orbitofrontal executive tasks. Tasks were modified to include a salience manipulation, allowing the interaction of these effects with salience to be described.

The hypothesis that executive task performance would improve with age was partially supported, in that Go/No-go performance among older children (aged 14-16 years) was superior to that of younger children (aged 11-13 years). Children with higher intensity fear, worry and ritualistic behaviour scores did not show a pattern of impaired 'hot' task performance combined with intact 'cool' task performance. There was evidence for lower executive performance among high-fear children specifically in the older age-group, but this related to all three executive tasks and was not specific to the hot tasks. Executive task performance was not found to be poorer in the high-salience conditions of the orbitofrontal tasks. There was also no support for the prediction that any such effect of

salience would be greater for individuals with higher fear, worry and ritualistic behaviour intensity scores. However, there was a trend towards high levels of ritualistic behaviour impairing salient orbitofrontal task performance in boys only.

5.2 Evaluating the utility of the developmental psychopathology approach

In Chapter One, the developmental psychopathology approach was identified as being potentially valuable for the study of anxiety in childhood for several reasons. First, it allows psychopathology in childhood to be conceptualised on a continuum with typical development, thus validating the study of anxiety phenomena and behaviours in the normal range. Second, it justifies the application of clinical-style methodologies to typical development, and vice versa. Third, it emphasises the need to consider phenomena within the whole context of development, such that different phenomena can have different significance at different times, depending on the developmental status of other elements of the system. Fourth, it allows the investigation of the cognitive mechanisms and processes underlying both typical and atypical development, with a view to promote understanding of how they malfunction in psychopathology. In this section, I consider each of these issues, as they are illustrated by the findings of the studies reported here, in turn.

5.2.1 The continuum between typical and atypical anxiety

The studies reported here showed evidence of wide variation in both the intensity and content of anxiety phenomena and behaviour in typical childhood. The findings reported in Chapter Two further demonstrate that fear and worry are related in predictable ways to ritualistic behaviour, with worry being a particularly strong predictor of rituals. Extremes of intensity for each of these phenomena were also observed, despite the fact that samples were selected as being representative of typical development. Although only a small

proportion of children completed standardised measures that were able to indicate clinical levels of symptomatology (i.e. those who took part in Phase 2 of the study reported in Chapter Four and completed the PSWQ, the SCARED-R and the SLOI-CV - none of whom scored within the clinical range), it is unlikely that any of the other children studied here would have had clinically significant levels of fear, worry or ritualistic behaviour. Although participants were not formally screened for psychiatric history, all were in mainstream schools, were operating at normal levels of functioning, and had become involved with child assent and parental and teacher consent (which would presumably not have been granted in cases where children had very high levels of anxiety).

The results of Chapter Two also showed predictable changes in the content and intensity of anxiety phenomena with age. For example, concrete fears (e.g. of animals) gave way to concerns regarding social or medical situations (e.g. visiting the dentist) and worries similarly became increasingly focussed on social evaluative matters (e.g. meeting new people, physical appearance) as development progressed, which reflects some of the changes observed in clinically anxious symptomatology across this age range (Fong & Garralda, 2005). However, the fact that the content of fears and worries were mostly concordant with participants' current developmental stage further supports the approach of 'normalising' anxiety phenomena by considering them as natural products of childhood experiences, rather than treating them as necessarily signs of pathology.

5.2.2 Applying clinical methodologies to typical development (and vice versa)

The second issue concerns the translation of methodologies between clinical and mainstream developmental research. The Fears, Worries and Ritualistic Behaviours Interview, used throughout this thesis, is one example of such an application, representing the use of a more clinical-style methodology with typically developing children, as

opposed to the self-report questionnaires typically administered in the field (e.g. Chorpita et al., 1997; Gullone & King, 1997; Leonard et al., 1990; Ollendick, 1983). This approach provided a more methodologically and ethically sensitive means of systematically assessing both the content and intensity of fear, worry and rituals across a wider age range than in previous work. For example, the self-generated and closed-response format provided an opportunity for children to self-report any salient phenomena not included on the lists, and also provided a validity check for the closed-response items, both in terms of content relevance and consistency of ratings (i.e. if an item within a closed-response list was also self-generated). The interview format also provided enhanced sensitivity to swiftly detect any potential signs of distress and permitted the researcher to assess comprehension of the items and to ask any follow-up questions with an aim to gain further specificity of responses. Importantly, this novel measure also demonstrated good levels of internal consistency and acceptable stability over a 9-month period. Furthermore, each scale demonstrated good convergent validity with standardised measures in the field.

The studies reported in Chapters Three and Four extended this methodological approach by additionally using an idiographic method. In Chapter Three, this involved tailoring questions designed to assess cognitive appraisals to each participant's individual concerns. In Chapter Four, this involved adapting standardised tests of orbitofrontal functioning to include stimuli that represented each participant's most intense personal fear or worry. Together, these studies permitted investigation into the potential influence of fear/worry salience on cognitive appraisals and executive functioning.

While internal validity concerns obviously arise when participants are presented with different stimuli/questions of varying content matter, intensity of fear/worry was judged to be the most appropriate variable of comparison in the above studies. This judgement was taken for a number of empirical reasons. Firstly, in terms of the study

reported in Chapter Three, the cognitive model of OCD (e.g. Salkovskis, 1985) suggests that personally distressing thoughts have more meaning for an individual, which in turn leads to more skewed interpretations. Conversely, thoughts experienced as only minimally distressing are appraised as less important, and are therefore less likely to be associated with biased interpretations. Thus, using the same fear/worry content across individuals is likely to activate varying levels of bias in cognitive appraisal, as stimuli will obviously be of varying relevance of each participant. The fact that the study reported in Chapter Three found that more salient anxiety-provoking concerns were generally appraised with a greater cognitive bias than less anxious concerns further supports the translation of a methodology typically used in the adult OCD literature (e.g. OCCWG, 1997, although see Barrett & Healy, 2003) to both clinically anxious and typically developing samples of children.

In terms of the study reported in Chapter Four, the orbitofrontal area is thought to respond to the personal significance of stimuli, as opposed to the basic characteristics of it (Zald & Kim, 1996). Thus, similar to the important role of salience in provoking extreme cognitive appraisals, it is presumably the negative personal salience of a situation that results in orbitofrontal hyperactivation and associated executive impairments, as opposed to subject matter itself. This reasoning provided the rationale for again using intensity of personal fear or worry to determine the stimuli that children received (to the extent where participants chose the most relevant portrayal of their fear/worry from a range of photographs depicting their concern), as opposed to simply using a fear or worry commonly reported as prevalent in the childhood literature, and presenting it to all participants.

Admittedly, this salience manipulation was less successful than that used in Chapter Three, as the only effect approaching significance was a trend towards high levels

of ritualistic behaviour impairing boys' performance on the salient tasks. While this may reflect a flaw in the methodology (as suggested in the discussion specific to this study), there is also a possibility that this finding reflects the developmental psychopathology concept of multifinality (i.e. the notion that the organisation of the system itself can determine how any one component may operate), in that deficits may be quicker to manifest in males due to the comparatively earlier maturation of this region. This further underscores the importance of advancing our understanding of the typical developmental trajectory of structural/functional brain maturation, in that this may be an important parameter in determining the onset of clinical impairment. As such, it cannot be fully discounted that the use of this methodological approach may prove to be useful in larger normative samples that include a wider spread of anxiety and ritualistic behaviour levels.

The idiographic interview approach taken in Chapters Three and Four also further improved the ethical sensitivity of each procedure. There was the opportunity for multiple checks on participant discomfort. For example, all items/stimuli used in the idiographic components were initially generated via the Fears, Worries and Ritualistic Behaviours Interview. As such, even prior to further participation in the salience manipulations, children had the opportunity to confirm their level of comfort in discussing any of their concerns or behaviours in more detail, and thus had some control over the material that was actually presented to them. This level of comfort was again assessed prior to further participation (either in the study reported in Chapter Three, or in the second phase of the study reported in Chapter Four), and great care was taken to ensure that children were aware of what participation entailed. None of the children involved in the studies opted out of further participation, and significantly, there were no signs of distress observed during any of the procedures. In fact, a number children even requested to participate again if possible.

Finally, although the present research was restricted to typically developing samples, the methodology used throughout is equally applicable to clinical populations. This is primarily due to the enhanced sensitivity and specificity of the procedures (particularly the salience considerations and self-generated component of the Fears, Worries and Ritualistic Behaviours Interview), and provides a useful means of systematic comparison on which future work can build.

