AN EXPERIMENTAL MANIPULATION OF THOUGHT-ACTION FUSION IN CHILDREN: A TEST OF THE ROLE OF THOUGHT-ACTION FUSION IN OCD

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Abstract

Introduction:

Thought-action fusion refers to a belief that is associated with obsessive-compulsive disorder (OCD) in adults and children, but little experimental research has investigated the causal relationship between thought-action fusion and obsessive-compulsive symptoms. This study aims to investigate whether thought-action fusion causes obsessive-compulsive symptoms in children and whether this relationship is mediated by beliefs about responsibility.

Method:

Eighty-five children aged 9 to 11 years were randomly allocated to conditions in a between-subjects experimental design. They completed baseline measures of thought-action fusion, responsibility beliefs and anxiety. During phase 1 of the task, children wore a helmet and tried to make pictures on a computer turn red using their thoughts. Children in the experimental group saw the pictures turn red – to induce positive thought-action fusion beliefs - and those in the control group did not. In phase two of the task – designed to activate thought-action fusion concerns – children in both groups were told that the computer might be damaged by particular thoughts. Children could press a button if they were concerned their thoughts might damage the computer. Dependent variables were: induced thought-action fusion, anxiety, button-pressing, responsibility beliefs and thought-control.

Results:

Children in the experimental group had significantly higher levels of induced thought-action fusion, indicating that the manipulation was successful. They also had higher levels of thought-control. Induced thought-action fusion was significantly correlated with thought-control in the experimental group. There were no other significant results. Results replicated some of the findings in the adult literature.

Conclusions:

The results offer preliminary support for a causal link between thought-action fusion and thought-control in children and add to the small body of literature suggesting that cognitive models of OCD may apply to children.

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Chapter 1

Introduction and Literature Review

1.1 Chapter Overview

Obsessive compulsive disorder (OCD) is a serious anxiety disorder with a huge impact on the lives of those affected. Refining psychological models of OCD has important implications for the treatment of children. The aim of the research reported in this thesis is to improve understanding of the way psychological models of OCD apply to children. In particular, this study investigates whether thought-action fusion has a causal role in OCD symptoms in children. Thought-action fusion refers to beliefs about thoughts being equivalent to actions. These beliefs are associated with OCD in both children and adults but may not have a causal role. They are similar to 'magical thinking', which is developmentally normal in younger children. There has been a growing interest in the link between thought-action fusion and OCD and how this may relate to normal development. In addition, there is disagreement over whether thought-action fusion contributes directly to symptoms of OCD or whether the relationship is mediated by other psychological factors. A small number of studies have investigated this question, but these have used mainly cross-sectional designs, making it difficult to determine the direction of relationships. Furthermore, most research has used adults. This research will use an experimental design to manipulate thought-action fusion in children and examine the effect of thought-action fusion on obsessive-compulsive (OC) behaviours.

This introduction begins by reviewing the clinical presentation of OCD in children. It will discuss theoretical approaches to OCD, in particular cognitive-behavioural models and their associated treatments. Research evaluating the role of thought-action fusion in OCD in adulthood will be discussed and the literature evaluating thought-action fusion in OCD in children will be critically discussed. It is proposed that thought-action fusion is an important OCD-related cognition in adults and children. The chapter concludes with a summary and outlines the research hypotheses.

1.2 The Clinical Presentation of OCD in Children

1.2.1 Diagnostic criteria.

The Diagnostic and Statistical Manual of Mental Disorders – Fourth Edition (DSM-IV; American Psychiatric Association, 1994) describes OCD as being characterised by recurrent obsessions and/or compulsions that cause marked distress and/or interference in functioning. Obsessions are defined as recurrent thoughts, images or impulses that are experienced as intrusive or inappropriate. Compulsions are repetitive behaviours or mental acts, which the person performs in response to an obsession or according to rigid rules. The aim of the compulsions is to reduce distress and/or prevent some dreaded event or situation. Common obsessions include thoughts about dirt and contamination, harmful events such as illness or death, symmetry and exactness, religious concern, unacceptable aggressive or sexual urges or ideas. Common compulsions, in response to these obsessions, include hand washing, checking, touching, ordering and mental compulsions such as counting, praying and cancelling thoughts.

OCD symptoms in children manifest themselves in a very similar way to those in adults, with the exception that children are not required to have insight into the unreasonable nature of the obsessions or compulsions in order to have a diagnosis. Usually children and adults report both obsessions and compulsions. Children usually present with a variety of different obsessions and compulsions which may well change over time (Hanna, 1995).

1.2.2 Epidemiology.

1.2.2.1 Prevalence.

Childhood OCD, as OCD in adulthood, is substantially more common than was once thought. Epidemiological studies in children (i.e. under 18 years) which have used mental health interviewers and semi-structured clinical interviews have found rates of 2.3%–4.0% (Douglass, Moffitt, Dar, McGee, & Silva, 1995; Valleni-Basile et al., 1994; Zohar et al., 1992). A point prevalence estimate of a community sample of over 5000 14–18 year-olds in the United States of America suggested that at a given time, between 0.5% and 1% of children suffer from OCD. The same study reported a lifetime prevalence of 1.9% (Flament et al., 1988). Heyman et al. (2001) found an overall prevalence of 0.25% in a United Kingdom community sample of over 10000 5–15 year-olds. They attributed their lower prevalence to their cut-off at age 15, compared with 18 years in other studies. Maina, Albert, Bogetto and Ravizza (1999) found the point prevalence of OCD in 17 year-old males in Italy was 2% with a lifetime prevalence of 2.6%. They found sub-threshold levels of OC symptoms in 12.3% of their sample. Fireman, Koran, Leventhal and Jacobson (2001) found a 1-year prevalence of only 0.084% in a sample of over 1.7 million children and adults in the US. This study used outpatient diagnoses, which suggests that many cases of OCD may go unrecognised and untreated. Heyman et al. (2001) found that of the 25 children they identified with OCD, only three had been seen by specialist services. This could be partially due to secretiveness about symptoms; Whitaker et al. (1990) found that only 25% of young people with OCD were likely to seek treatment from a mental health professional. Lack of awareness of the condition and treatment availability may also contribute to many cases of childhood OCD remaining unnoticed and untreated. Jenike (1989, p539) characterised OCD as a “hidden epidemic”.

1.2.2.2 Age of onset, course and prognosis.

In children and adolescents, studies have reported a mean age of OCD onset of about 10 years, but some children develop OCD when they are as young as 3 or 4 years (Garcia et al., 2009; Mancebo et al., 2008, Rasmussen, & Eisen, 1992). Researchers have observed that OCD has two peaks of incidence, one in childhood and a second in early adulthood at around 21–23 years (Mancebo et al., 2008; Pauls, Alsobrook, Goodman, Rasmussen, & Leckman, 1995). Over 50% of adults with OCD identify the onset of their symptoms before the age of 18 (Pauls et al., 1995) and approximately 40% of childhood-onset cases of OCD continue into adulthood, suggesting it can take a chronic course (Stewart et al., 2004). A number of studies have shown that prevalence rises with age during childhood and adolescence (Heyman et al., 2001; Thomsen, 1993; Valleni-Basile et al., 1996; Zohar & Bruno, 1997). This suggests that developmental factors may increase the risk of OCD in childhood (Fontenelle & Hasler, 2008).

The onset of OCD is usually gradual. Hanna (1995) interviewed a small sample of children and adolescents with OCD and found that 55% had a gradual onset over a period of years, compared to only 6% who had an onset over a period of days. Garcia et al. (2009) investigated younger children aged 4–8 years old with OCD and found that 24% had an abrupt onset and 50% had a gradual onset, the remaining children were not able to identify how their symptoms began. However, in this study it is not clear how ‘abrupt’ and ‘gradual’ are defined.

The course of OCD can vary, one study of juveniles with OCD found that 70% reported a continuous course of OCD, while 28% reported that their OCD symptoms became significantly better at times (periods of at least 3 months' duration of sub-clinical symptoms) (Mancebo et al., 2008). Farrell and Barrett (2006) found that children and adolescents with OCD had less severe symptoms than adults with OCD and displayed significantly less insight, as might be expected developmentally.

OCD in childhood can be a devastating condition. Studies have found that it has detrimental effects on social, family and academic functioning (Leonard et al., 1993; Piacentini, Bergman, Keller, & McCracken, 2003; Geffken et al., 2006). Earlier onset of OCD seems to result in greater symptom severity in adulthood (Fontenelle, Mendlowicz, Marques, & Versiani, 2003) and more persistence of symptoms (Geller et al, 2001). This evidence suggests that childhood OCD is a debilitating condition in its own right with serious implications for future health and functioning.

1.2.3 Co-morbidity.

Rates of axis 1 co-morbidity are high for children and adolescents with OCD. Mancebo et al. (2008) found that 70% of children and 84% of adolescents with OCD had suffered from another axis 1 disorder at some point, and that 50% of each met current criteria for another axis 1 disorder. Swedo, Rapoport, Leonard, Lenane and Cheslow (1989) found that 74% of children in their study had at least one other diagnosis; 35% had a co-morbid diagnosis of depression and 40% had another co-morbid anxiety disorder. De Mathis et al. (2008) interviewed 330 adults with OCD and found that the lower the age of onset, the higher the probability of a variety of co-morbidities, including anxiety disorders, eating disorders and impulse control disorders. Individuals with early onset OCD have higher rates of co-morbid tic disorders and Tourette's disorder (Miguel, Rosario-Campos, Shavitt, Hournie, & Marcadante, 2001; Millet et al., 2004). Leonard et al. (1992) found that nearly 60% of children seeking treatment for OCD had a history of tics.

1.3 Biological and Behavioural Approaches and Treatments for Childhood OCD

This section critically discusses the main biological and behavioural theories which explain how OCD is developed and maintained in children, with their associated treatment.

1.3.1 Biological models.

Family studies of adults and children with OCD suggest that there are genetic risk factors, particularly for childhood OCD. Several biological factors have been implicated in OCD, including neurochemistry and genetic factors which cause differences in the neuroanatomy of the brain.

Family studies have shown that the close relatives of people with OCD are more likely to have OCD themselves. A meta-analysis found that there was an 8.3% risk of OCD in first degree relatives of adults with the condition, compared to a 2% risk for the relatives of controls (Hettema, Neale, & Kendler, 2001). One large study of 106 children with OCD and 325 first-degree relatives, found a 22.7% rate of OCD in relatives, compared to a 0.9% rate in the relatives of controls (Rossario-Campos et al., 2005). A smaller study of 35 children with OCD and 102 first degree relatives found a very similar OCD rate of 22.5% in relatives, compared to 2.6% in relatives of controls (Hanna, Himle, Curtis, & Gillespie, 2005). It has also been pointed out that the greater incidence of co-morbid tic disorders in childhood-onset OCD points to a possible genetic contribution (Alsobrook, Leckman, Goodman, Rasmussen, & Pauls, 1999). These results suggest that there may be a stronger genetic contribution to OCD that begins in childhood. However, family studies cannot show causality and it is difficult to separate the effect of a similar environment from similar genes. It is also the case that there are many children with OCD who have no relatives with OCD, so although genetics may be important, they are not a complete explanation.

Functional imaging studies of adults with OCD have found hyperactivity in the orbitofrontal cortex, anterior cingulate cortex and caudate nucleus. One study has compared resting blood flow before and after treatment in children with OCD and used healthy controls as a comparison group (Castillo et al., 2005). The results were consistent with findings in adults, showing hyperactivity in the caudate and anterior cingulate, which declined after treatment. Findings such as these have been taken as evidence that there are abnormalities in cortico-basal ganglia-thalamo-cortical loops which are causally related to OCD, and which can be ameliorated by both pharmacological and behavioural treatments (Maia, Cooney, & Peterson, 2008; Baxter, Schwartz, Bergman, & Kenneth, 1992).

1.3.2 Drug treatment.

Neurochemical factors, particularly serotonin, have also been proposed as mediators of obsessive-compulsive symptoms. Selective serotonin reuptake inhibitors (SSRIs) are effective at reducing obsessive-compulsive symptoms in childhood OCD (Leonard, Ale, Freeman, Garcia, & Ng, 2005). The effect of medication is modest, with studies showing a 30%–40% decrease in OCD symptom severity (Geller et al, 2004; March & Curry, 1998). Furthermore, although side-effects of SSRI medication are well tolerated in children and adolescents (e.g. March & Curry, 1998) the National Institute for Health and Clinical Excellence (NICE; 2005) recommend that SSRIs should be used with caution in children as little is known about their effect on the immature brain. Research also suggests that symptom return is highly likely when medication is withdrawn (e.g., Leonard et al., 1991). Given these difficulties with drug treatment for children with OCD, there has been growing emphasis on the importance of developing psychological treatments.

1.3.3. Behavioural model.

The principal behavioural model of OCD is based on Mowrer's (1960) two-stage theory of the acquisition of fear. Initially, a neutral stimulus (the conditioned stimulus), such as a dirty counter top, a particular activity or a thought image or impulse, is paired with an aversive stimulus. This pairing could happen because of a traumatic event or through a coincidence of arousal or attention. The conditioned stimulus then begins to evoke fear. Rachman (1977) proposed that anxiety can also develop through the transmission of information and modelling.

The second stage of Mowrer's (1960) model describes a process of operant conditioning where OCD is maintained by negative reinforcement of compulsions. When a compulsion is performed, anxiety levels reduce, so that the behaviour is negatively reinforced and more likely to be repeated. The compulsive responses and avoidance strategies developed by the child mean that they never have the opportunity to habituate to the intrusive thought, so their fear is not extinguished.

Some of the claims of this model have good empirical support. There is evidence in adults to show that operant conditioning contributes to the maintenance of OCD. Compulsive rituals lead to a short-term reduction in anxiety (Rachman, de Silva, & Roper, 1976) and exposure to obsessional stimuli provokes distress and the urge to perform a compulsion (Rachman & Hodgson, 1980). However, the classical conditioning model of fear acquisition is not well supported in relation to the development of OCD. Traumatic events are rarely linked to the onset of OCD and when they are reported they often occur far in advance of the start of symptoms (Jones & Menzies, 1998). Also, as discussed above, the onset of OCD is often gradual, rather than a sudden response to a traumatic event. There is little evidence available to evaluate the alternative pathways to fear conditioning suggested by Rachman (1977). Furthermore, many children present with multiple obsessions and the themes can shift over time, without any obvious conditioning experience. In summary, while the model effectively explains aspects of the maintenance of the condition, it struggles to fully explain its origins or complexities.

1.3.4 Exposure and response prevention (ERP).

ERP is based on a behavioural understanding of OCD and National Institute of Health and Clinical Excellence guidelines recommend that it should be part of the treatment offered to children with moderate to severe OCD (NICE; 2005). It involves exposing a child to a stimulus that would usually compel them to perform a compulsion – for example a dirty counter-top – and prolonging the exposure while the child refrains from performing their compulsion. In this way, they can experience that their anxiety begins to fall (habituation) and that nothing catastrophic happens. Exposure can take place with thoughts and images as well as with actual objects and situations. Treatment involves repeated and prolonged exposure to stimuli that trigger obsessional thoughts and anxiety. ERP with children also usually involves the parents, who are instructed in how to support their child to perform treatment exercises and resist performing compulsions.

Before the development of ERP in the 1960s, OCD was considered highly resistant to treatment. Early evaluations of ERP by Meyer (1966) showed that it led to sustained improvement in a large proportion of patients. In an open trial Bolton, Collins and Steinberg (1983) treated 15 adolescents with OCD with ERP. Treatment was effective, with 87% of patients improving after treatment. The change in symptom severity from pre to post treatment had an effect size of 1.97. However, the participants were receiving hospital treatment, both as inpatients and outpatients because their OCD was so severe. As a result, all participants received other forms of therapy, including individual psychotherapy and family therapy, as well as the therapeutic milieu of the unit. Due to the lack of a control group and additional therapies, it is hard to tell how much of the change was due to the ERP. A recent meta-review (Rosa-Alcázar, Sánchez-Meca, Gómez-Conesa, & Marín-Martínez, 2008) found ERP was an effective treatment of OCD in adults, with an overall effect size of 1.127, based on 21 studies. Barrett, Farrell, Pina, Peris and Piacentini (2008) reviewed the literature on psychosocial treatments for child and adolescent OCD. They identified only one study which described ERP with children in the absence of any additional cognitive components to therapy. de Haan, Hoogduin, Buitelaar and Keisjers (1998) randomly assigned 22 children aged 8 to 18 years to treatment with ERP or clomipramine. The ERP group had a 59.9% reduction in symptom severity, compared to a 33.4% reduction in the clomipramine group and this difference was significant (at $p<0.05$). However, a primary OCD diagnosis was established using an unspecified semi-structured interview and there was no follow-up to see if treatment gains were maintained.

Despite some evidence of its success, there remain a number of limitations to ERP alone for the treatment of OCD in children. The treatment can be very aversive and as many as a third of young people drop out because of the level of anxiety it can generate (Allsopp & Verduyn, 1990; Knox, Albano and Barlow, 1996). Bolton et al. (1983) had to physically restrain some adolescents to prevent them from performing rituals. Finally, not everyone shows a clinically significant decrease in OCD symptoms following ERP (Abramowitz, Whiteside and Deacon, 2005). It has also been suggested that when symptoms are mainly obsessional, response to ERP is more uncertain, because preventing people from performing mental compulsions is harder (Steketee, 1993). Piacentini and Langley (2004) point out that there could be particular developmental reasons why ERP may be unsuited to children. They argue that children are more present-oriented than adults, so less motivated to do difficult exercises for future gain. Children have also been shown to be less likely than adults to consider their symptoms excessive, which could also impair motivation for anxiety-provoking treatment. These limitations have encouraged researchers to develop other psychological treatments to enhance ERP.

1.4 Cognitive models

Cognitive methods of treatment have emerged to be used alongside ERP. These target distorted thoughts and beliefs which, it is proposed, contribute to the development and maintenance of OCD. The cognitive understanding of OCD is based on Beck's (1976) cognitive specificity model of emotion. According to this model, a situation itself does not cause emotions directly. Instead, it is the meanings that a person gives to a particular situation that causes their emotional reactions and subsequent behaviour. Particular interpretations are linked to particular emotional and behavioural reactions. Beck proposed that if an individual perceived a situation as dangerous and also believed that they would not be able to cope, this would result in intense anxiety. He hypothesised that past experiences cause people to develop particular beliefs about themselves, the world and others, which could cause them to interpret situations as more dangerous than they really are.

In OCD, the ‘situation’ is an individual's intrusive thoughts. Research with adults shows that intrusive thoughts, images and impulses are normal and that their content differs little between clinical and non-clinical groups (Rachman, 1971; Rachman & de Silva, 1978; Salkovskis & Harrison, 1984). Allsopp and Williams (1996) found that 85% of a community sample of adolescents reported experiencing repetitive unwanted thoughts. Cognitive models suggest that intrusive thoughts can develop into obsessions if individuals have particular dysfunctional beliefs about them (e.g. Rachman, 2003; Salkovskis, 1999). The Obsessive Compulsive Cognitions Working Group (OCCWG, 1997) identified a number of beliefs associated with OCD: (1) inflated responsibility; (2) thought-action fusion and beliefs concerning the over-importance of the consequences of one's thoughts; (3) excessive concern about the importance of controlling one's thoughts; (4) overestimation of the probability and severity of threat; and (5) intolerance of uncertainty. Some of these beliefs are associated with OCD in children and adolescents (Barrett & Healy, 2003; Libby, Reynolds, Derisley & Clark, 2004). Cognitive models suggest that these beliefs about the meaning of intrusive thoughts trigger anxiety and attempts to control the thoughts. In turn, intrusive thoughts escalate, becoming persistent and distressing obsessions.

1.4.1 Thought-action fusion.

Thought-action fusion is one of the beliefs identified by the OCCWG (1997) as linked to OCD in adults. Thought-action fusion is a cognitive distortion which describes beliefs about the equivalence of thoughts and actions. Although thought-action fusion can be positive (for example, a belief that thinking about winning the lottery makes it more likely to happen) negative thought-action fusion has been more closely considered in relation to OCD. Moral thought-action fusion is the belief that to think about doing a terrible thing is as morally wrong as actually doing it. For example, a mother may believe that it is as bad to think about pushing her child onto a railway track as to actually do it. Likelihood thought-action fusion is the belief that thinking about a negative action makes it more likely to come about. Likelihood thought-action fusion can be further broken down into two different domains: likelihood-self and likelihood-other beliefs. Likelihood-self refers to the belief that thoughts could harm the self; for example thinking about yourself being in an accident would make it more likely to happen. Likelihood-other refers to the belief that thoughts can harm other people; for example thinking about a family member becoming sick would make it more likely to happen. Although likelihood and moral thought-action fusion are distinct concepts, they may be related. Rachman and Shafran (1999) point out that if an individual believes that their thoughts have made a bad consequence more likely, they may also consider it morally wrong to have such thoughts.

1.4.2 Developmental influences on thought-action fusion.

Thought-action fusion has been linked with the broader concept of magical thinking. This has been defined as “the type of thinking that embraces the possibility that magical and other types of mental-physical causality can directly affect perceived or imagined objects” (Subbotsky, 2005, p. 301). There may be a number of developmental issues which could influence magical thinking and thought-action fusion beliefs in children. Young children are trying to establish what can happen in the world and the extent of their own power, and they do not yet have a clear understanding of normal causal principles (Meltzoff & Moore, 1998). Noting that one event precedes another is a way in which adults, but particularly children, decide causality (Phelps and Woolley, 1994). This can lead to a young child over-estimating their control over events. In this way, a thought might be seen to precede an action or an event and causal power attributed to it. Tallis (1994) suggested that thought-action fusion beliefs important to the maintenance of OCD could develop after a chance pairing of a thought and a negative event. Shafran and Rachman (1996) described a patient whose father died after she wished him dead. She came to believe that she had caused his death and developed strong likelihood and moral thought-action fusion beliefs.

A further developmental influence on thought-action fusion beliefs may come in later childhood. According to Piaget (1973), the formal operational period starts from age 11 and is characterised by abstract reasoning and the ability to reflect on one's own thinking. Having ‘thoughts about thoughts’ is an important component of cognitive theories of OCD. Geller et al. (1998) found that the first peak in onset of OCD was between 10 and 12 years. This suggests that children of this age, perhaps because of cognitive development, could be particularly vulnerable to OCD. If children become more aware of their own thoughts, it is possible that thought-action fusion beliefs could be more likely to have a pernicious effect.

In normally developing children, magical thinking is common in younger children and decreases with age (Subbotsky, 2005; Woolley, 1997; Woolley, Phelps, Davis, & Mandell, 1999). In an unpublished study, Laing, Fernyhough and Freeston (2007) found that thought-action fusion was highest in children aged around 7–10, before dropping off in early adolescence. A number of authors have suggested that magical thinking may give the appearance of control when real control is not possible (Bolton, Dearsley, Madronal-Luque, & Baron-Cohen, 2002; Einstein, & Menzies, 2004). In this way, magical thinking could seem to be a way of coping with anxiety (Bolton, 1996).

Thought-action fusion along with other magical thinking beliefs may be a relatively normal part of childhood, which would usually decrease naturally with age. Since thought-action fusion is an OCD-related belief which seems likely to have a developmental component, it is of particular interest in relation to childhood OCD.

1.4.3 Thought-action fusion in psychological models of OCD.

The role of thought-action fusion beliefs in three main models of OCD is described below.

1.4.3.1 Rachman's misinterpretation of significance model.

Rachman (1997, 1998, 2003) proposed that OCD is more likely to develop if an individual considers an intrusive thought to be personally significant and threatening. Likelihood thought-action fusion beliefs can cause fears about being a danger to others or one's self, while moral thought-action fusion beliefs could lead an individual to think they were ‘bad’ for having a particular thought. As a result, thought-action fusion beliefs in response to particular thoughts could contribute to a catastrophic misinterpretation of intrusive thoughts as meaning that an individual is ‘mad, bad or dangerous’. This leads to an increase in anxiety, guilt and attempts to limit thoughts or their harmful consequences. These attempts could be mental, with thought-control strategies such as suppression and neutralisation, or physical, with compulsive behaviours or rituals designed to reduce danger. In the longer term, avoidance behaviours might also develop. An individual who believes that particular people are put in danger by their thoughts might avoid those people, or avoid situations which trigger the thoughts. In the short term, avoidance and mental and physical compulsions would decrease anxiety and so be reinforced. In the longer term, however, these would prevent dis-confirmation of the thought-action fusion beliefs; for example an individual might think: ‘If I had not performed my ritual, something bad would have happened’. Anxiety and mental and physical control strategies also increase the salience of the intrusive thoughts, making them more frequent. Rachman (1997) suggests that, as well as contributing directly to symptoms of OCD in the way described above, thought-action fusion may contribute to, and be a product of, other cognitive biases involved in OCD.

1.4.3.2 Salkovskis' inflated responsibility model.

Inflated responsibility is defined as “The belief that one has power which is pivotal to bring about or prevent subjectively crucial negative outcomes. These outcomes are perceived as essential to prevent.” (Salkovskis, 1996, p.110). According to Salkovskis, a responsibility appraisal would increase an individual's motivation to prevent harm in order to discharge their duty of responsibility. Salkovskis (1985) considered thought-action fusion as a kind of responsibility appraisal. He argued that in OCD intrusive thoughts often lead to concerns about being responsible for harm. Thought-action fusion beliefs would be likely to increase responsibility appraisals. If a person believes their thoughts could cause harm, they are more likely to feel responsible for preventing harm (Shafran, Thordarson, & Rachman, 1996). According to this model, thought-action fusion would be associated with OCD by triggering appraisals of responsibility for harm. In turn, these would trigger the anxiety and cognitive and behavioural strategies which would lead to the development of obsessions and compulsions.

1.4.3.3 Wells' metacognitive model.

The metacognitive beliefs model of OCD (Wells, 1997, 2000; Wells & Matthews, 1994) emphasises meta-cognitive beliefs about the meaning or consequences of having particular intrusive thoughts. They emphasise two different belief domains: (1) beliefs about the importance/meaning and power of thoughts, and (2) beliefs about the need to control thoughts and/or perform rituals. The first domain includes thought-action fusion beliefs. The metacognitive model considers thought-action fusion to be a metacognitive belief about thoughts, so, like Rachman's model (2003), predicts that thought-action fusion beliefs should directly contribute to obsessive-compulsive symptoms. However, according to this model, a number of other meta-cognitive beliefs about the importance of controlling thoughts also contribute, so thought-action fusion beliefs would not be necessary or sufficient to lead to obsessive-compulsive symptoms.