5.2.3 Considering phenomena within the context of development

Inherent in the developmental psychopathology approach is the notion that it is important to consider the mutual influence of multiple contributory factors (e.g. biological, social, emotional and cognitive) to psychopathology in a way that is specific to an individual's stage of development. In this vein, the present research was motivated by a need to obtain normative data on the development of anxiety phenomena in typical childhood in order to provide a context within which to evaluate pathological behaviour. This is important, as empirical theory, research and interventions for childhood anxiety have tended to adopt a 'top-down' approach, beginning with adult theory and companion treatment techniques, and then broadly testing the 'fit' of the model to childhood populations (Turner, 2006). However, as demonstrated throughout this thesis, it may not be suitable to directly apply adult models to children, in that higher levels of anxiety, rituals and cognitive appraisals, as well as sub-optimal executive performance, may have differing significance depending on the age of the young person.

For example, the study reported in Chapter Two found that levels of fear, worry and ritualistic behaviour were typically high during middle childhood, decreasing rapidly after 10 years of age. However, despite a drop in normative prevalence, ritualistic behaviour remained strongly associated with intense anxiety (particularly worry)

throughout childhood. As such, it may be that extreme worry increasingly becomes a prerequisite to the occurrence of ritualistic behaviour as children mature. This could tentatively suggest that phenomena that are normative (and even adaptive) in early childhood may begin to signify psychopathology if intensively continued beyond their developmental peak.

In the absence of direct empirical confirmation, the predictive value of childhood anxiety and ritualistic behaviour for the eventual onset of psychopathology is unclear. Leonard et al. (1990) dismissed this possibility after examining retrospective parental reports of the childhood rituals of OCD patients compared to controls. The connection between normative childhood ritual and eventual disorder was attributed to retrospective report bias, and dismissed on the grounds that the content of premorbid behaviour was unrelated to the symptoms of the disorder. However, failure to take a developmental approach may have resulted in Leonard and colleagues missing some important developmental processes in OCD.

For example, children and adolescents with OCD often display multiple obsessions and compulsions, the specific types of which change in both content and severity over the course of the disorder. Concerns over contamination, numbers, superstitions and symmetry, as well as washing/cleaning, counting and arranging compulsions, can become less prevalent as OCD progresses (Geller et al., 2001; Sobin et al., 2001). While it has been claimed that these changes occur in no clear sequence (e.g. Leonard et al., 1990), this pattern clearly corresponds with the findings of the Study 1. This suggests the possibility that there may be ages of vulnerability for certain manifestations of obsessive-compulsive symptomatology, and that age-specific variability in OCD presentation may be coloured by common and fluctuating typical developmental themes in anxiety and ritualistic behaviour. This does not necessarily mean that normative anxieties and rituals will develop into

clinical obsessions and compulsions, but again highlights the importance of considering typical developmental variability to increase the sensitivity of research and clinical work.

Another relevant finding that demonstrates the importance of developmental context was the comparatively limited support found in Chapter Three for the role of inflated responsibility, as opposed to IOU and TAF, in the presentation of fear, worry and rituals across childhood. Although the drawing of direct clinical implications is limited by virtue of the typically developing nature of the sample, this finding corresponds with similar failures to find a link between responsibility and obsessive-compulsive symptomatology in clinical child samples (e.g. Barrett & Healy, 2003; Barrett & Healy-Farrell, 2003), as well as the suggestion that other cognitive biases may be more closely linked to OCD development in early life (Farrell & Barrett, 2006). As such, not all of the cognitive biases associated with adult OCD may be present in children, and distorted appraisals may in fact develop over time, or with increased severity of symptoms (as suggested by the salience effect found in Chapter Three). Although more work is required in this area, together these findings have potential implications for the direct application of the current cognitive model of OCD (which is based on research with adult samples) in treating children with the disorder.

Indeed, as the concepts of multifinality and equifinality suggest, it cannot be assumed that OCD onset is driven by the same underlying mechanisms across the lifespan, nor indeed that the same mechanisms non-discriminately contribute to OCD onset in individuals at the same developmental stages. The former notion was further highlighted by some of the issues arising from Chapter Four, when it was found that while high fear levels were associated with sub-optimal executive functioning during later adolescence, high levels of ritualistic behaviour were associated with executive deficits during earlier adolescence. Interestingly, this pattern appears to reflect the natural history of childhood

onset OCD, in that compulsions tend to emerge significantly earlier than obsessions (Evans et al., 2004). It was suggested that this may reflect the potentially differing rates of maturation of behavioural and emotional regulation, with deficits not becoming apparent until a system matures. This would account for why the behavioural consequences of executive maturation may manifest prior to the cognitive consequences in both typical and atypical presentations of anxiety and ritualistic behaviour, and further emphasises the relevance of developmental context.

5.2.4 Identification of the cognitive mechanisms underlying both typical and atypical development

The present research attempted to effect the translation between typical and clinical phenomena in two ways. The study described in Chapter Three set out to apply the 'clinical' concept of biased cognitive appraisals to mechanisms of anxiety in typical childhood. This study promoted a clearer understanding of the typical levels of these variables across childhood and adolescence, promoting comprehension of the clinical significance of their presentation at varying stages of development. While increased understanding of these phenomena in typical childhood is useful in its own right, it also has the potential to improve early recognition and developmentally sensitive treatment of OCD.

In the opposite direction of translation, the study described in Chapter Four applied concepts derived from mainstream research on executive function development to the clinical issue of OCD symptomatology in childhood. Although the expected differences between hot and cool task performance were not found, this study was successful in showing how this translation can be done and in pointing the way for future research. Indeed, the mainstream cognitive developmental concept of a fractionated executive

system has not yet found its way into clinical discourses. The study reported in Chapter Four was a first step in attempting to facilitate this crossover. Continued research into the potential precursors of OCD that takes seriously the distinction between these systems would seem a promising way of illuminating the operation of these systems in both typical and atypical development. Ultimately, it is hoped that the findings of each of these studies will prove useful in understanding why cognitive processes involved in normative anxiety become transformed under some conditions into psychopathology.

5.3 Issues in the study of fear, worry and ritualistic behaviour in childhood

In this section, I consider the implications of the present findings for two issues that are current in the literature on this topic. Firstly, the usefulness of a distinction between fear and worry will be considered, followed by further discussion relating to the relative significance of fear and worry in the performance of rituals during childhood and adolescence.

5.3.1 Is fear the same as worry?

In the childhood literature, fears and worries are often bracketed together (Vasey et al., 1994; Neitzel et al., 1988), with some researchers proposing that differentiation between the two is neither possible nor useful (Neitzel et al., 1988; Rosen & Schulkin, 1998). The basis of this argument resides in similarities in prevalence rates, gender distribution and continuity across childhood, as well as an overlap between the affective and physiological patterns in which fear and worry are expressed (Gullone, King & Ollendick, 2000). There is also some evidence to suggest that anxiety in younger primary school-aged children presents in a more diffuse manner, reflecting a single dimension of anxiety, as opposed to clear subtypes (Spence, 1997).

The studies reported in the present thesis provided a range of evidence against this supposition, with results being more in line with reports that anxiety symptoms begin to cluster into subtypes of anxiety in early life (Spence, Rapee, McDonald & Ingram, 2001), as well as suggestions that these constructs are related, yet ultimately distinct, phenomena (e.g. Antony & Barlow, 1991; Gullone, 2000) in childhood and adolescence. For example, differential relations were found in Chapter Two between worry and rituals and fear and rituals, with the former being the stronger predictor. Further evidence for specificity arose from differential relations between fear and worry with cognitive appraisals in Chapter Three (e.g. the strong relation between worry and IOU), as well as the convergent validity data gathered in Chapter Four. Moreover, while sample limitations prevented the use of statistical methods (e.g. factor analysis) to establish the distinctiveness of the fear and worry constructs as assessed by the Fears, Worries and Ritualistic Behaviours Interview, the above evidence also goes some way to support the validity of this novel measure and its approach to specifically assessing each of these anxiety phenomena.

5.3.2 The relative significance of fear and worry in the performance of rituals during childhood and adolescence

As previously outlined, the study reported in Chapter Two also found that more anxious typically developing children engaged in more ritualistic behaviour throughout the age-range studied. While previous research has reported similar findings (e.g. Evans et al., 1997; Zohar & Bruno, 1997; Zohar & Felz, 2001), the finding that worry had a greater relative influence than fear in predicting the performance of rituals was a previously unexplored finding in the literature. On the basis of previous work, it was suggested that this may reside in the underlying similarity between worry and obsessions as opposed to fear and obsessions (Borkovec et al., 1993; Freeston et al., 1994; Wells & Papageorgiou,

1998), as well as reports that intrusive thoughts and worries are both associated with similar modes of coping (i.e. problem focused and escape/avoidance strategies) in non-clinical populations.

Considering these parallels, and the specific relationship between worry and rituals in the current study, it was proposed that normative ritualistic behaviour may similarly represent efforts to relieve tension and anxiety (Kopp, 1989; Marks, 1987). However, while this suggestion accords with that of Evans and colleagues (1997, 2000), who similarly propose that the rituals of children as young as 13 months of age are associated with anxiety reduction, neither Evans' work nor the present research is able to infer the directionality or causality between anxious states and the display of ritualistic behaviour in childhood. Indeed, looking to the clinical literature, while a combination of obsessions and compulsions is most common (Pollock & Carter, 1999) this is not always the case. For example, in a study consecutively examining 70 children and adolescents with OCD, Swedo et al. (1989) found that approximately 40% of participants denied associated obsessions, and that 'pure' ritualisers occurred more commonly than 'pure' obsessives. Thus, it seems that compulsions may commonly present without identifiable obsessional thoughts or cognitions, or apparent links to harm avoidance (Pollock & Carter, 1999). While this may potentially indicate a relative lack of insight in children with the disorder, in the form of an inability to reflect on or develop rational explanations about their behaviour (Carter, Pauls & Leckman, 1995), it also raises the question as to whether these differences in presentation could reflect developmental subtypes of the disorder, with different aetiologies. For example, it has been suggested that early childhood onset OCD has a stronger genetic and/or biological component than late onset cases (Bolton, 1996), and that it is significantly more related to neuropsychiatric disorders such as Tourette's (Millet et al., 2004), with males potentially being more vulnerable to these influences than

females (Lochner et al., 2004). This again reflects the concept of equifinality, and highlights the requirement for future research (perhaps including genetic and neuroimaging data) to delineate such subtypes to further clarify the aetiology of OCD across the developmental trajectory.

5.4 Limitations and future directions

There are a number of limitations to the studies presented within this thesis that need to be considered. Firstly, given the cross-sectional nature of each study, causal connections cannot be drawn. This, along with relatively small sample sizes and lack of data from clinical participants means that theoretical and clinical implications can only be speculated upon. Furthermore, the lack of stringent psychiatric screening leaves open the possibility that a number of children included in the research were within the clinical range on the variables assessed. The obvious implication of this is that the purported deepening of understanding regarding normative levels of these so-called 'clinical' variables across childhood and adolescence was not a true reflection of typical childhood after all.

Furthermore, while there is currently a lack of well-developed tools to systematically and consistently measure anxiety across childhood and adolescence, the novel measures generated for use within this thesis (the Fears, Worries and Ritualistic Behaviours Interview, the semi-idiographic method to assess cognitive appraisals, and the salience manipulation to the hot executive tasks) require further validation to ensure that they do in fact reliably and sensitively assess developmental differences in their purported constructs. In particular, there is a further need for clarity regarding the distinction between fear and worry in childhood, which could in turn inform the debate regarding the nosological validity of anxiety and its disorders in children and young people. The salience manipulation of the executive tasks could also be improved, perhaps by presenting

phenomena via a video screen or through the use of other, stronger stimuli (although ethical implications will obviously limit what such research can achieve). The internal validity of presenting a variety of phenomena must also be questioned. While there was a justifiable rationale for this, it cannot be ruled out that a high degree of variance in stimuli presentation impaired the consistency and sensitivity of the procedure. Perhaps in the future it would be useful to identify and test groups of children with the same intense fear/worry (e.g. identifying a group of children with the same strong fear of tarantulas), which would allow the uniform presentation of visual stimuli. It is also essential to investigate executive functioning in relation to anxiety and rituals over a larger age range than in the present research. However, the challenge in this is ensuring task specificity and sensitivity across childhood and adolescence, as although functioning typically increases with age, there is a need to hold cognitive load/complexity constant to ensure that performance can be more confidently associated with the presence/absence of anxiety phenomena.

Despite these limitations, this thesis managed to explore and present patterns of results that might usefully initiate and guide future investigation in an area of research that to date is largely understudied. Given the reported associations between fear, worry and ritualistic behaviour throughout childhood and adolescence, as well as preliminary evidence regarding the potentially important role of distorted cognitive processes (both in terms of appraisal and executive functioning), it would be useful to conduct longitudinal, prospective studies that simultaneously incorporated all of these factors within larger samples of healthy, sub-clinical and clinical participants. Developmentally sensitive replication is needed to add strength to the present findings, and further investigation into the correlates of OCD phenomena (perhaps incorporating statistical techniques such as structural equation modelling) would provide important information relating to the

mediating effects of cognitive variables on obsessive-compulsive symptoms and severity. This could provide direct empirical confirmation of some of the preliminary findings and theoretical suggestions made throughout this thesis, as well as delineate the mutual, interacting influences of each of these factors in both typical and atypical presentations.

It would be particularly interesting to assess risk longitudinally to investigate transition into psychopathology. For example, children high in anxiety could be identified during infancy, with measures taken to assess associated coping strategies over a course of years, to determine whether psychopathology ensues or is prevented. These children could be followed through multiple periods of high biological and psychosocial vulnerability. For example, this could be done during the transition to primary school or secondary school, which both present unique challenges with increased responsibility and unpredictability as well as a wide range of other stressors that may lower an individual's threshold for psychopathology. This would allow investigation into both protective and predisposing/ precipitating factors and promote the development of bottom-up as opposed to top-down models of anxiety in childhood (i.e. models based on what we see in children, rather than what we know about adults). Indeed, bottom-up research implicating a range of sensitive methodologies (e.g. clinical interviews, neuropsychological tasks and experimental paradigms) might assist in understanding the unique neurobiological and cognitive behavioural processes specifically relevant to childhood OCD.

The presentation of both clinical and non-clinical manifestations of anxiety and ritualistic behaviour appears to be a heterogenous entity, with the implication that different processes might differentially contribute to the onset of the disorder at different stages of childhood. Developmentally sensitive research would open up possibilities for prevention, particularly in sub-clinical groups, and findings would also have important, wide-ranging implications for early detection and the development of targeted, optimally effective

treatment techniques. In considering the tentative findings of the studies reported in this thesis, within the wider developmental psychopathology framework, it may be that a combination of developmentally sensitive executive performance training and cognitive-behavioural therapy (perhaps with an emphasis on IOU and TAF) will be a particularly efficient means to successfully promote effective emotional regulation and adaptive coping strategies during childhood and adolescence.

5.5 Concluding comments

This thesis applied a developmental psychopathology approach to fear, worry and ritualistic behaviour in typical childhood. While the work presented provides only a first step in this field of study, it is hoped that this research has gone some way to demonstrate the potential of this framework in promoting a deeper understanding of anxiety phenomena, and that future research will similarly embrace a developmentally sensitive approach when investigating the pathways and mechanisms underlying fear, worry and rituals throughout typical and atypical childhood and adolescence.

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APPENDICES

APPENDIX 1

(*The same format and questions will be used for all participants. A comprehensive literature review of studies involving participants within the age range of 7-17 years provided the closed response items and suggested the suitability of the methodology*)

Below is a summary of the fear, worries and ritualistic behaviours interview, as it relates to Study 1 (Chapter 2). Responses given to this interview also form the basis of the idiographic stimuli administered in Study 2 to a sub-sample of participants from Study 1. An overview of how participants might respond to the interview, as well as further description of how Study 1 and Study 2 procedures are linked, can be found in the flow chart to follow.

VERBAL INTRODUCTION FOR THE CHILDREN

Hello, how are you today? My name is Sarah, what's yours?

I'm here today (name) because I would like to find out what types of things children/people who are the same age as you might think are scary, and things they might worry about. Would it be ok to talk to you about things like that?

If you change your mind at any time and want to stop just let me know and that's ok.

Before we start, it is important that you know that there are no right or wrong answers to the questions I am going to ask you. And, if you don't understand a question or are not sure, just ask.