1.5 Cognitive Therapy for OCD

1.5.1 Cognitive therapy with adults.

As cognitive theories have developed, cognitive therapy has increasingly been used alongside ERP to treat OCD. In their meta-analysis, Abramowitz, Franklin and Foa (2002), found effect sizes of 1.50, 1.19 and 0.99 for ERP, cognitive therapy and the combination, respectively. Rosa-Alcázar et al. (2008) carried out a meta-analysis of psychological treatments for obsessive-compulsive disorder in adults. Overall treatment versus control effect sizes of 1.127, 1.090 and 0.998 were found for ERP, cognitive therapy alone and ERP plus cognitive therapy for OCD. Rosa-Alcázar et al. concluded that cognitive therapy and ERP were equally effective in the treatment of OCD and that the combination did not seem to produce an improvement in effectiveness. Eddy, Dutra, Bradley and Westen (2004) included studies without control groups in their meta-analysis. They compared pre- and post-treatment results and found effect sizes of 1.53, 1.45 and 1.39 for ERP, cognitive therapy and CBT respectively.

None of these effect sizes are based on intention-to-treat analyses, and as there were large drop-out rates in some studies this is problematic. For example, Vogel, Stiles and Götestam (2004), compared ERP with cognitive therapy to ERP with relaxation training. Seven out of 19 patients dropped out of the ERP with relaxation condition, compared to 1 out of 16 for the ERP plus cognitive therapy condition. Including only the data from those who completed treatment resulted in a larger effect size for ERP with relaxation that is unlikely to represent the success of the treatment and obscures differences between treatments. Eddy et al. (2004) point out that strict exclusion criteria were used in many studies, resulting in exclusion rates of approximately 50% in the few studies which reported them. They argue that while some exclusion criteria are appropriate, others, such as co-morbidity, may not be. Numerous exclusion criteria may also make it difficult to tell whether cognitive therapy and ERP are effective with different patient groups. Whittal, Thordarson and McLean (2005) argued that early cognitive therapy trials were not designed to specifically target the dysfunctional appraisals identified by the OCCWG (1997), which may make these less effective. Despite these difficulties, these meta-analyses suggest that cognitive therapy as well as ERP and CBT can be an effective treatment for OCD.

1.5.2 Cognitive therapy with children.

Since cognitive distortions also seem to have a role in childhood OCD, some form of cognitive intervention has become standard in the treatment of childhood OCD (NICE, 2005; Brown et al., 2007). March, Mulle and Herbel (1994) developed a manualised CBT treatment for children with OCD. This helps children to re-label their fears, giving ‘OCD’ a nasty nickname, so they are better able to distance themselves from their anxious thoughts and ‘boss back’ OCD. Cognitive components also involve psycho-education, cognitive restructuring of anxious thoughts, with the help of age-appropriate metaphors, and helping children to more accurately evaluate the likelihood of feared consequences. In the context of cognitive components, ERP is often used to test anxious predictions, rather than as a purely behavioural component. Many subsequently developed treatments for childhood OCD have used components from this manual (e.g. Barrett, Healy-Farrell and March, 2004).

Barrett et al. (2008) reviewed evidence-based psychosocial treatments for OCD in children and adolescents. Two of the reviewed studies were rigorous randomised controlled trials (RCTs). Barrett et al. (2004) compared individual (I)CBT and group (G)CBT with a wait-list control condition. Both had a family component and both led to a significant symptom reduction of over 60%, with an effect size (compared to wait-list) of 2.84 for the ICBT and 2.63 for the GCBT. Treatment outcomes were maintained to 18-month follow-up (Barrett, Farrell, Dadds, & Boulter, 2005). The inclusion of a family-intervention component of both CBT groups makes it hard to assess how much of the success was due to CBT and how much to more effective parental responses to symptoms. Furthermore, for ethical reasons, the wait-list control group was limited to 4–6 weeks, so that it was not possible to compare the three conditions over the same time period.

The Pediatric OCD Treatment Study (POTS; 2004) compared CBT with and without SSRI, SSRI alone and a drug placebo. A significant advantage was found for the two CBT conditions with response rates of 53.6% for combination treatment, 39.0% for CBT alone, 21% for SSRI alone and 3% for drug placebo. The effect sizes for the CBT and combined groups, compared to the placebo group, were 0.99 and 1.46 respectively. Barrett et al. (2008) concluded that the most thoroughly examined psychological intervention for OCD in children and adolescents is CBT and that it met the requirements for “a probably efficacious” intervention.

1.6 The Role of Thought-Action Fusion in OCD in Adults

1.6.1 Evidence for an association between thought-action fusion and OCD.

A number of studies have found an association between OCD and thought-action fusion. Berle and Starcevic (2005) and Shafran and Rachman (2004) noted small to large correlations of between 0.2 and 0.38 between thought-action fusion and OC symptoms in non-clinical participants. Larger correlations of up to 0.58 have been found in clinical samples (Rassin, Diepstraten, Merckelbach, & Muris, 2001). They also found that the correlation between likelihood thought-action fusion and OCD symptoms is stronger than that for moral thought-action fusion in non-clinical and clinical samples. Questionnaire studies have also shown that thought-action fusion is higher in clinical participants and that clinical groups score more highly on likelihood-other thought-action fusion (Rassin, Merckelbach, Muris, & Schmidt, 2001; Shafran et al., 1996). Shafran and Rachman (2004) concluded that there was an association between obsessional psychopathology and likelihood thought-action fusion but that moral thought-action fusion did not seem to be significantly and reliably related to obsessional complaints in non-clinical samples.

Two questionnaire-based studies have looked at how the relationship between thought-action fusion and obsessive-compulsive symptoms might be affected by other OCD-related beliefs. Gwilliam, Wells and Cartwright-Hatton (2004) compared the meta-cognitive and inflated responsibility models of OCD in a non-clinical sample. When responsibility was controlled, thought-action fusion was still correlated with obsessive-compulsive symptoms. When meta-cognitive variables including thought-action fusion were controlled, responsibility was no longer significantly correlated with symptoms. The authors argued that this supports the hypothesis that inflated responsibility is a by-product of meta-cognitions and makes little additional contribution to OCD. Amir, Freshman, Ramsey, Neary and Brigidi (2003) compared participants with OCD to a non-clinical group and found that after controlling for ratings of responsibility, the OCD group still had significantly higher likelihood thought-action fusion. When controlling for likelihood thought-action fusion, responsibility no longer differed. However, both these studies were observational and Maxwell and Cole (2007) have pointed out that using statistical models based on cross-sectional data to demonstrate the direction of causal effects can be misleading.

1.6.2 Evidence for a causal role for thought-action fusion in OCD.

In order to demonstrate a causal role for thought-action fusion in OCD, longitudinal or experimental studies are necessary (Field, 2005). Shafran and Rachman (2004) identified 6 experimental studies and one longitudinal study and a search of the literature since this review identified one further longitudinal study and two further experimental studies. Most of these experimental studies have used a sentence paradigm to induce thought-action fusion. Participants were asked to write out and then visualise a sentence designed to induce thought-action fusion concerns, for example: “I hope X is in a car accident”, imagining a close friend or relative for X. A number of studies have used this sentence paradigm in non-clinical groups and found an increase in anxiety, suppression and spontaneous neutralising behaviour (Bocci & Gordon, 2007, Rassin, 2001; Rachman, Shafran, Mitchell, Trant, & Teachman, 1996; van den Hout, Kindt, Weiland, & Peters, 2002; van den Hout, van Pol, & Peters, 2001; Zucker, Craske, Barrios, & Holguin, 2002). Two studies found that neutralising was positively correlated with likelihood thought-action fusion (Bocci and Gordon, 2007; van den Hout et al., 2002). Rachman et al. (1996) used a high thought-action fusion sample and found that likelihood-other thought-action fusion was also correlated with anxiety, responsibility and probability of harm.

One longitudinal study with non-clinical participants (Abramowitz, Nelson, Rygwall, & Khandker, 2007) measured thought-action beliefs in couples in the last trimester of pregnancy. They found that likelihood-other thought-action fusion beliefs predicted postpartum obsessive-compulsive symptom development.

Two experimental studies examined the effect of an intervention designed to reduce thought-action fusion. Zucker et al. (2002) found that a group who received an educational message about thought-action fusion were less anxious after writing a sentence designed to induce thought-action fusion than a group who received a placebo message. Zucker, Craske, Blackmore and Nitz (2006) ran a three hour cognitive-behavioural workshop for individuals with sub-clinical OC symptoms. This included psycho-education on thought-action fusion and its role in OCD, together with a group exercise to challenge thinking errors including thought-action fusion. This resulted in lower thought-action fusion beliefs compared to a wait-list control group at one and five month follow-ups and fewer intrusive thoughts and compulsive habits at the five month follow-up. These studies suggest that further research would be valuable to establish whether cognitive interventions designed to target thought-action fusion may be helpful in the treatment of OCD.

All these studies have used non-clinical participants. This is appropriate to examine possible causal relationships. In clinical samples, causal relationships cannot be examined and these samples are more appropriate to test maintenance of OCD symptoms. The sentence paradigm used in the experimental studies may not be a very ecologically valid representation of thought-action fusion. Writing down a thought may increase confidence in the thought (Briñol & Petty, 2003) and thinking about a loved one in a car accident could induce anxiety because it is an aversive activity, as well as for reasons of thought-action fusion. Despite these limitations, the evidence from these studies offers some support for a causal link between thought-action fusion and OCD, but further research is needed.

1.6.3 Summary: The role of thought-action fusion in OCD.

Three central models of OCD all describe a relationship between thought-action fusion and obsessive-compulsive symptoms. Rachman's (2003) personal significance model and the meta-cognitive model (Wells & Matthew, 1994) both argue that thought-action fusion beliefs are likely to contribute directly to the development and maintenance of OCD. In contrast, Salkovskis' (1985) Inflated Responsibility Model sees responsibility beliefs as mediating the relationship between thought-action fusion beliefs and OCD.

Cross-sectional questionnaire studies as well as experimental and longitudinal studies lend support to a causal role for thought-action fusion in OCD. Thought-action fusion, as an aspect of magical thinking, appears to be a common belief in childhood which, in normal development, reduces with age. It is plausible that, for this reason, it may be particularly important to understand its role in OCD in children. The next section evaluates research into the role of thought-action fusion in OCD in children.

1.7 The Role of Thought-Action Fusion Beliefs in OCD in Children

A small number of studies have examined whether thought-action fusion beliefs are also related to OCD in childhood. This section critically evaluates this research. It begins by describing the literature search strategy used. The studies are then reviewed according to the type of sample (clinical or non-clinical) and type of design.

1.7.1 Literature search strategy.

Computerised searches were done on Psychinfo (1806 to date), Medline (1996 to date) and Embase (1980 to date). The search terms were: (OCD OR obsessive OR compulsive) and (Child OR Children OR adolescent OR young people OR juvenile) AND (cognitive model* OR cognitive appraisal OR cognitive processes OR meta-cognition OR thought-action fusion OR magical thinking). Hand searches were also conducted on: Behaviour Research and Therapy (1998–2010) and The Journal of Anxiety Disorders (1998–2010). Hand searches were conducted from 1998 onwards because few articles on thought-action fusion were published before this time.

Following this search, papers were selected based on a number of criteria. Articles were included if they offered data about the relationship between thought-action fusion and OCD in children or adolescents aged 18 years or under. Where studies had used both adolescents and adults in a single group, the average age of participants had to be 18 years or under. Articles had to be written in English.

The search identified 10 studies which met inclusion criteria (Table 1).

Table 1

Current Research Examining the Role of Thought-Action Fusion in OCD in Children

		Clinical	
Experimental	Age Range	Observational	Age range
		Barrett and Healy (2003)	7–13
		Farrell and Barrett (2006)	6–11, 12–17
		Libby, Reynolds, Derisley and Clark (2004)	11–18
		Verhaak and de Haan (2007)	8–12, 13–18
		Non-Clinical	
Rassin, Merckelbach, Muris and Spaan (1999)	16–20	Evans, Milanak, Medeiros and Ross (2002)	3–8
		Simonds, Demetre and Read (2009)	5–10
		Matthews, Reynolds and Derisley (2007)	13–16
		Muris, Meesters, Rassin, Merckelbach and Campbell (2001)	13–16
		Bolton, Dearsley, Madronal-Luque and Baron-Cohen (2002)	5–17

1.7.2 Studies of thought-action fusion and OCD in children.

1.7.2.1 Studies with non-clinical samples.

1.7.2.1.1 Observational studies.

Muris, Meesters, Rassin, Merckelbach and Campbell (2001) found that thought-action fusion was significantly associated with symptoms of OCD (*r*=0.34) in a sample of 427 13-16 year olds. They also found significant associations with trait anxiety (*r*=0.31) panic and agoraphobia symptoms (*r*=0.27), generalised anxiety disorder (*r*=0.31), separation anxiety (*r*=0.24), social phobia symptoms (*r*=0.27) and depression symptoms (*r*=0.33). When they controlled for trait anxiety, only symptoms of OCD, generalised anxiety and depression remained significantly related to thought-action fusion. The authors did not check to see whether thought-action fusion was still related to anxiety and depression once obsessional symptoms had been controlled for. They concluded that this supported the proposal that thought-action fusion is involved in a range of anxiety disorders but that it is most relevant for OCD.

One study investigated whether thought-action fusion or inflated responsibility is a better predictor of OC symptoms in a non-clinical sample. Matthews, Reynolds and Derisley (2007) found that thought-action fusion (*r*=0.35) and inflated responsibility (*r*=0.56) were significantly correlated with OC symptoms in a sample of 223 adolescents aged 13–16 years. When inflated responsibility was controlled the relationship between thought-action fusion and OC symptoms was fully mediated by responsibility attitudes.