OPEN-RESPONSE SECTION REGARDING FEARS

To start with, I'm going to ask you about things that make you scared or frightened. For example, some children/people are frightened of the dark. What makes you frightened or scared?

Can you tell me another thing that you find scary?

Is there anything else you find frightening?

Thank you, that's excellent. Now that you have told me some scary things, I would like you to let me know just how scary you think they are. Is that ok? So you can let me know how scary you think these things are, I would like you to use the 'scare meter'. *(1 metre x 30 cm card meter with 0 – not scared at the bottom, then 1 – a little scared, 2 – quite scared, 3 – very scared. Also includes pictures of a very scared face, and a not scared face at points 3 and 0 respectively. Children point to statement that best describes how they feel)*

So, when I say something that you have told me is scary, I would like you to point to the place on the meter that best describes how you feel. So, if what I say would make you feel very scared, then you would point to number 3. But, if you feel as though it would not scare you at all, then you would point to 0. Do you understand? Have you got any questions?

Shall we have a practice? If I say to you, "how scared are you of the dark", what place would you point to?

Wait till the child points, then say what they have pointed to means, e.g. So, you pointed to number 3, that means you are very scared of the dark. Is that right?

Now that we have practiced, let's use the things that you have said are scary.

I read out each item that the participant has said is scary and child points to place on meter that describes how scared they are of that item

CLOSED RESPONSE SECTION REGARDING FEARS

(All closed-response items have been approved by University of Durham Ethics Committee for use with typically developing children between the ages of 7 and 16 years)

Now I would like to talk about things that other children have said they find scary. I would like you to think about each one, let me know if it frightens you, and then point to the meter to let me know how you feel about it. Remember, there are no right or wrong answers, and I want you to point to the place that best describes how you feel. Is that ok with you? OK, are you scared of:

1. Dogs, rats or other animals?
2. Spiders, worms, other insects?
3. Strangers or being kidnapped?
4. Getting lost in a strange place?
5. Falling from a high place?
6. Fire, getting burned?
7. Having an injection, seeing blood?
8. Getting hit by a car or lorry?
9. Going to the dentist?
10. The dark?
11. Ghosts, vampires, dinosaurs?
12. Lonely places?
13. Being alone at home?
14. Closed places: lifts, small rooms?
15. Nightmares?

Can you think of anything else you find scary that we haven't talked about yet? (*If so use scare meter to find out more: How much does it scare you?)*

OPEN RESPONSE SECTION REGARDING WORRIES/OBSESSIONS

Was that ok? Are you happy to carry on? Now we have finished talking about scary things I would like to talk about things that might worry children who are the same age as you. Is that ok?

Everybody worries about things now and then. For instance, many children worry about how they do in school, like how well they have done in a test/exam. Do you worry about anything?

Is there anything else that worries you? (Can you tell me?)

Do you worry about anything else?

Now I would like you to tell me how often you worry about these things. Just like when we were talking about scary things, I wonder if you could point to a place on the 'worry meter' that describes how often you worry about something.

(1 metre x 30 cm card meter with 0 – never, then 1 – sometimes, 2 – often, 3 – always. Also includes pictures of a very worried face, and a neutral face at points 3 and 0 respectively. Children point to statement that best describes how they feel)

As you can see, you would point to 0 if you never worried about it, to 1 if you sometimes worry, to 2 if you often worry, and to 3 if you always worry. Shall we have a practice?

(*As before, read out each self-generated worry, and child points to how often they worry about it).*

CLOSED RESPONSE SECTION REGARDING WORRIES/ OBSESSIONS

Now, like before, I would like us to think about some worries that other children have said they have. Would it be ok for you to tell me how you feel about these worries?

For each worry I say, I would like you to tell me whether you worry about this thing, and if you do, would you then point to the place on the meter that best describes how often you worry about it?

So, the first thing some children have said they worry about is:

1. Being told off

Do you ever worry about this? Could you point to the place that shows how often you worry about being told off?

2. Getting poor marks at school
3. Something bad happening to someone you care about
4. Being bullied or picked on
5. People complaining about you or criticising you
6. Losing your friends
7. The way you look
8. Whether other children like you
9. Germs or dirt
10. War
11. Whether you have done things properly
12. Going to school/having to go to school
13. Being clean enough
14. Meeting someone for the first time
15. Being betrayed by a friend – e.g. talking about you behind you back.

Can you think of anything else you worry about that we have not talked about yet?

CLOSED RESPONSE SECTION REGARDING RITUALS

How are you doing? Now I'd like to ask you a few more questions, but this time about things people do sometimes. For this bit, I wonder if you can point to the place on this new meter that would show how often you might do the things I am going to ask you about.

(1 metre x 30 cm card meter with 0 – never, then 1 – sometimes, 2 – often, 3 – always. Children point to statement that best describes how they feel)

Is that ok? If you never do something I mention, you would point to 0, if you sometimes do, you would point to 1, if you often do, then point to 2, and if you always do, then point to 3. Do you understand?

Lots of people do things in their own particular way, and I'd like to know if you do these things too. For example, lots of people have a special order of doing things before they go to bed on a night:

1. When you get ready to go to bed at night, do you have a set routine you have to do, or a special way of doing things before you get into bed?

(If they say yes ask how often? If very often ask: what do you do in particular?)

2. Do you ever have to check water taps to make sure they are turned off, or doors/window to make sure they are shut more than once?
3. Do you ever line things up into straight lines?
4. Do you prefer it when objects are arranged in patterns?
5. Have you got special places for your belongings?
6. Do you ever feel you need to shower or wash several times a day/wash your hands over and over again?
7. Do you need to keep your room very clean and tidy?
8. Do you have to do things over and over a certain number of times before they feel right? E.g. homework
9. Do you ever count or go through numbers in your mind?

10. Do you keep a lot of things around in your room that you don't really need just in case you might need them one day?
11. Do you ever play special games, like not stepping on cracks to keep away bad luck?
12. Do you ever say special numbers or words to keep away bad luck?
13. Do thoughts and words go over and over in your mind even though you don't want them to?
14. Do you have a special number that you like to count up to or do things just that number of times?
15. Do you have certain ways of doing things that you cannot change? Give an example.

Positive response: Why do you do this/what makes you do this? Is this something you worry about/fear? What do you think would happen if you didn't do this?

Thank you for all your help, you have worked very hard. It was really nice to talk to you today. Do you have any questions about anything we have talked about?

FLOW CHART DEPICTING AN OVERVIEW OF POTENTIAL PARTICIPANT RESPONSES TO THE FEARS, WORRIES AND RITUALISTIC BEHAVIOURS INTERVIEW, AS RELEVANT TO STUDY 1 AND 2

START:

Stage 1: Open response fear section 1:

What makes you frightened/scared?

Response: next prompt

No response: move on to Stage 3

Can you tell me another thing you find scary?

Response: next prompt

No response: move on to Stage 2

Is there anything else you find frightening?

Response: move on to Stage 2

No response: move on to Stage 2

Stage 2: Rating of open response item(s)

Practice item

Rating of self-generated fear(s)

Rating of '1' or '3':
a) *When/if this happens, what do you/would you do to try and feel less scared?*
b) *What do you think would happen if* you didn't do this?

Rating of 0 or 2: move on to next self-generated fear or stage 3 (if all open-response concerns have been rated)

Move on to stage 3 when all open-response concerns have been rated

Stage 3: Closed response fear section: *procedure below is repeated until all 15 items have been presented, upon which the interviewer proceeds to Stage 4.*

Item 1

Rating of '1' or '3':
a) *When/if this happens, what do you/would you do to try and feel less scared?*
b) *What do you think would happen if you didn't do this?*

Move on to next item until list completed then continue to stage 4

Rating of 0 or 2: move on to next item until list completed, then continue to Stage 4

Stage 4: Open response fear section 2:

Can you think of anything else you find scary that we haven't talked about yet?

Response: rate fear with scare-meter

No response: move on to Stage 5

Rating of '1' or '3':
a) *When/if this happens, what do you/would you do to try and feel less scared?*
b) *What do you think would happen if* you didn't do this?

Move on to Stage 5

Rating of 0 or 2: move on to Stage 5

Stage 5: Open response worry section 1:

Do you worry about anything?

Response: next prompt

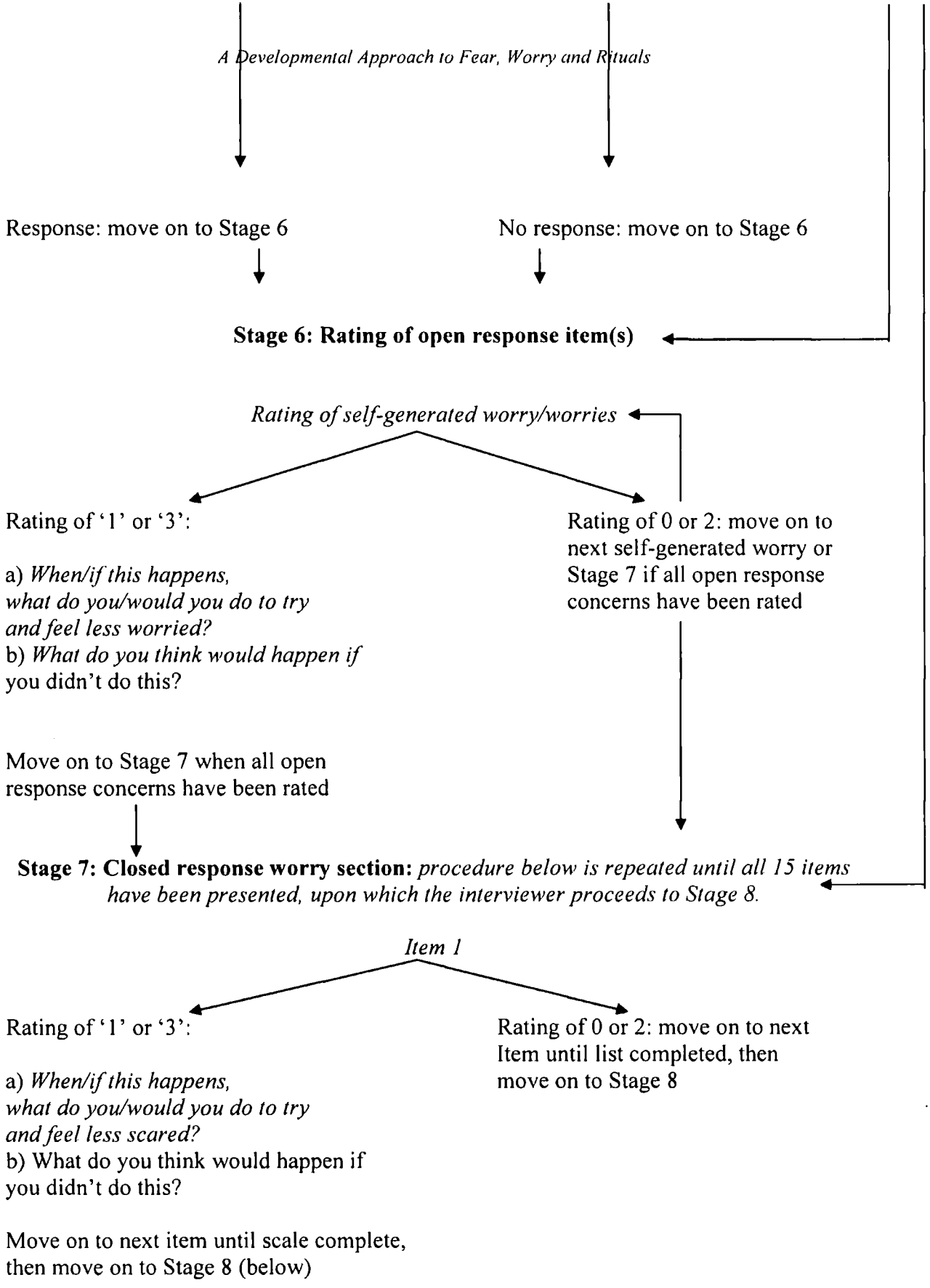
No response: move on to Stage 7

Is there anything else that worries you?

Response: next prompt

No response: move on to Stage 6

Do you worry about anything else?


Response: move on to Stage 6
No response: move on to Stage 6
Stage 6: Rating of open response item(s)
Rating of self-generated worry/worries
Rating of '1' or '3':
a) When/if this happens, what do you/would you do to try and feel less worried?
b) What do you think would happen if you didn't do this?
Move on to Stage 7 when all open response concerns have been rated
Rating of 0 or 2: move on to next self-generated worry or Stage 7 if all open response concerns have been rated
Stage 7: Closed response worry section: procedure below is repeated until all 15 items have been presented, upon which the interviewer proceeds to Stage 8.
Item 1
Rating of '1' or '3':
a) When/if this happens, what do you/would you do to try and feel less scared?
b) What do you think would happen if you didn't do this?
Move on to next item until scale complete, then move on to Stage 8 (below)
Rating of 0 or 2: move on to next Item until list completed, then move on to Stage 8

Stage 8: Open response worry section 2:

Can you think of anything else you worry about that we haven't talked about yet?

Response: rate worry with worry-meter

No response: move on to Stage 9

Rating of '1' or '3':

a) *When/if this happens, what do you/would you do to try and feel less worried?*
b) *What do you think would happen if you didn't do this?*

Rating of 0 or 2: move on to Stage 9

Stage 9: Closed response ritual section: *procedure below is repeated until all 15 items have been presented, upon which the researcher terminates the interview.*

Item 1

Rating of '1', '2' or '3':

a) *Why do you do this/what makes you do this?*
b) With regard to motivation for action: *Is this something you worry about/fear?*

Rating of 0: move on to next item

Yes response: use worry meter/scare meter To rate frequency/intensity of concern

c) What do you think would happen if you didn't do this?

No response: move on to next item

END.

APPENDIX 2

SUMMARY OF PHASE 2 OF THE PROCEDURE, APPLICABLE TO STUDY 2

(This phase of the study takes an idiographic approach, thus according to the responses given during Study 1 (which all participants in Study 2 have previously completed), items will be tailored to each individual. Children are therefore presented with their personally acknowledged fears, worries (of differing salience) and corresponding rituals. Responsibility, thought-action fusion and intolerance of uncertainty appraisals will then be assessed for all respondents in relation to each personal concern. As each session will be personal to the individual, it is impossible to provide an exhaustive list of fears, worries, rituals and relevant appraisals. As such, I have provided an example to demonstrate how appraisals may be accordingly placed into each standardised sentence stem.)

VERBAL INTRODUCTION TO THE CHILDREN

Now I would like to talk a little more about how you feel about the fears and worries we talked about last time. Would that be ok with you? If you change your mind at any time and want to stop just let me know and that's ok.

Before we start, it's important that you know that there are no right or wrong answers to the questions I am going to ask you. And, if you don't understand anything I mention, just ask and I will do my best to explain it more clearly to you.

EXAMPLE OF STUDY 2 PROTOCOL

Now, first of all, you mentioned to me that you sometimes worry about germs, and to deal with this, you often wash your hands over and over again. Would it be ok if we talked about this some more?

OK, now I'd like to ask you a few questions about this worry, and to help me understand how you feel about it, I wonder if you could point to this meter to let me know exactly what you think. *(This would be of identical format to the meters used in Phase 1).* So, if you totally agree with what I say, you would point to number 3. But, if you think what I say is not right, then you would point to 0. Do you understand? Have you got any questions? OK.

(Responsibility): If you didn't (wash you hands over and over again) **do you think it would be all your fault and nobody else's** (if you caught germs and started to feel ill)?

Can you point to the place on the meter that best shows what you think?

(Child points to meter – 0 – No, not at all, 1 – No, probably not, 2 – yes, maybe, 3 – Yes, very much)

(Thought-action fusion – Likelihood self): If you just think *(about catching germs and feeling ill),* ***do you think it is then a lot more likely*** *to come true in real life?*

(TAF – Likelihood other): If you just think about a good friend *(catching germs and feeling ill),* ***do you think it is then a lot more likely*** *to come true for them in real life?* *(*Again, child points to appropriate place on meter*)*

(TAF – Moral): Do you feel that just thinking about *a good friend (catching germs and feeling ill)* ***is just as bad as wanting*** *it to come true in real life?*

(Intolerance of uncertainty – convergent): Do you need to be totally sure *you wash your hands over and over)* ***to be certain that*** *you don't catch germs and start to feel ill)?* *(*Again, child points to appropriate place on meter*)*

(Intolerance of uncertainty – intermediate): Do you need to do anything else to be totally sure (you don't become ill)? (Again, child points to appropriate place on meter)

How are you doing, was that ok? Would it be all right to talk about some other things you mentioned last time?