Three studies investigated the relationship between magical thinking and OC symptoms in non-clinical samples. Evans, Milanak, Medeiros and Ross (2002) found that rituals and compulsions were positively related to beliefs about the effects of wishing (*r*=0.40) in 31 3–8 year old children. Bolton et al. (2002) found a relationship between magical thinking and obsessive-compulsive symptoms (*r*=0.42) in 127 children aged 5–17. Simonds, Demetre and Read (2009) found that magical thinking was significantly correlated with OC symptoms (*r*=0.374) in a sample of 102 5–10 year-olds. They also found that this correlation was significantly higher in the youngest age group.

One difficulty with these studies is that participants were not experiencing problems with OCD symptoms, so results may not generalise to a clinical population. They are also all cross-sectional so cannot demonstrate causality. Matthews et al. (2007) used cross-sectional data to demonstrate a mediating relationship, but cross-sectional approaches to mediation can be problematic (Maxwell & Cole, 2007). Three studies (Bolton et al., 2002; Evans et al., 2002; Simonds et al., 2009) used measures of magical thinking rather than thought-action fusion. These measures included items which linked thoughts to events and actions just as in likelihood-thought-action fusion. However, these items were not restricted to negative events, as they are in the thought-action fusion scale and there were a large number of other non-thought-action fusion items included in the magical thinking scales.

1.7.2.1.2 Experimental studies.

One experimental study investigated thought-action fusion in a mixed sample of adults and adolescents (mean age = 17.1 years). Rassin, Merckelbach, Muris, and Spaan (1999), told participants in the experimental group that apparatus could pick up the word ‘apple’ in their thoughts and that thoughts of that word would result in an electric shock being given to someone else. The control group were simply told that the apparatus could pick up their thoughts and they could think of anything, including the word ‘apple’. Those in the experimental group experienced more discomfort, and more intrusions of the word ‘apple’. They showed neutralisation behaviour (subjects could press a button if they thought ‘apple’ to prevent a shock) in about 50% of intrusions. However, there was no correlation between previously measured thought-action fusion beliefs and any of these outcomes. The presence of higher thought-action fusion in the experimental group was assumed to exist because students were told that their thoughts had real-world consequences. Participants' level of belief in the instruction was not measured. In this experimental paradigm it is also possible that responsibility played a significant role, and may have interacted with thought-action fusion beliefs. While this study offers support for a link between thought-action fusion and OCD-related symptoms, the mechanism of this link remains uncertain. Furthermore, this study included adult participants, which limits its relevance for the purposes of this review.

1.7.2.2 Studies with clinical samples.

Four studies have used clinical samples assessed using criteria based on the Diagnostic and Statistical Manual for Mental Disorders (fourth edition; DSM-IV; American Psychiatric Association, 1994). Three used the Anxiety Disorders Interview Schedule for Children and Parents (ADIS-C and ADIS-P; Silverman & Albano, 1996) which apply DSM-IV criteria and are considered to be a gold standard in childhood anxiety diagnosis and one (Verhaak & de Haan, 2007) used an unstructured assessment with a clinical psychologist, followed by a discussion by a multi-disciplinary mental health team to determine diagnostic status. As a result, the diagnostic status of children in this study may be less certain.

Barrett and Healy (2003) compared a number of appraisals associated with OCD in children with OCD, anxious children and a non-clinical control group. They found that OCD children scored significantly more highly on thought-action fusion than the non-clinical control group. However, thought-action fusion did not distinguish between the OCD group and the anxious group. The OCD group had higher ratings of thought-action fusion than the anxious group, but the difference was not significant. This may have been because a relatively small sample size was used (N=59) so there was not enough power to detect a difference. It may also have been because anxious participants had some obsessive-compulsive symptoms.

Farrell and Barrett (2006) also investigated OCD-related appraisals in 34 children, 39 adolescents and 38 adults with OCD. They found no significant difference between the age groups for thought-action fusion beliefs, although they did for other OCD-related appraisals. Across the entire sample, they found that likelihood-self (r=0.27) and likelihood-other (r=0.30) thought-action fusion was significantly associated with symptom severity. They concluded that thought-action fusion was likely to be associated with OCD in childhood to a similar degree as it is in adolescence or adulthood. However, although they showed a link between thought-action fusion and symptom severity, the authors did not assess whether the association remained the same across the groups.

Libby et al. (2004) measured likelihood-other thought-action fusion beliefs in children aged 11–18 years, with OCD (N=28), other anxiety disorders (N=28) and non-clinical controls (N=28). The OCD group had significantly higher scores on likelihood-other thought-action fusion than either of the other two groups and the anxiety group had significantly higher scores than the non-clinical group. Across all groups, thought-action fusion showed a large association with OCD symptom severity (r=0.51) and the average likelihood-other thought-action fusion score in the OCD group (M = 7.82) was actually higher than that observed in studies with adults who have OCD (e.g. Rassin, Merckelbach, et al., 2001, M = 4.43; Shafran et al., 1996, M = 4.77). Libby et al. concluded that likelihood-other thought-action fusion had a minor role in anxiety disorders in young people and a specific association with OCD.

Veerhaak and de Haan (2007) measured magical thinking in 18 children aged 8-12 and 21 adolescents aged 13–18 with OCD. They found no association between magical thinking and symptom severity. The authors concluded that thought-action fusion seemed to have no connection with the severity of OCD symptoms in children and adolescents. However, this study did not use a measure of thought-action fusion. The Magical Thinking Questionnaire (MTQ; Bolton et al., 2002) contains 10 items out of 30 which assess the perceived power of thoughts. Of these, only four describe a link between a thought and a negative event. The broad nature of this measure could account for the lack of association found. It may also be that the sample size was too small to provide adequate power. Given these difficulties, their conclusion seems inadequately supported.

1.7.3 Summary of the literature examining whether thought-action fusion is associated with OCD in children.

The research suggests that thought-action fusion is associated with OCD in children and adolescents. Only Verhaak and de Haan (2007) reported contrary results. This study measured magical thinking, rather than thought-action fusion, and did not use a standard diagnostic measure, making the conclusion questionable. There is limited research comparing alternative models of thought-action fusion and its role in OCD. Only Matthews et al. (2007) tested the mediating relationship of inflated responsibility beliefs and thought-action fusion. They found that inflated responsibility did mediate the relationship between thought-action fusion and OC symptoms.

Although the evidence suggests that thought-action fusion is a relevant belief in childhood OCD, there are a number of limitations to the research evidence. All the studies apart from Rassin et al. (1999) used cross-sectional questionnaire based designs. These can show association but not causality. Rassin et al. designed an experiment which offered some support for a causal role of thought-action fusion in the development of OCD. However, there were difficulties with the design and the participant group included adults, so the results may not generalise to younger adolescents or children. Further research using an experimental design in a younger age group would help to investigate the possibility of a causal role for thought-action fusion in OCD.

1.7.4 The influence of cognitive development on thought-action fusion.

Of the studies reviewed, five measured magical thinking or thought-action fusion beliefs in a non-clinical group and of these, three found a decrease with age (Matthews et al., 2007, Libby et al., 2004; Simonds et al., 2009). In Simonds et al. (2009) the decrease was not significant. Libby et al. (2004) found that children aged 11–18 in their non-clinical group had higher thought-action fusion scores than adults in a general non-clinical population. Evans et al. (2002) did not find a significant correlation between magical thinking score and age. This may have been because younger children, aged 3–8 took part in this study and magical thinking is high across this age group. Bolton et al.

(2002) did not find a significant decrease in magical thinking, but did find that 9–10 year olds had the highest level of magical thinking, significantly higher than 12–13 year olds. This is consistent with an unpublished study by Laing et al. (2007) which found that thought-action fusion beliefs peaked at 7–10 years before decreasing in early adolescence.

Farrell and Barrett (2006) found no significant difference in thought-action fusion beliefs between clinical groups of children, adolescents and adults. In contrast, Libby et al. (2004) found that the thought-action fusion likelihood-other scores of the children with OCD in their sample were greater than those in adults with OCD.

This evidence suggests that thought-action fusion may decrease in normally developing children, although results for magical thinking are more mixed. In comparison, thought-action fusion remains higher in children and adolescents with OCD and it is uncertain whether it decreases with age.

1.8 Chapter Summary

This chapter has examined the current understanding of OCD in children. There are many similarities between OCD in children and in adults. Treatment for OCD in childhood is primarily based on ERP but this has a number of practical limitations, often resulting in a high drop-out rate. In adults, cognitive methods are increasingly used alongside ERP. One belief that has been shown to be associated with OCD in adults is thought-action fusion. The role of thought-action fusion in three main cognitive models of OCD has been discussed. The role of thought-action fusion in OCD in children has been reviewed and it appears that thought-action fusion is associated with OCD in children, although the nature of this association remains somewhat unclear. The developmental literature regarding thought-action fusion and magical thinking in children is discussed. It suggests that thought-action fusion beliefs may be quite normal in younger children and usually decrease after middle childhood. In children with OCD, thought-action fusion beliefs appear to remain high.

1.8.1 Rationale for study.

The literature suggests that thought-action fusion is an important OCD-related appraisal in children but different models suggest that thought-action fusion may contribute directly to symptoms (Rachman, 2003; Wells and Matthews, 1994) or that it is mediated by other factors (Salkovskis, 1985). If thought-action fusion is directly linked with OCD symptoms then cognitive methods, similar to those used in adult populations, for challenging thought-action fusion beliefs might prove helpful in childhood OCD. If it is indirectly linked, then methods targeting other more primary beliefs might be more useful. To demonstrate a causal link between thought-action fusion and obsessive-compulsive symptoms, experimental research is needed.

This study seeks to test, experimentally, whether thought-action fusion is causally related to obsessive-compulsive symptoms in a non-clinical group of children and whether this link is mediated by responsibility beliefs. It will use an experimental method, based loosely on that of Rassin et al. (1999) to induce a thought-action fusion belief. Children in the experimental group will be led to believe they can influence pictures on a computer screen with their thoughts. It will then be suggested that some thoughts might damage the computer. As in Rassin et al., the children will have a button they can press if they have a thought they are concerned about. Button-pressing, anxiety, thought-control and experimentally-induced responsibility and thought-action fusion will be measured. This study will differ from that of Rassin et al. by providing what is designed to be a more ecologically valid method of inducing thought-action fusion in a younger age group.

1.9 Research Hypotheses

1.9.1 Question 1: Does thought-action fusion cause OCD behaviours?

- Hypothesis 1: Manipulation check. Children in the thought-action fusion group will show higher levels of experimentally induced thought-action fusion than children in the control group.

- Hypothesis 2: Children in the experimental group will show more button-pressing, experimentally-induced responsibility anxiety and thought-control.
- Hypothesis 3: Induced thought-action fusion will be positively correlated with the dependent variables.
- Hypothesis 4: Children's initial level of likelihood thought-action fusion beliefs will contribute significantly to the variance of the outcome measures.

1.9.2 Question 2: What is the role of responsibility in the relationship between thought-action fusion and OCD behaviours?

- Hypothesis 5: Children who have stronger responsibility beliefs will score more highly on the dependent variables for a given level of thought-action fusion. Therefore, the relationship between experimentally-induced thought-action fusion and the dependent variables of button-pressing, anxiety and thought-control will be moderated by responsibility beliefs.
- Hypothesis 6: Induced thought-action fusion will lead to higher levels of perceived responsibility, which will, in turn, lead to higher scores on the dependent variables. Therefore, the relationship between experimentally-induced thought-action fusion and button-pressing, anxiety and thought-control will be mediated by experimentally-induced responsibility beliefs.

Chapter 2

Method

2.1 Chapter Overview

This chapter describes the method used in the study. The design is explained, along with details about participants and the experimental task. Ethical considerations are discussed. The measures used, along with their psychometric properties are described. Finally, the procedure is described.

2.2 Design

A between-groups experimental design was used. The independent variable was induced thought-action fusion, with two levels of manipulation: thought-action fusion (experimental group) and no thought-action fusion (control group). Children were allocated to the two experimental conditions using a computerised method; this allocated at random while balancing age and gender between the control and experimental groups. The effect of experimental condition on several different dependent variables was examined:

1. level of anxiety
2. number of ‘disconnect’ button presses
3. level of thought-control
4. perception of thought-action fusion
5. perception of responsibility for harm and severity of harm

2.3 Participants

Participants were 85 school children aged 9 to 11. This age group was selected because previous research has indicated that magical thinking and thought-action fusion are high in this age group, before dropping in early adolescence (Bolton et al., 2002; Laing et al., 2007). Furthermore, research indicates that children of this age have developed responsibility beliefs, so this was thought to be an appropriate age to look at how thought-action fusion might be influenced by responsibility appraisals (Barrett & Healy, 2003). It was also felt that the premise of the experiment was more likely to be believed in this age group, compared to older children.

2.3.1 Inclusion/exclusion criteria.

Children were included if they were aged between 9 and 11 and were fluent in English. Children were excluded if they had recognised special educational needs (as determined by a teacher), as this could affect their ability to complete questionnaires or their performance on the task. Children who were colour blind (as determined by a parent) were also excluded, as this would affect their ability to participate in the task. Children were also excluded if they were known to have epilepsy (as determined by a parent) as the task involved rapidly changing bright images. If children scored above a cut-off on an anxiety measure, they underwent a modified version of the experiment, designed not to induce anxiety (Appendix M), and their results were not included in the analysis.