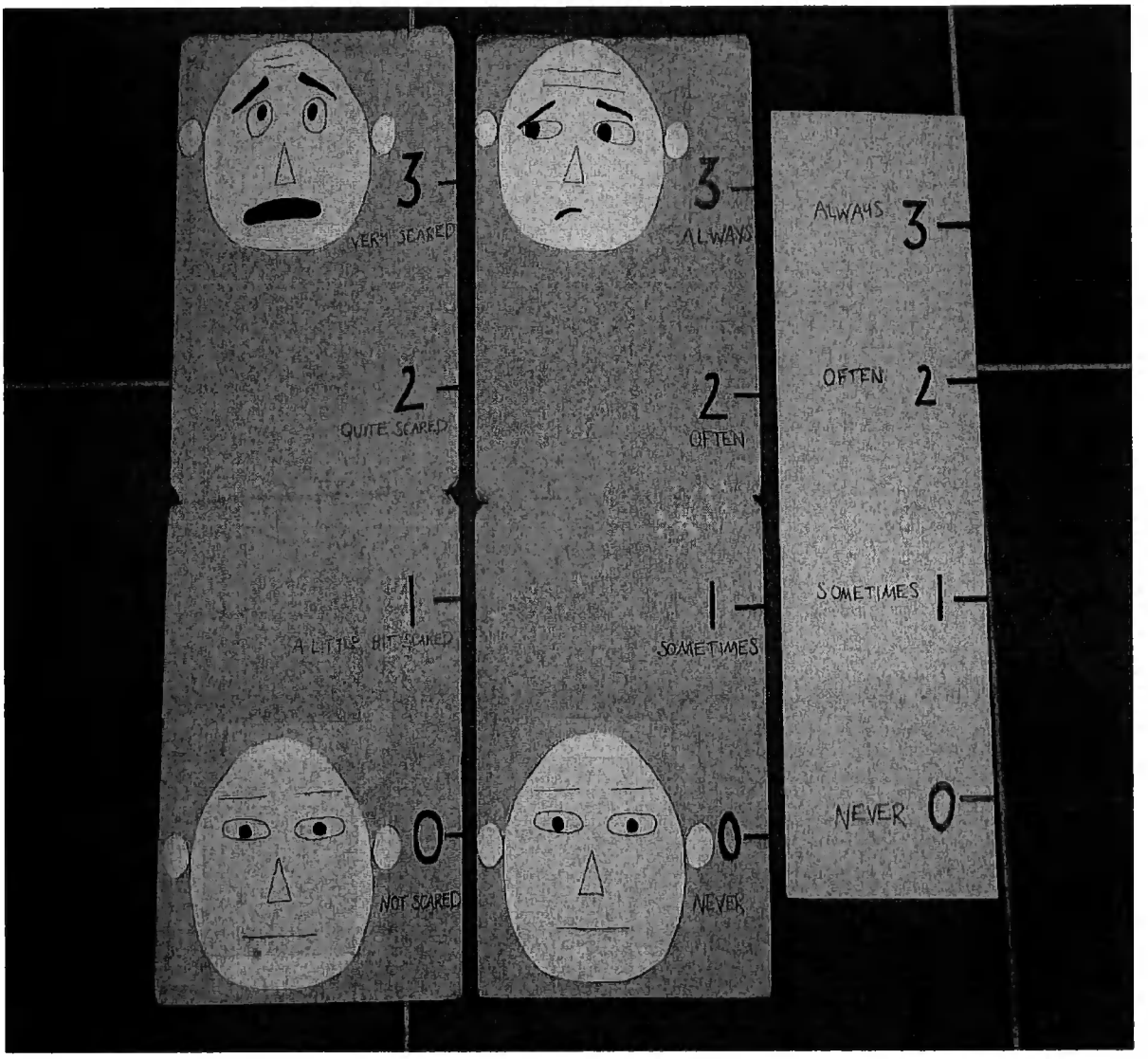
(This procedure will be repeated until 2 salient fears and worries have been covered, and 2 less salient fears and worries have been covered. In each case, the same appraisals will be rated, but in a format made specific to each concern.

The child will be continually asked how they feel about continuing with the procedure, and given the right to withdraw if necessary.)

Thank you for all of your help, you have worked very hard. Do you have any questions about anything we have talked about?

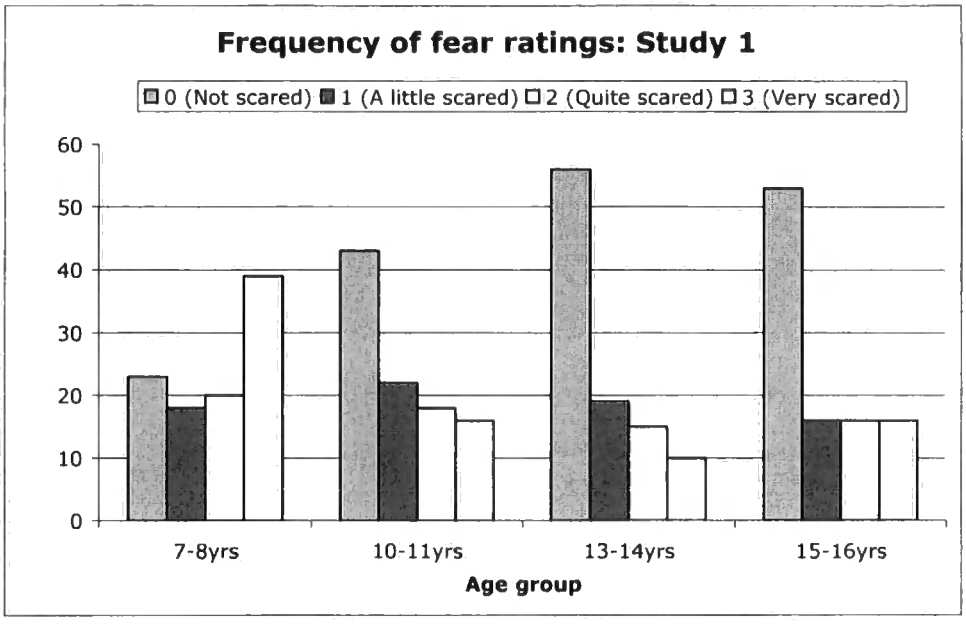
Now that we have finished talking about that, could you tell me what makes you very happy, and what you enjoy doing the most?

APPENDIX 3

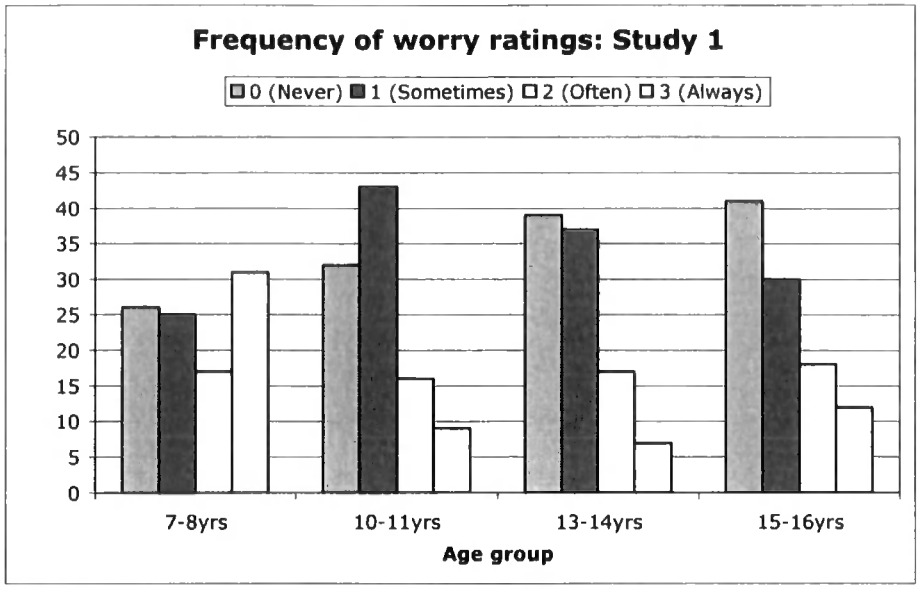

3
VERY SCARED
2
QUITE SCARED
1
A LITTLE BIT SCARED
0
NOT SCARED
3
ALWAYS
2
OFTEN
1
SOMETIMES
0
NEVER
ALWAYS 3
OFTEN 2
SOMETIMES 1
NEVER 0