2.3.2 Sample size.

This study could be considered a preliminary study of a new experimental method. It was difficult to determine the necessary sample size, because there are few similar studies. Rassin et al. (1999) told subjects in their experimental group that thinking the word ‘apple’ could result in another participant receiving an electric shock. The study found effect sizes of 0.9 for intrusive thoughts of the word ‘apple’ and of 1.4 for efforts to avoid thinking of the word ‘apple’. As in the present study, participants were able to press a ‘signal interrupting’ button if they had a thought that could be harmful. They found that subjects felt ‘fairly’ responsible and pressed a ‘signal-interrupting’ button on average 5.2 times, but did not measure these variables in a control group, so no effect size can be estimated. In a study manipulating responsibility appraisals in children aged 9–11, Reeves, Reynolds, Coker and Wilson (2010) found effect sizes ranging from 0.27–0.64.

Assuming an effect size of 0.5 for the dependent variables of button-pressing, thought-control and responsibility, then 100 participants would be needed to find a difference between the groups if power is 0.8 and statistical significance 0.05. See Appendix A for power calculation.

2.3.3 Recruitment of participants.

All participants in this study were recruited from schools in Cambridgeshire. Forty schools were chosen from the list of Cambridgeshire Schools provided by Cambridgeshire County Council on their webpage. Schools were initially selected randomly. However, a number of urban schools in a large city chose not to participate due to the frequency of research requests in the area. For this reason, no further schools in this area were contacted. One school was selected because the researcher had links with a teacher there. Schools were contacted in batches of five and headteachers were given information about the study by letter (appendices C and D). The letter was then followed up by a phone call one week later. Four schools expressed an interest in the study. The researcher arranged to meet the headteacher at each of these schools to go through the study and answer any questions. All four schools then agreed to participate and will be referred to as primary schools A, B, C and D (see Appendix B for information about the schools).

The researcher spoke in assembly to the relevant year groups, talking about psychological research, briefly describing the study and inviting children to take part. An information pack for parents explaining the project and inviting them to take part was taken home by each child aged 9–11. The information pack contained a parent information sheet (Appendix E), a demographic questionnaire (Appendix F) and a parent consent form (Appendix G). Children were given an information sheet at school by their teachers (Appendix H). Parents were informed that for each child who participated a £2 book voucher would be given to the school. For primary school A, 136 packs were sent out to children aged 9–11. For primary school B, 92 were sent, for primary school C, 21 were sent and for primary school D, 25 were sent. Twenty-one consent forms were returned from primary school A (14.7%), 45 from primary school B (48.9%), 8 from primary school C (38.1 %) and 15 from primary school D (60%). There was a combined response rate of 32.5%. Results from four children were not included for the following reasons: one child closed his eyes during the experiment and was unable to complete the final measure; one child's data was lost due to a computer error; one child scored above the cut-off for anxiety and one child was not able to conform to the experimental task. Incomplete data were gathered from one further child because, in consultation with the school, two measures were not deemed appropriate due to the child's personal circumstances.

2.3.4 Demographic data.

The children who participated in the study, and whose results could be included, were 85 school children aged 9 years 0 months to 11 years 10 months (mean = 10 years 2 months). 38 were male (44.7%) and 47 were female (55.3%). Full demographic details of the sample are reported in the results section 3.3.

2.4 Experimental Task

The task was loosely adapted from the task developed by Rassin et al. (1999). Their task was designed to induce thought-action fusion in adults by telling participants that a helmet could pick up their thoughts. The experimental group were then told that if they thought the word ‘apple’ another participant would be given an electric shock. The ‘thought-action fusion’ beliefs of the participants were based on the instruction of the experimenter, rather than on feedback from the computer and there was no measure of the strength of participants' belief in the instruction. Furthermore, a specific ‘dangerous’ thought was suggested, strongly encouraging thought suppression in the experimental group. Finally, the task was anxiety-provoking and would not be considered ethical with young children.

The current study differed from that of Rassin et al. (1999) by aiming to provide children with visual feedback about the power of their thoughts to see how likely they were to believe this. The task was considered to have face validity as many children know about cutting-edge computer-gaming technology where helmets are used to allow a player to control aspects of a game with their thoughts. Furthermore, the absence of a direct instruction would make it possible to see whether the task was more likely to induce thought-action fusion beliefs in some children than in others. Finally, rather than suggesting a specific ‘dangerous’ thought, which would be more likely to cause thought suppression, the study sought to find out whether children did believe that their thoughts could cause harm and how they would respond. Pilot work was undertaken with 5 children aged 9–11 to determine whether the task was successful at manipulating thought-action fusion, whether adaptations were necessary and whether questionnaires were age-appropriate. The details of the task outlined below are the results of piloting work undertaken. The experiment had two phases:

2.4.1 Phase 1: Induction of positive thought-action fusion.

Children were told that they would be asked to “put on a special helmet, think hard about the colour red and try to change some pictures on the computer screen”. It was explained that “we are doing research to find out how well the helmet works and what you think about the task”. The helmet (see figure 1) and its design are described in more detail in section 2.4.3. Children were told: “You are going to see a series of pictures come up on the screen one after another. Think hard about the colour red; try to visualise it in your mind. The computer will try to pick up on what you're thinking and begin to turn the pictures red. It won't work straight away, because the computer needs time to tune in and it doesn't always work so don't be disappointed. Just try your hardest.”

Children were told that the computer wouldn't pick up on their thoughts straight away both to make the task more realistic and also to give children something to compare the later pictures with, to make it easier for them to judge whether or not they were ‘successful’. Children in the experimental and control group saw the same series of 60 images, selected from the International Affective Picture System (Lang, Bradley, & Cuthbert, 2005). Details of the pictures are described in section 2.4.3. Images were shown at the rate of 1 per 1.1 seconds, so this part of the experiment lasted just over 1 minute. This length of time was chosen because, for the experiment to be convincing, children in the experimental group had to be concentrating on red for the entire time. During piloting, 1 minute was found to be an appropriate length of time. Thought-action fusion was manipulated as follows:

(1) Experimental group: Induced thought-action fusion

In the experimental group, these images were tinted as described in Appendix I. The tinting was designed so that pictures became, on average, increasingly red, but the increase varied around a mean. This was done to make the experiment more convincing: so that children would be more likely to feel that the computer was genuinely responding to their thoughts and they were becoming increasingly good at influencing it. Pictures did not turn very red too quickly so that children were more likely to continue to concentrate and think ‘red’ all the way to the end. If children stopped thinking about red and the pictures continued to change, it was expected that this would undermine their belief in their ability to influence the computer.

(2) Control group: no induced thought-action fusion

Children in the control group saw the un-tinted images, some of which happened to have red in them.

Phase 1 was designed to give children in the experimental group evidence that their thoughts could affect the computer in a positive way, by turning the pictures red (positive thought-action fusion).

2.4.2 Phase 2: Suggestion of harm.

During the second phase of the experiment, children in both groups were asked to keep the helmet on and told “The computer just needs to take some background readings. You don't have to think about anything in particular, but if the computer is sensitive to your thoughts, it can be damaged by surges of energy and the equipment is very expensive. When I click ‘next’ [to move the computer on] you will see a big button that says ‘disconnect’. If you have a thought you're worried might damage the computer, please press the disconnect button. You can press it every time you have a thought you are worried might damage the computer.” This part of the experiment was designed to make the children concerned that their thoughts might be damaging to the computer. The button-pressing measure was designed to be a way to measure whether the positive thought-action fusion induced in the experimental group made this group more concerned about the suggestion of harm.

After one minute, that part of the task ended and the children alerted the researcher and were asked to remove the helmet.

2.4.3 IAPS picture selection.

The International Affective Picture System (Lang et al., 2005) was developed to provide a normative set of colour photographs rated for emotional arousal. The pictures are rated on affective valence (from unpleasant to pleasant), arousal (from calm to excited). They are also rated on dominance, which is a third, less strong, factor identified as accounting for variance in emotional assessments (Osgood, Suci, & Tanenbaum, 1957). Pictures which were both neutral in valence – which the authors define as those scored at or near the mid-line for valence – and low in arousal were selected as possible candidates for this study. This was because pictures should not be unpleasant or anxiety provoking for ethical reasons, and it was felt that they should be as affect-neutral as possible.

Suitable pictures were defined as those which scored between 4.5 and 6.5 on valence and below 6 for arousal. This range was above the mid-point because many pictures rated lower than 4.5 by adults contained content unsuitable for children. From this pool of pictures, any regarded as being unsuitable for children because of (1) nakedness, (2) sexual content (however mild) or (3) violence (however mild) were excluded. Pictures which were judged to be too red were also excluded, as these could undermine the difference between the experimental and control groups. From the remaining pictures, 60 were selected at random (appendices J and K).

2.4.4 Helmet.

The helmet was designed by a professional model maker, loosely based on the design of a mind-control headset called the Emotive EPOC, by Emotiv Systems. It was made of moulded plastic, with a wire coming from the back which could plug in to a USB port in a laptop. The structure was flexible and designed to fit different head sizes and shapes (Figure 1).

Figure 1: Helmet

2.5 Ethical Considerations

Ethical approval was obtained from the University of East Anglia Faculty of Health Research Ethics Committee (see Appendix L for approval letter). Careful consideration was given to the potential ethical issues connected with this research, both because it involved children and because some deception was involved. The study considered guidelines from the British Psychological Society and the Medical Research Council. The researcher consulted with parents when planning the experiment and asked for feedback from parents and children during the piloting stage. Changes were made to the parent information sheet following feedback.

2.5.1 Consent.

Parents were provided with an information sheet describing the research (Appendix E). This explained exactly what the procedure would involve and how long it would take. It was made clear that children would be told that the helmet could pick up their thoughts, although this was not true. The reasons for this were explained. A telephone number was provided so parents could contact the researcher. Parents returned a consent form along with a demographic questionnaire if they gave permission for their child to be involved.

Children were provided with an age-appropriate information sheet. When they met with the researcher, this sheet was read to them, or by them again. The researcher then gave them the opportunity to ask questions. Children were told that they did not have to take part, even though their parents had signed the consent forms. They were also told they could change their minds at any time, without giving a reason. Children completed assent forms if they wanted to take part.

2.5.2 Deception.

Where possible, deception was avoided. However, in order for the experimental manipulation to be successful, children had to believe that the helmet was real. This meant that children had to be somewhat deceived about the purpose of the study. They were told, truthfully, that the researcher wanted to know their thoughts and feelings about the task, but they were also told that the researcher wanted to see how they went about using the helmet and how well it worked. Children were fully debriefed, either immediately after they had finished the task or at the end of the school day, about the real purpose of the study and the fact the helmet was pretend (Appendix T). The BPS Committee (2006) concluded that the central factor was the reaction of the participants when the deception was revealed. If this led to discomfort, anger, or objections, then the deception was inappropriate. The task was piloted on 5 children and none became distressed or felt angry when full information was given. During the debrief, the researcher explained to children clearly that the helmet was pretend, but stressed that it was designed to look just like helmets that can really pick up thoughts, so that it was very convincing and adults believed it too. This was done to minimise the chance that children would feel embarrassed that they had been ‘tricked’. It was also explained that some children had seen the pictures change and some had not and this was why some children believed the helmet worked and some did not. The debriefing process involved discussing the children's experience of the task, asking about their thoughts about the deception and checking for any distress, anger or unforeseen consequences. A small number of children said they were a bit disappointed that the helmet was not real, but all children said they were glad they took part and agreed to keep the ‘secret’ of the helmet.

The BPS (2006) also recommends that participants are provided with sufficient information at the earliest possible stage. No participant went home without being debriefed. The BPS recommends that researchers should consult appropriately about the way the deception will be received. This was done both during piloting, and by giving full information to parents, who would be more able to predict whether their child might become upset.

2.5.3 Managing distress.

The task was administered with the intent of minimising distress. This was done in the following ways:

1) The researcher was able to minimise anxiety by building rapport with children when they were in small groups to talk about the research and complete the initial measures. When the researcher collected each child from their class, she was able to chat to each child briefly to put them at ease.
2) The children's scores on the Multidimensional Anxiety Scale for Children were checked by the researcher before each child did the task. One child was above the cut-off score, suggesting they might be experiencing clinical levels of anxiety. This child was given an alternative version of the task, which did not induce anxiety (Appendix M), so that she did not feel excluded. Her parents were written to and informed of their child's higher than usual

score (Appendix N).

3) At the start of the task, children were told that “the helmet does not always work” to minimise disappointment if a child happened to be in the control group.
4) Children were also given a ‘STOP’ card and told they could hold this up at any time, or they could wave their hand or call the researcher if they wanted to stop.
5) Children completed visual analogue anxiety scales before the start of the task, after the first stage and at the end and called the researcher over each time these appeared. This provided the researcher with another way of telling if any child had become very anxious.

If a child had shown distress, the task would have been discontinued, the child comforted and the teacher informed. No child showed distress.

2.5.4 Confidentiality.

Data was managed in accordance with the Data Protection Act. Raw data, including questionnaire results, were kept in a locked cupboard. All participants were identified by identity numbers held in a separate location. Schools, parents and children were informed that they would not be identified in any reports of the research.

2.6 Measures

2.6.1 Demographic questionnaire.

A demographic questionnaire was used, based on that used by Reeves et al. (2010) (Appendix N). This asked for information about age, gender and ethnic origin, as well as colour-blindness and epilepsy. Parents completed the demographic questionnaire along with the consent form.

2.6.2 Independent variable measures.

2.6.2.1 The multidimensional anxiety scale for children -short form (MASC-10; March, Parker, Sullivan, Stallings, & Conners, 1997).

The short form of the MASC is a 10 item self-report measure, intended to be a short and efficient global measure of anxiety symptoms in children aged 8–19. It consists of 10 short statements with which children can rate their agreement on a 4-point scale from 1 (never) to 4 (often). It has been shown to distinguish between anxiety and depression in a clinical sample of children (Rynn et al., 2006). Test-retest reliability ranges from 0.64 to 0.89, indicating satisfactory to excellent stability. Internal reliability is satisfactory. The test was used as a general anxiety measure and to identify highly anxious children who would be unsuitable for this study. The MASC Technical Manual (March, 1997) states that T-scores above 65 are likely to represent clinically significant symptoms in a 'high base rate group'. However, the manual suggests using a higher T-score of 70 or 75 in a low base rate group such as a population of children without identified behavioural problems. For this reason, a T-score of 70 was selected as a cut-off for this study. This translated to a score of 24 or above in girls and 21 or above for boys, out of a maximum score of 30. This measure is not included in the appendices because permission has not been given by the copyright holder.

2.6.2.2 Responsibility attitude scale: Adapted version (RAS; Salkovskis et al., 2000).

The RAS is a 26 item questionnaire which measures general beliefs or assumptions related to inflated responsibility in adults. It has been shown to have good test-retest reliability (r=.94) and high internal consistency (α=.92) (Salkovskis et al., 2000). A number of studies have adapted this questionnaire to use with a younger population. Mather and Cartwright-Hatton (2004) found the RAS to be a reliable measure in an adolescent population aged 13–17 years, with a correlation coefficient of 0.90. An adapted version of the RAS (Appendix O) is a 20-item questionnaire, which had been used with children aged 10 to 18 (Reeves et al., 2010). It has an internal consistency of α=0.78, which demonstrates acceptable reliability (Reeves et al.). Scores range from 20–140 with a lower score indicating a higher level of inflated responsibility. Reeves et al. reported that the mean score for 9–12 year olds was 69.68. This version was used to measure and control for inflated responsibility beliefs. During piloting, two 9 year-old children did not understand two items. One item was changed from ‘I will be condemned for my actions’ to ‘people will think very badly of me for my actions’. One further item was changed from ‘I often nearly cause harm’ to ‘there are often times when I nearly cause harm’.

2.6.2.3 Thought-action fusion questionnaire: Adolescent version (TAFQ-A; Muris, Meesters, Rassin, Merckelbach, & Campbell, 2001).

The TAFQ-A (Appendix P) was based on the Thought-Action Fusion Questionnaire – Revised (Shafran et al., 1996). It was designed for teenagers and consists of 15 brief vignettes followed by a statement; respondents mark their level of agreement with this on a 4-point Likert scale ranging from 1 (not at all true) to 4 (very true). The Morality subscale includes 8 items and the Likelihood subscale includes 7 items. A reliability of 0.84 has been demonstrated for adolescents aged 13–16. This scale has not been normed for younger children but the language used is consistent with that used in the other measures. Following piloting, part of one item was changed from ‘stay down a class at school’ to ‘repeat a year at school’.

2.6.3 Measures of dependent variables.

2.6.3.1 Visual-analogue anxiety measure (Bernstein and Garfinkel, 1992).

This is a single item measure (Appendix Q) taken from the Visual Analogue Scale for Anxiety-Revised (VAA-R). This item was computerised and children were asked to indicate, using a mouse pointer, their anxiety level from 0–100, by placing a mark on a continuous line to show how ‘jittery/nervous’ or ‘steady’ they feel ‘right now’. A score of 100 represents ‘steady’, so this item is reverse scored, with low numbers representing greater anxiety. It is a short measure for state anxiety in children aged 8–18 years. This single item has been found to be sensitive to changes in anxiety in children across short time periods (Bernstein et al., 1994). Visual analogue mood scales have been shown to correlate with other mood measure and are especially sensitive to short-term changes in mood (Lindsay & Powell, 1994).

2.6.3.2 Measure of induced thought-action fusion, responsibility, thought-control and reason for button-pressing (Likert scale measure).

To measure induced thought-action fusion, responsibility beliefs, thought-control and reasons for button-pressing, 10 statements were used. Children could rate their agreement on a 5-point Likert scale ranging from 0 (completely disagree) to 4 (completely agree) (Appendix R). Questions 1-3 were designed by the researcher to test the success of the first part of the experimental manipulation. This section of the measure will be referred to as 'induced thought-action fusion'. Question 4 was designed to assess participant's belief in the second part of the manipulation: the suggestion that their thoughts could cause damage to the computer. This question will be referred to as 'probability of harm'. Questions 5-7 were based upon items used by Reeves et al. (2010). These measured severity of harm and responsibility for harm and this section of the measure will be referred to as 'responsibility'. Question 8 evaluated thought-control. This question was added part-way through testing after the first 21 participants. To establish why children had pressed the 'disconnect' button, questions 9 and 10 were used. These questions were designed by the researcher to establish whether children pressed the button in response to thoughts they were concerned about or whether they pressed it 'just in case'. They were completed only by children who had pressed the 'disconnect' button. These items were tested during piloting and found to be age appropriate.

2.6.4 Behavioural Measure: Button-pressing.

During the second phase of the experiment, children could see a 'button' on the computer screen labelled 'disconnect'. They were asked to click on this button with the mouse pointer if they had a thought they were worried could damage the computer. This measure is based on that used by Rassin et al. (1999). The computer recorded the number of times the 'button' was pressed.

2.7 Procedure

Pilot work was carried out with 5 children aged 9–11. For the main study, children were recruited from four primary schools in Cambridgeshire. The researcher spoke to children aged 9–11 in school assembly about psychology and this research study. Children were asked to take information packs home to their parents. Parents were asked to return the demographic questionnaire and consent forms to the school office in the envelope provided by a given date. They were asked not to give all the information about the study to their children, even if they did not want to take part. When the agreed date for the return of consent forms had passed, the researcher met with a teacher from the school to check that all children met inclusion criteria. The teacher also advised the researcher on which order to take the children. This was guided by school schedules but also by the teacher's knowledge of the children. Children who the teacher felt would find it hard to keep the information about the helmet a secret were the last in their classes to participate. This was done to minimise the chance that children would inform each other about the experiment.

Children whose parents had completed consent forms met with the researcher in groups of 5. Children identified by teachers as needing more support with their reading were met individually or in pairs, according to their teacher's guidance. Each child was given an information sheet to read, or it was read out by the researcher (see Appendix S for task instructions). They were encouraged to ask questions and it was emphasised that they did not have to take part. Children who were happy to take part signed an assent form and were each given a participant number, which they wrote on all measures. Children then completed the MASC-10, RAS and TAFQA.

Children in groups decided, with some support from the researcher, in which order they wanted to take part. Each child then completed the experiment while the rest of their group were in class, to minimise distraction and the time children were away from their lessons. Children were randomly allocated to the experimental or control group by the computer, once their age, gender and participant number had been entered. The researcher was blind to this allocation. Before the task began, children completed a computerised version of the visual analogue anxiety measure. Children were then given instructions (Appendix S) and asked to click ‘next’ when they were ready to start.

The researcher sat directly behind the child, in a position that made it impossible to see the computer screen, but so that, if the child raised the ‘STOP’ card, the researcher would notice. The computer programme ran the first part of the experiment (Phase 1). When this finished, a message on the computer asked the child to tell the researcher they had finished. The researcher then moved the screen on, and the child was asked to complete the visual analogue anxiety measure for the second time. The researcher then explained the next part of the experiment to the child (Phase 2; Appendix S). When this part finished, the computer screen moved to the final visual analogue anxiety measure and the child was asked to tell the researcher they had finished. The child was then reassured that the computer was not damaged and asked to complete the final Likert scale measure.

At the end of the school day, or immediately after the whole group had completed the task, depending on the wishes of the school, the children were debriefed in their groups (Appendix T). Children chose a small toy to thank them for participating and the school received a £2 book voucher for each child that participated. If the children were not the last in the school to participate, they were asked if they had enjoyed the experiment and if they could keep the ‘secret’ of the helmet, so that other children could take part as well.

Chapter 3

Results

3.1 Chapter Overview

The first section describes how data were made suitable for analysis, including screening for normality and missing data. The second section describes demographic data, including the age, gender and ethnic origin of participants. The internal consistencies of the TAFQ-A questionnaire are presented in the third section, because this is a new measure for this age group. Internal consistencies of the induced thought-action fusion and responsibility subscales developed for the study are also presented. Section four has descriptive data for each measure used in the main analysis. This describes whether data were normally distributed and which data transformations were used. The fifth section compares the experimental and control groups on the confounding variables of age, gender, thought-action fusion beliefs, inflated responsibility beliefs and anxiety. Section six tests the research hypotheses. This begins with the results of the induced thought-action fusion measure, to check whether the manipulation was successful. The experimental and control groups are then compared on the dependent variables. Section seven presents some further analyses of the data. The chapter concludes with a summary of the results and addresses each research hypothesis in turn.

3.2 Treatment of Data

The data were entered into SPSS version 16 and screened for outliers. Unusual variables were checked again the original questionnaire responses to rule out data entry mistakes. The data set was also screened for missing data. There were four incidents of missing data; one computerised measure of anxiety for three participants was lost due to computer error. One participant did not complete the RAS or TAFQA because her teacher did not feel these measures were appropriate for her, for personal reasons. The measure for thought-control was not completed by children at the first school tested, so only 67 participants completed this measure.

3.3 Demographic Data

The demographic characteristics of the sample and each of the experimental groups was explored. Table 2 shows the gender distribution of the whole sample and each of the experimental groups. Pearson's Chi-Square test was used to check whether there was an association between gender and group. There was no significant association (χ^2 (1) = 0.01, p = 0.59).

Table 2

Frequency of Males and Females for the Whole Sample and Both Groups

	N	Males	Females
Whole sample	85	38	47
Experimental group	42	19	23
Control group	43	19	24

The mean age of participants was 10 years 2 months (SD = 9.92 months) and the range was 9 years to 11 years 10 months (Table 3). Age was included as a variable in a MANOVA to test for differences between independent variables (section 3.6). There was no significant difference in age between the groups (F=0.063, p=0.803). The demographic characteristics of the 67 children who completed the thought-control question, along with analyses comparing the groups on age and gender are shown in Appendix U. The groups for this sample did not differ on age or gender.

Table 3

Mean Age for the Whole Sample and Both Groups

	N	Mean age (months)	SD
Whole sample	85	122	9.92
Experimental group	42	122.29	9.89
Control group	43	121.72	10.06

The ethnic origin of the whole sample was also explored. Two children were of Asian origin (2.4%) and the rest were of White British origin (97.6%). Information was also collected on epilepsy and colour-blindness, and no children were reported to have either of these conditions.

3.4 Internal Consistency of the Questionnaire Measures

The internal consistencies of the new and non-standardised measures were tested. The TAFQ-A is a new measure for children of this age and the measures of induced thought-action fusion and responsibility for harm were designed by the researcher for this study. The single question measure of thought-control could not be checked for internal consistency. The internal consistencies were calculated using Cronbach's alpha (Table 4). An alpha (α) of above 0.80 is considered to indicate good internal consistency (Bryman & Cramer, 2001). All the measures had good internal consistency.

Table 4

Internal Consistency of Measures

Measure	Alpha (α)
TAFQA-Likelihood	0.84
TAFQA-Morality	0.80
Induced thought-action fusion	0.89
Responsibility (3 items)	0.81

3.5 Descriptive Data

This section presents the descriptive data for the independent variables (Table 5) and the dependent variables (Table 6). Histograms and boxplots were plotted to examine the data visually and check for outliers. Skewness and kurtosis was checked for each variable. All independent variables were normally distributed apart from the likelihood subscale of the TAFQA and the VAS at Time 1 in the whole sample. These had significant levels of skew as z-scores were above 1.96 (p<0.05).

Table 5

Descriptive Data for the Independent Variables

	Experimental Group[1]			Control Group[2]			Whole Sample[3]		
	Mean (SD)	Skew	Kurtosis	Mean (SD)	Skew	Kurtosis	Mean (SD)	Skew	Kurtosis
MASC-10	10.81 (5.38)	0.02	0.03	11.02 (5.16)	0.23	-0.53	10.92 (5.24)	0.11	-0.28
RAS	67.25 (12.71)	0.07	0.03	65.31 (15.16)	0.16	0.32	66.42 (13.95)	0.09	-0.06
TAFQA	31.40 (8.08)	-0.06	-0.66	30.67 (8.22)	0.63	-0.41	31.04 (8.12)	0.29	-0.66
TAFQA Likelihood	12.79 (4.83)	0.65	-0.41	12.40 (3.98)	0.68	0.42	12.60 (4.40)	0.68*	-0.07
TAFQA Morality	18.62 (5.13)	0.16	-0.14	18.26 (5.34)	0.57	-0.38	18.44 (5.16)	0.36	-0.35
VAS1	26.36 (24.00)	-0.69	-0.23	27.09 (26.40)	-0.69	-0.43	26.73 (25.09)	-0.68*	-0.37

*p<0.05
[1]N=42; [2]N=43 for MASC-10 and VAS1, N=42 for other variables; [3]N=85 for MASC-10 and VAS1, N=84 for other variables

Table 6 includes a measure of anxiety change. This represents the change in anxiety, measured on the VAS, during the second phase of the task, when children were told that it was possible for ‘high energy’ thoughts to damage the computer. A positive score represents an increase in anxiety. Significant levels of skew or kurtosis, with z-scores over 1.96, indicated that the following variables were not normally distributed in the groups: probability of harm question, responsibility questions, thought-control question, VAS2, VAS3, anxiety change and button-pressing. There were no significant outliers, as none of the z-scores were greater than 3.29 or less than -3.29 (Field, 2005).