APPENDIX 4

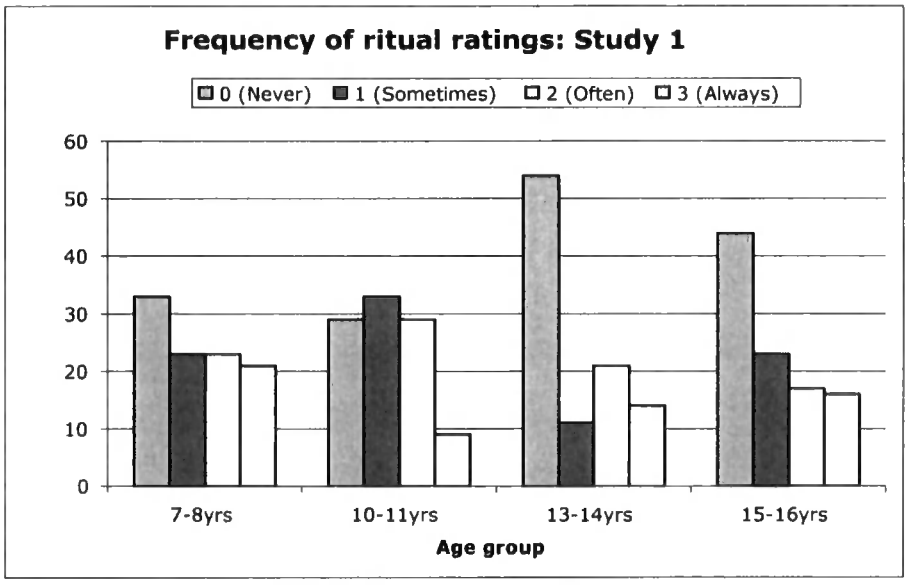
STUDY 1: FREQUENCY DISTRIBUTION OF 0, 1, 2 AND 3 RATINGS BY AGE



The pattern of responding in the latter 3 age groups suggests that the majority of items in the fear list are experienced as 'not scary' by older children, with a gradual decrease in commonality of ratings that reflect a higher intensity of fear. This pattern is reversed among the youngest age group, who typically report a wider variety of items as 'very scary'. With regard to the issue of biased responding towards ratings with an accompanying face (0 and 3), the patterns of responding across age groups suggest this is improbable. Data from the youngest age group could perhaps be viewed as most suggestive of this possibility, however given 23% of ratings overall were 0's, and 20% of ratings were 2's within this age group, it appears unlikely that the visual scale unduly influenced responding.



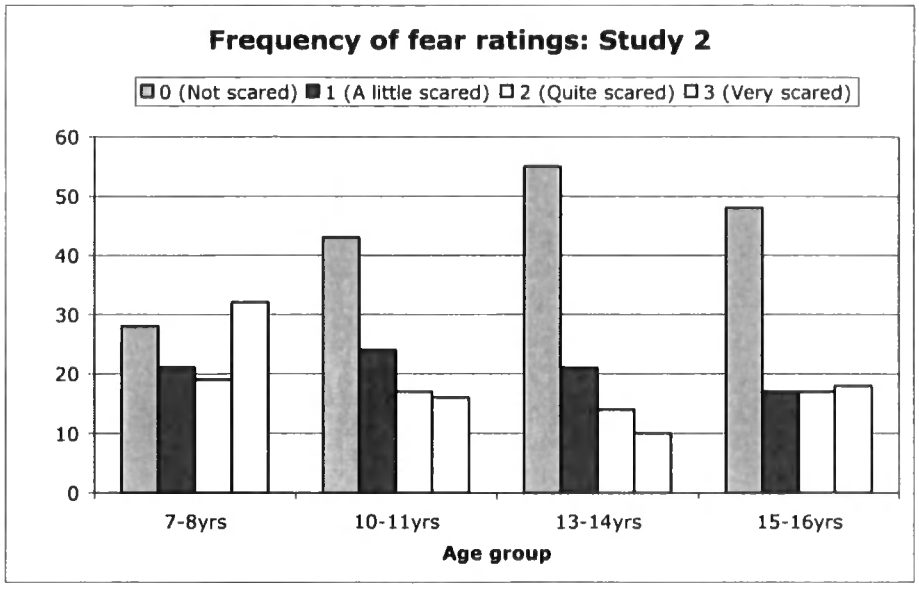
The pattern of responding among the oldest groups is most similar, with a decrease in the commonality of ratings as they reflect greater frequency of worry. At 10-11 years, children most commonly endorse that they 'sometimes' worry about the items on the closed-response list. At 7-8 years, children again most commonly endorsed the highest frequency of worry across items. Frequency of ratings for 'never' and 'sometimes' worry were close, reducing the likelihood that the visual scale influenced responding.



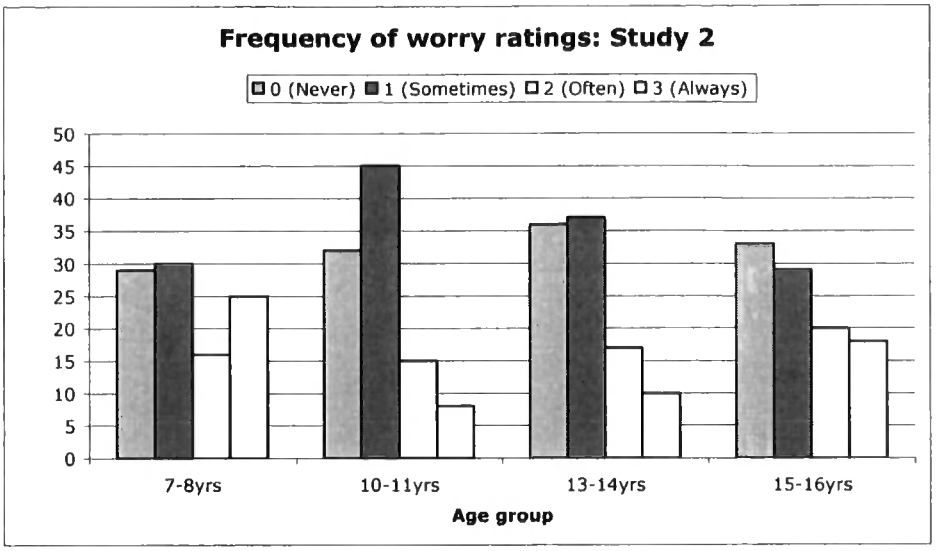
The graph above suggests variation both within and between ages in responding to the ritual scale, and a lack of bi-modal distribution across groups.

APPENDIX 5

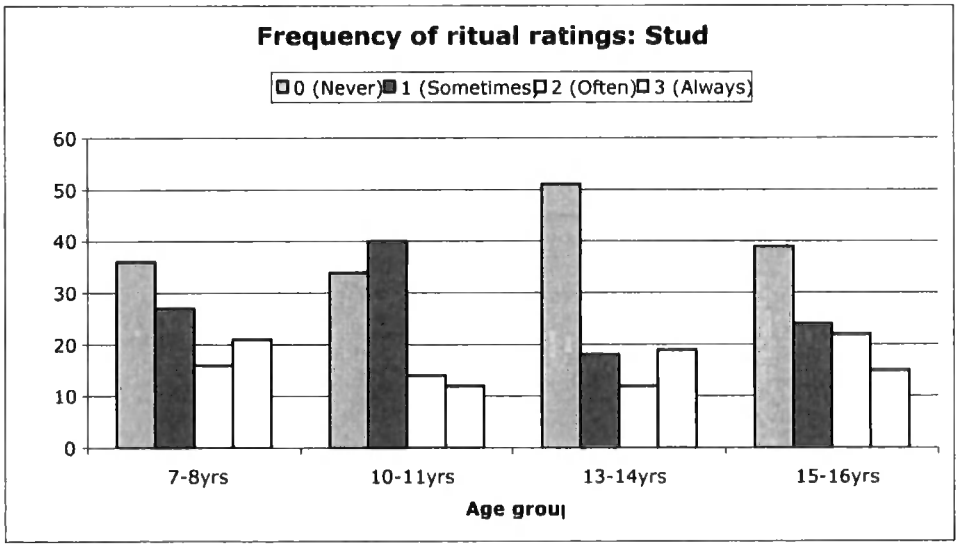
STUDY 2: FREQUENCY DISTRIBUTION OF 0, 1, 2 AND 3 RATINGS BY AGE



Among the three older age groups, the data suggest a decrease in the commonality of ratings as they reflect increasingly intense fear intensity. This is not the case among the youngest age group. While frequencies are highest for 3 and 0 ratings, the limited difference between the percentage of 0 (28%) and 1 ratings (21%) would suggest that this is not significantly problematic in terms of bi-modal distribution.