Table 6

Descriptive Data for the Dependent Variables

	Experimental Group[1]			Control Group[2]			Whole Sample[3]		
	Mean (SD)	Skew	Kurtosis	Mean (SD)	Skew	Kurtosis	Mean (SD)	Skew	Kurtosis
Induced TAF	9.21 (1.99)	-0.56	-0.03	4.12 (2.48)	-0.08	-0.88	6.64 (3.40)	-0.27	-0.86
Probability of harm	1.12 (1.21)	097*	0.20	0.84 (0.90)	0.75*	-0.36	0.98 (1.07)	1.01*	0.51
Responsibility	8.07 (2.98)	-0.98	-0.97	7.79 (3.01)	-0.59	-0.28	7.93 (2.98)	-0.77*	0.20
Thought-Control	3.51 (0.74)	-1.65*	2.77*	2.91 (1.35)	-1.24	0.46	3.22 (1.11)	-1.69*	2.34*
VAS2	18.67 (17.01)	0.45	-0.81	26.11 (22.24)	0.41	-0.78	22.44 (20.06)	0.55*	-0.50
VAS3	16.65 (20.81)	1.38*	1.79*	23.62 (22.45)	0.57	-0.76	20.22 (21.81)	0.90*	0.016
Anxiety Change	-2.95 (17.80)	0.84*	8.83*	-2.81 (14.96)	-0.45	3.06*	-2.88 (16.30)	0.49	6.60*
Button-Pressing	0.57 (2.35)	5.94	36.96	0.14 (0.64)	5.61*	33.49*	0.35 (1.72)	7.72*	65.02*

*$p<0.05$

[1]N=42 except for VAS3 where N=40; [2]N=43 except for VAS3 where N=42; [3]N=85 except for VAS3 where N=82.

Where data were not normally distributed, appropriate transforms were tried. Responsibility was reflected, anchored at 1, and a square root transform applied. This was then reflected back so that data retained its original order. New values of skew and kurtosis are reported in Table 7. A Kolmogorov-Smirnov test for normality and Levene's test for equality of variance were non-significant, demonstrating that the equality of variance and normality assumptions necessary for parametric analyses were met.

Table 7

Skewness and Kurtosis for Transformed Variables

	Experimental Group				Control Group			
	Skew	SE	Kurtosis	SE	Skew	SE	Kurtosis	SE
Responsibility	-0.210	0.365	-0.226	0.717	0.057	0.361	-0.562	0.709

Transforms on the measure for probability of harm, thought-control, VAS anxiety and anxiety change did not improve the distribution so non-parametric analyses were used for these variables. The likelihood subscale of the TAFQA was not transformed as it was normally distributed in the groups, allowing for parametric comparison. Button-pressing was re-coded as a categorical variable (Table 8). This was considered to be more appropriate as only 10 children had pressed the disconnect button and the data was extremely non-normal.

Table 8

Button-Pressing as a Categorical Variable

	N	Pressers	Non-Pressers
Whole sample	85	10	75
Experimental group	42	7	35
Control group	43	3	40

3.6 Comparisons between Experimental and Control Groups on Age and Independent Variable Measures

Participants were matched across the groups for age and gender, however, data from some participants could not be included, so it was important to check that the matching had been successful and the groups did not differ on age or gender. Groups were not matched for anxiety, responsibility beliefs or prior thought-action fusion beliefs, so it was important to determine whether they differed significantly on any of these variables.

TAFQA, the morality and likelihood subscales of the TAFQA, RAS MASC-10 and VAS at Time 1 were compared using a MANOVA (Table 9). MANOVA was used to reduce Type 1 error and to maximise power (Field, 2005). Cases were excluded listwise, and there was missing data for one participant. Therefore the total number in the analysis was 84. The variables met the assumptions of MANOVA as outlined by Field (2005). The data were randomly sampled and normally distributed. Initial Levene's tests for homogeneity of variance were non-significant, indicating that the assumption of univariate normality was met. Box's test indicated that the covariance matrices were not significantly different in each group, $F(21, 24731) = 1.205$, $p=0.23$; therefore the assumption of homogeneity of covariance matrices was also met. The MANOVA was not significant – $F(6,77) = 0.197$, $p=0.977$.

The same variables were compared for the 67 participants who completed the thought-control question (Appendix U). Groups were not significantly different, multivariate $F(6,59) = 0.036$, $p=1.000$.

Table 9

Descriptive Data, Univariate F Values and p Values for the Independent Variables

	Experimental Group		Control Group		F*	P
	Mean	SD	Mean	SD		
Age (months)	122.29	9.89	121.74	10.18	0.063	0.803
MASC-10	10.81	5.38	11.05	5.22	0.042	0.837
RAS	67.52	12.71	65.31	15.16	0.526	0.470
TAFQA	31.40	8.08	30.67	8.22	0.172	0.679
TAFQA - likelihood	12.79	4.83	12.40	3.98	0.156	0.694
TAFQA - moral	18.62	5.13	18.26	5.24	0.100	0.753
VAS 1	73.64	24.00	73.52	26.40	0.000	0.983

Note. N = 84
*df(1, 82)

3.7 Interim Summary

The TAFQA morality and likelihood subscales, as well as the measures for responsibility and induced thought-action fusion all had good internal consistency. The measures for responsibility were divided into a single measure for probability of harm and another measure for responsibility and severity of harm. Some variables were not normally distributed and were transformed where possible. At baseline, participants in the two groups did not differ significantly on age, anxiety, thought-action fusion beliefs or responsibility beliefs. There was no significant association between group and gender. The next sections present the data analysis in relation to the specific research hypotheses.

3.8 Induced Thought-Action Fusion Check

This study aimed to experimentally manipulate thought-action fusion beliefs. To check whether this was successful, the groups were compared on their scores on the subscale of induced thought-action fusion (Table 10). As this variable was normally distributed, a t-test was used. There was a significant between groups difference, t(83) = 10.43, $p = 0.00$; this represents a large effect size of 2.26 (Cohen, 1992) and indicates that the manipulation was successful.

Table 10

Comparison of Groups on Induced Thought-Action Fusion

	Experimental Group		Control Group		t	*p*	Cohen's *d*
	Mean	SD	Mean	SD			
Induced TAF	9.21	1.99	4.12	2.48	10.43	0.00	2.26

3.9 Between Group Differences

Hypothesis 2 stated that children in the experimental group will show more button-pressing, experimentally induced responsibility, anxiety and thought-control. To test this hypothesis, non-parametric Mann-Whitney tests were used for probability of harm, thought-control and anxiety change (Table 11). A Bonferroni correction was applied, to reduce the chance of a Type 1 error, and the critical level of significance applied was 0.0125 (0.05/4 tests). There were no significant between groups differences. The difference between the control and experimental groups on thought-control was approaching significance.

Table 11

Group Differences on Dependent Variables using Mann-Whitney tests

	Experimental Group		Control Group		U	P (1 tailed)
	Mean	SD	Mean	SD		
Probability of harm	1.12	1.21	0.84	0.90	812.50	0.200
Thought-Control	3.51	0.74	2.91	1.35	422.50	0.028
Anxiety change	-0.44	23.82	-2.81	14.96	833.00	0.399

A t-test was used for the transformed variables of responsibility (Table 12). T-tests have greater power than non-parametric alternatives. Rasch and Guiard (2004) used data-simulation techniques to show that the t-test is extremely robust to non-normality. They recommended its use even with small sample sizes. For this reason, a t-test was also used to test for a between groups difference in thought-control (Table 12). There was a significant between groups difference at the 0.0125 level of significance ($t=2.31$, $p=0.012$); this represents a medium effect size of 0.55 (Cohen, 1992). Figure 2 displays the mean thought-control for the groups.

Table 12

Group Differences on Thought-Control and Responsibility using t-tests

	Experimental Group		Control Group		t	p (1 tailed)
	Mean	SD	Mean	SD		
Thought-Control	3.51	0.742	2.91	1.353	2.31	0.012
Responsibility	8.07	2.98	7.79	3.01	0.169	0.341

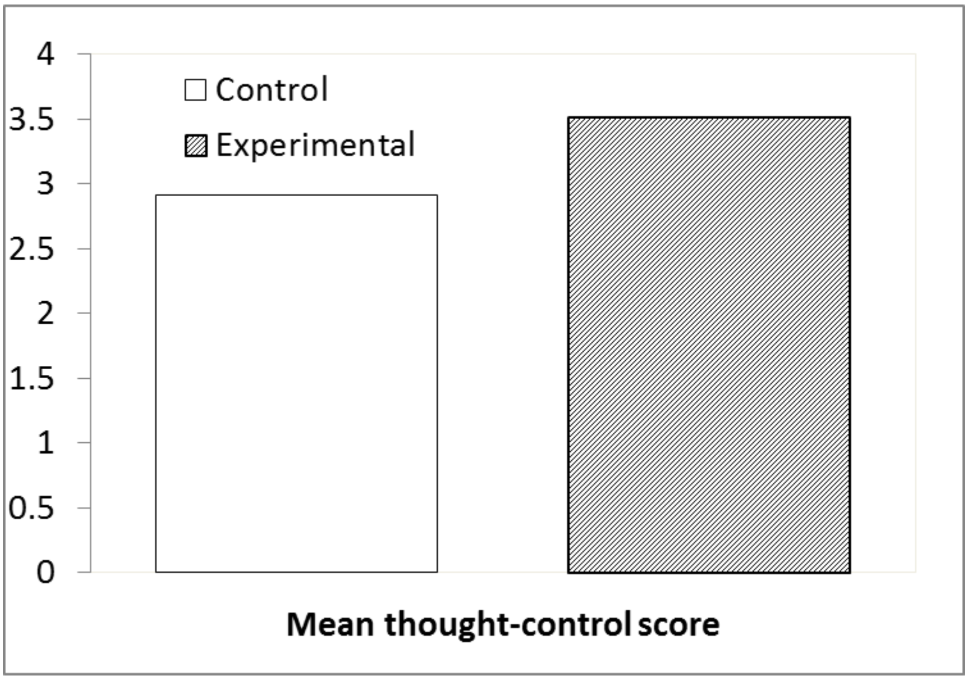

Figure 2. Mean Score on Thought-Control for Both Groups

Button-pressing was re-coded as a categorical variable. In the experimental group 7 children pressed the button and 35 did not; in the control group 3 children pressed the button and 40 did not. A Pearson's Chi-Square test revealed no significant association between button-pressing and group membership, χ^2 (1) = 1.922, p = 0.083 (1-tailed).

3.10 Associations between Thought-Action Fusion and Dependent Variables

Hypothesis 3 stated that induced thought-action fusion will be positively correlated with the dependent variables. To test this hypothesis, Pearson's and Spearman's rank correlations were performed across the whole sample and with both groups (Table 13). There was a significant correlation (ρ=0.401, p<0.001) between thought-control and induced thought-action fusion for the whole group and for the experimental group (ρ=0.436, p=0.004). No other significant correlations were found. The correlation between induced thought-action fusion and probability of harm in the control group approached significance (ρ=0.237, p=0.063).

Table 13

Correlations between Induced Thought-Action Fusion and Dependent Variables

	Induced Thought-Action Fusion		
	Whole Group[1]	Experimental Group	Control Group
Thought-Control [1]	0.401**	0.436**	0.215
Probability of Harm[1]	0.132	-0.013	0.237
Responsibility	0.003	-0.115	-0.057
Anxiety Change[1]	0.046	-0.016	0.106

**p<0.01, 1 tailed.
[1]Spearman's correlation coefficient

3.11 Relationship between Likelihood TAFQA Score and Dependent Variables

Hypothesis 4 stated that children's initial level of likelihood thought-action fusion beliefs will contribute significantly to the variance of the outcome measures. To test this hypothesis, children's baseline thought-action fusion and the dependent variables, apart from button-pressing, were correlated using Pearson's and Spearman's rank correlations (Table 14). These were not significant, indicating that children's thought-action fusion beliefs at baseline did not predict obsessive-compulsive behaviours, thoughts or emotions. The correlation between likelihood TAFQA and probability of harm in the control group approached significance at the 0.05 level (ρ=0.248, p=0.057).

Table 14

Correlations between Likelihood TAFQA and Dependent Variables

Likelihood TAFQA	Responsibility	Thought[1]-Control	Anxiety[1] change	Probability[1] of Harm	Induced TAF
Whole [1] Sample	0.030	0.044	0.103	0.032	-0.012
Experimental Group	-0.021	-0.059	0.136	-0.147	-0.084
Control Group	0.102	0.152	0.069	0.248	-0.094

Note, N = 67 for thought-control, N=84 for other variables.
[1]Spearman's correlation coefficient

3.12 Testing for RAS as a Moderator

Hypothesis 5 stated that the relationship between experimentally induced thought-action fusion and the dependent variables will be moderated by initial responsibility beliefs. A significant relationship was found between induced thought-action fusion and thought-control in the whole sample and the experimental group so it was possible to test for a moderating relationship for these variables. Multiple regression using an interaction term calculated from centred variables is a preferred way to test for a moderating relationship (Cohen, Cohen, West, & Aiken, 2003; Frazier, Tix, & Barron, 2004). This method maximises power by retaining the continuous nature of the variables. Following this procedure, the scores for RAS and thought-action fusion were centred to prevent multicolinearity in the data (Howell, 2002). The product of the centred variables of RAS and thought-action fusion was then calculated, to represent the interaction term. Before a regression analysis was done, exploratory correlations were calculated between the predictor variables, including the interaction term, and the outcome variable of thought-control (Table 15). The correlation between the interaction term and the dependent variable of thought-control was not significant for the whole group or the experimental group. This indicated that the relationship between thought-action fusion and thought-control did not change according to the level of responsibility, so responsibility was not a moderator. As this correlation was not significant, a regression analysis was not performed.