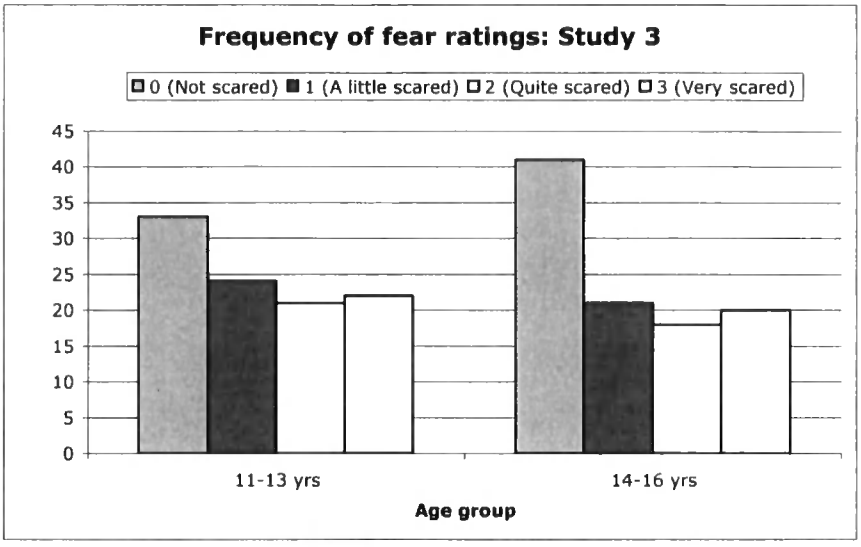
At 7-8 yrs, 10-11 years, and 13-14 years, children most commonly endorse that they 'sometimes' worry about the items on the closed-response list. Again, this provides evidence against a response bias towards ratings with an accompanying face (e.g. 0 or 3).



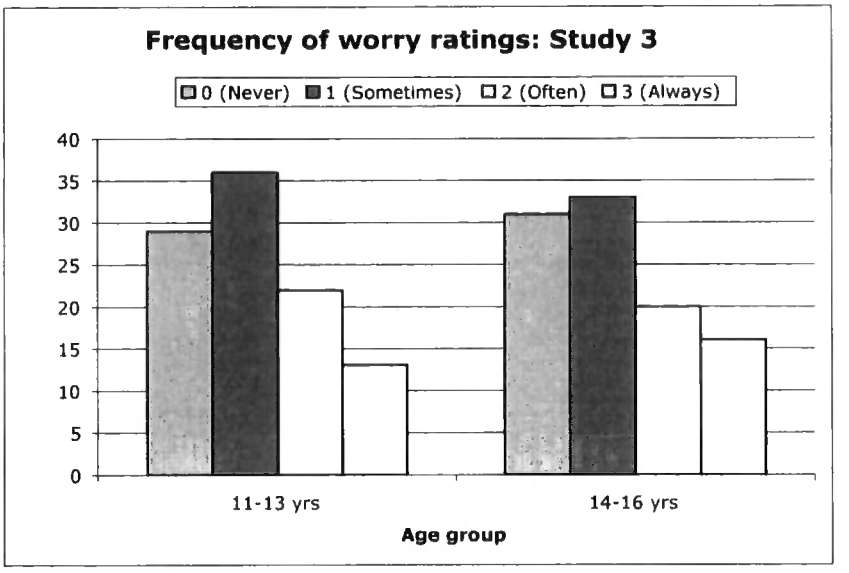
The graph above suggests variation both within and between ages in responding to the ritual scale, and a lack of bi-modal distribution across groups.

APPENDIX 6

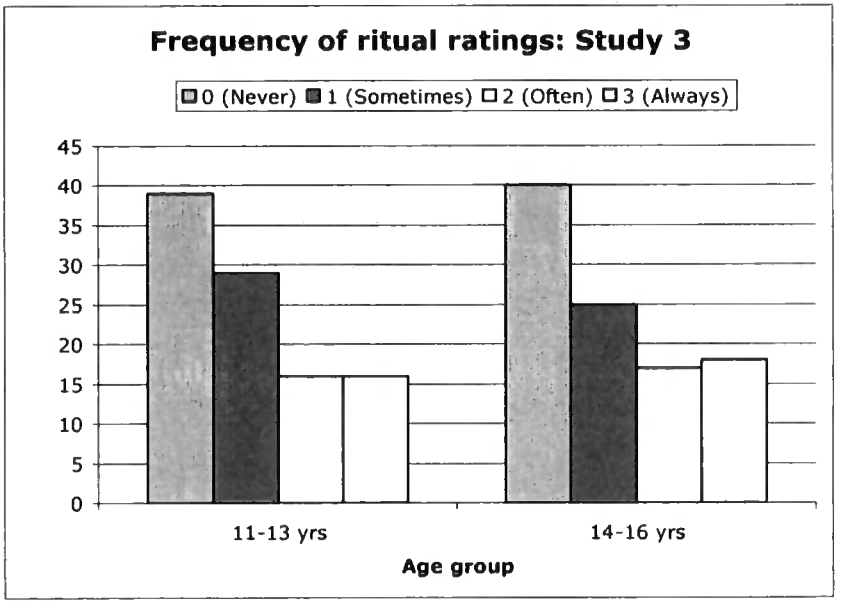
STUDY 3: FREQUENCY DISTRIBUTION OF 0, 1, 2 AND 3 RATINGS BY AGE



Both age groups most commonly endorse fear items with a rating of '0', with a decrease in frequency of ratings as they represent more intense fear. There is no evidence of bi-modal responding.



The most common rating across groups is 'sometimes worry'. Again, ratings reflecting higher frequency of worry are least commonly endorsed. There is no evidence of bi-modal distribution.



Participants in study 3 most commonly endorse that they 'Never' engage in the items on the closed-response list, with a similar pattern of responding across age groups. There is no evidence of bi-modal distribution.

APPENDIX 7

ETHICAL APPROVAL FOR STUDY 1, 2 (JOINT) AND 3

Research and Economic Development Support Service

Memorandum

TO: Sarah Laing, Research Postgraduate, Department of Psychology

FROM: Lucy Middleton, Secretary to the Ethics Advisory Committee

DATE: 15th June 2004

SUBJECT: **Application Number 03 EAC R157:**
Obsessive-Compulsive Disorder from a Developmental Perspective

Thank you for sending in your application form to the Ethics Advisory Committee for an advisory decision on your proposed project.

I am pleased to inform you that, in light of your responses to the Committee's views, and amended application, Professor Bob Sullivan, Acting Chairman of the Ethics Advisory Committee, acting on Members' advice, has given advisory ethical approval to your above-named project.

We should be grateful if you would also provide a report on the project when completed, based on form EC3, (available from the University's REDSS website/from this office).

With best wishes

Research and Economic Development Support Service, University Office, x 46093
E-mail: l.e.middleton@durham.ac.uk

STUDY 3:

Memorandum

Applied Psychology

From:	Michael Burt Deputy Chair, Psychology Ethics Committee	To:	Sarah Laing
Date:	16 May 2006	Copy to:	Charles Fernyhough

Subject: ***Ethics Application: Obsessive-compulsive behaviour and orbitofrontal functioning in typical childhood***

This is to confirm that approval for this study was granted on 11 October 2005 subject to the following conditions:

- You must ensure that the actual conduct of your research conforms to the ethical guidelines of the British Psychological Society. One of the requirements is that participants should be fully informed about the nature of the proposed study. This is particularly important if any aspects of the study are likely to prove distressing to the participant.

- You should also note that, according to the British Psychological Society, individual feedback to participants regarding their performance on standardised tests should *not* be given by researchers unless they have a professional qualification in psychometrics.

- If you are working with children, you should obtain a Criminal Records Bureau (CRB) Disclosure.

Michael Burt

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Fax 0191 334 3241
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