Table 15

Correlations between Predictor Variables and Thought-Control

Thought-Control	Responsibility	Thought-Action Fusion	Interaction
Whole sample[1]	0.024	0.401**	0.005
Experimental Group	-0.008	0.436**	0.086

N=67
***p*<0.01, 1 tailed.
[1]Spearman's correlation coefficient.

3.13 Testing for Perceived Responsibility as a Mediator

Hypothesis 6 stated that the relationship between thought-action fusion and the dependent variables would be mediated by perceived responsibility. Bootstrapping is a nonparametric resampling procedure which has been recommended for testing mediation because it has high power while maintaining control over type 1 error rate (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002; Preacher & Hayes, 2008). This method does not require normality in the sampling distribution and provides greater power than the causal steps method which is commonly used to investigate mediation (Baron & Kenny, 1986). A macro for SPSS (Hayes, 2008) was downloaded to carry out the procedure. Using this method, with 5000 samples, the 95% confidence interval for the size of the indirect effect of induced thought-action fusion on the dependent variables of thought-control and anxiety change, through responsibility, was calculated. Button-pressing was not included in this analysis because of the small number of button presses in the study. Table 16 shows that all the confidence intervals include 0. Therefore the null hypothesis could not be rejected and responsibility was not found to mediate the relationship between thought-action fusion and the dependent variables.

Table 16

95% Confidence Intervals for Indirect Effect of Induced Thought-Action Fusion on Dependent Variables through Responsibility

	Whole Group		Experimental Group		Control group	
Thought-control	-0.024	0.011	-0.013	0.029	-0.015	0.026
Anxiety change	-0.211	0.139	-2.491	0.175	-2.657	0.152

3.14 Further Analyses

Following tests for the main hypotheses, the data were examined further using post-hoc analyses.

3.14.1 Correlations among the independent variables.

Previous studies have found associations between responsibility, anxiety and thought-action fusion in children (Matthews et al., 2007; Muris et al., 2001). To establish whether scores on the independent variables were related to each other in a way that was consistent with previous literature, correlations between scores on the pre-task visual analogue anxiety scale (VAS anxiety), MASC-10, RAS, TAFQA, and the morality and likelihood subscales of the TAFQA were calculated (Table 17). For variables that were normally distributed Pearson's correlation coefficient was used, and for variables that were not normally distributed Spearman's rank correlation coefficient was used.

Scores on RAS are reversed, so that a low score indicates higher responsibility. There were significant positive correlations between scores on the MASC-10, TAFQA and the TAFQA subscales. The RAS was significantly negatively correlated with scores on the TAFQA, MASC-10 and likelihood subscale of the TAFQA, indicating that higher levels of responsibility were associated with greater thought-action fusion and anxiety. The pre-task visual analogue anxiety scale was significantly correlated with the MASC-10, suggesting that it was a valid measure of anxiety.

Table 17

Correlations between Independent Variables

	MASC-10	RAS	TAFQA	Morality	Likelihood[1]
VAS Anxiety[1]	0.235*	-0.089	-0.002	-0.073	0.073
MASC-10		-0.186*	0.288**	0.184*	0.263**
RAS			-0.388**	-0.351	-0.313**
TAFQA				0.872**	0.840**
Morality					0.466**

Note, N=85 for correlations with the MASC-10, N=84 for other correlations
[1]Spearman's correlation coefficient.
**p*<0.05, ***p*<0.01, 1 tailed.

3.14.2 Differences in anxiety across time.

Although anxiety change during the task (i.e. Time 2 to Time 3) was not significantly different between the groups, mean anxiety level at Time 1 appears to be higher than at times 2 or 3. This suggests that children may have got less anxious during the experiment. To establish whether anxiety level changed significantly over time and whether the change differed between groups, a repeated measures ANOVA was carried out on the visual-analogue anxiety measure (Table 18). Although the VAS at Time 3 in the experimental group was not normally distributed, the model is robust to non-normality if group sizes are equal (Rasch & Guiard, 2004). Mauchley's test indicated that the assumption of sphericity had been violated (χ^2= 11.13, p<0.05), therefore degrees of freedom were corrected using Huynh-Feldt estimates of sphericity (ε = 0.914). There was a significant main effect of time (F(1.83, 146.18) =5.778, p=0.005) but no significant group effect or interaction effect.

Table 18

Changes in Anxiety over Time

Anxiety	Experimental Group		Control Group		Time		Group		Time* group	
	Mean	SD	Mean	SD	F	*p*	F	*p*	F	*p*
Pre-task	27.68	23.83	27.74	26.67						
During task	19.60	16.89	26.43	22.41	5.79	0.005	1.21	0.275	1.54	0.219
Post-task	16.65	20.81	23.61	22.45						

N = 82

Follow-up pairwise comparisons revealed that anxiety at Time 1 was significantly greater than at Time 3 (t = 2.957, p(2-tailed)=0.004). No other comparisons were significant.

3.14.3 Developmental differences in TAFQA scores.

This sample had higher scores on the TAFQA and both subscales, than the sample of 427 13–16 year-olds used by Muris et al. (2001). T-tests were used to compare the two samples and test the null hypothesis that there was no significant difference between the means (Table 19). At p=0.01, the current sample scored significantly higher on the TAFQA (t=10.65, p<0.01), the likelihood subscale (t=8.47, p<0.01) and the morality subscale (t=9.87, p<0.01).

Table 19

Comparison in TAFQA Scores between the Current Sample and Muris et. al. (2001)

	Group	N	Mean	SD	t-value
Whole Sample	Current Study	84	31.04	8.12	10.65**
	Muris et al.	427	22.2	6.4	
Likelihood	Current Study	84	12.60	4.40	8.47**
	Muris et al.	427	8.7	2.8	
Morality	Current Study	84	18.44	5.16	9.87**
	Muris et al.	427	13.4	4.9	

***p*<0.01

Matthews et al. (2007) also used the TAFQA with a sample of 13-16 year olds and found very similar means of 22.44 (total) 13.55 (morality) and 8.89 (Likelihood) to those found by Muris et al. (2001).

3.14.4 Reason for button-pressing.

Ten children pressed the button and then answered the corresponding Likert scale questions about button-pressing. These were designed as a validation check, to make sure the children had pressed the button in response to intrusive thoughts. A high score on question 1 indicated that a child pressed the button because of a thought they were worried might damage the computer. A high score on question 2 indicated that a child pressed the button because they wanted ‘to be on the safe side’. Each child answered both questions and some pressed the button more than once, so it was possible to have high scores on both. Table 20 shows the descriptive statistics for these variables in the group of 10 children who pressed the button. The variables did not have significant skewness or kurtosis, as z-scores were below 1.96 and therefore not significant at the 0.05 level. This indicated that they were normally distributed.

An exploratory t-test was done to see whether the difference in mean was significant (Table

20). A paired test was chosen, as the measures had similar units. Children scored significantly higher (t=2.45, *p*(2-tailed)=0.037) on the question about damage. As the sample was small, the analysis was repeated with a non-parametric Wilcoxon signed ranks test, which also revealed a significant difference (Z=-1.980, p(2-tailed)=0.048).

Table 20

Descriptive Statistics for Questions on Button-Pressing

Question	Mean	SD	Skew	Kurtosis	t	*p* (2-tailed)
Damage	3.5	0.707	-1.179	0.571	2.45	0.037
'Safe Side'	1.9	1.60	-0.004	-1.589		

3.15 Chapter Summary

This section summarises the findings by considering each of the research hypotheses in turn, followed by the further analyses.

3.15.1 Hypothesis 1: Manipulation check.

This hypothesis stated that children in the thought-action fusion group will show higher levels of experimentally induced thought-action fusion than children in the control group. The results from the manipulation check indicated that the experiment was successful in manipulating thought-action fusion between the experimental and control group. Therefore, the hypothesis was supported.

3.15.2 Hypothesis 2: Between groups differences.

This hypothesis stated that children in the experimental group will show more button-pressing, experimentally-induced responsibility, anxiety and thought-control. The experimental manipulation did not have a significant effect on any of the dependent variables when non-parametric Mann-Whitney tests were used. The effect on thought-control approached significance. When a follow-up t-test was used, a between groups difference was found at the 0.0125 level. The hypothesis was therefore partially supported. A Chi-square test revealed a near-significant association between button-pressing and group (p=0.083).

3.15.3 Hypothesis 3: Association between induced thought-action fusion and the dependent variables.

This hypothesis stated that there would be a significant positive correlation between induced thought-action fusion and the dependent variables. Spearman's rank's correlations showed that induced thought-action fusion was significantly correlated with thought-control in the whole sample ($\rho=0.401$) and the experimental group ($\rho=0.436$) and no other correlations were significant. Therefore the hypothesis was partially supported. The small correlation between induced thought-action fusion and probability of harm approached significance in the control group ($\rho=0.195$, $p=0.059$.)

3.15.4 Hypothesis 4: Association between likelihood thought-action fusion and the dependent variables.

This hypothesis stated that children's initial level of likelihood thought-action fusion beliefs will contribute significantly to the variance of the outcome measures. There was no relationship between children's baseline thought-action fusion beliefs (likelihood TAFQA) and any of the outcome measures. Therefore, the hypothesis was not supported. The correlation between likelihood thought-action fusion and probability of harm approached significance in the control group.

3.15.5 Hypothesis 5: Moderation by responsibility beliefs.

The hypothesis stated that the relationship between experimentally-induced thought-action fusion and button-pressing, anxiety and thought-control will be moderated by responsibility beliefs. Moderation was tested for, following the procedure suggested by Frazier et al. (2004). No moderating relationship was found, therefore the hypothesis was not supported.

3.15.6 Hypothesis 6: Mediation by perceived responsibility.

The hypothesis stated that the relationship between experimentally-induced thought-action fusion and button-pressing, anxiety and thought-control will be mediated by perception of responsibility. Using a bootstrapping method to test the indirect effects of thought-action fusion on thought-control and anxiety change through responsibility, no indirect effect was found. Therefore the conditions for a mediating relationship were not met and the hypothesis was not supported.

3.15.7 Further analyses.

Correlations between the independent variables showed that responsibility likelihood thought-action fusion and anxiety were all intercorrelated. Anxiety was associated with morality thought-action fusion and both measures of anxiety were significantly correlated.

A non-parametric repeated measures ANOVA showed that there were significant differences in anxiety over time but there was no time by group interaction. Follow up comparisons showed that anxiety at Time 3 was significantly lower than at Time 1.

Comparison of the TAFQA scores for the current sample of 9–11 year olds revealed that average scores were significantly higher than a sample of 13–16 year olds (Muris et al., 2001) for both subscales and the total score.

A small number of children pressed the ‘disconnect’ button and completed questions about their reasons for doing this. Data was checked for normality and a t-test revealed children were more likely to strongly endorse the question indicating they had pressed the button because of an intrusive thought than to be ‘on the safe side’.

Chapter 4

Discussion

4.1 Chapter Overview

This study aimed to test the causal relationship between thought-action fusion and OCD using an experimental manipulation of thought-action fusion in non-clinical children aged 9 to 11. The results of the study are discussed in this chapter. First the main results are summarised and evaluated in relation to the research hypotheses and further analyses. This is followed by a critique of the methodology used and the implications of this for interpretation (section 4.4). The theoretical and clinical implications of the findings are considered and directions for future research are suggested. Finally, an overall summary and main conclusions are presented.

4.2 Evaluation of Findings

This section considers the results in relation to each of the research hypotheses and reviews them findings in relation to the current literature. The study reported here used a new experimental design to manipulate thought-action fusion, so there is limited previous research of direct relevance. Where possible, the findings will be related to research on thought-action fusion and OCD in children; at other times, links are made to research with adults.

4.2.1 Hypothesis 1: Manipulation check.

This hypothesis stated that children in the thought-action fusion group will show higher levels of experimentally induced thought-action fusion than children in the control group. The results from the manipulation check indicated that the experiment was successful in manipulating thought-action fusion between the experimental and control group. Therefore the hypothesis was supported.

No previous experimental manipulations of thought-action fusion have measured participants' belief in the manipulation (Bocci & Gordon, 2007; Rachman et al., 1996; Rassin, 2001; Rassin et al., 1999; van den Hout et al., 2001, 2002; Zucker et al., 2002). Thus the manipulation used is novel and appears to have potential value as a research technique.

4.2.2 Hypothesis 2: Between-groups differences.

Hypothesis 2 stated that children in the experimental group (i.e. with increased thought-action fusion) will show more button-pressing and report more anxiety, responsibility and attempts to control their thoughts. Each dependent variable is discussed below and the results related to previous research. This is done with the following limitations: (1) comparisons are primarily made to studies using adult participants, (2) the dependent measures are different and (3) experimental paradigms are different.

4.2.2.1 Anxiety.

No difference was found between the groups on anxiety change and anxiety was significantly lower on the during-task and post-task measures compared to the pre-task measure. Therefore the hypothesis was not supported.

This is not consistent with results from previous experimental studies, which have found an increase in anxiety following an experimental manipulation of thought-action fusion (Rachman et al., 1996; Zucker, Craske, Barrios, & Holguin, 2002; van den Hout et al., 2001, 2002; Bocci & Gordon, 2007). Rassin et al. (1999) found that their experimental group experienced significantly more discomfort than the control group after a thought-action fusion manipulation. The experimental methods used in these studies were designed to be substantially more anxiety-provoking. Studies using a sentence paradigm have asked participants to write and think about a car crash happening to a loved one and Rassin et al. (1999) told participants that their thoughts could cause someone to receive an electric shock. In comparison, the negative consequence suggested by the current study – that the experimenter's expensive computer could be damaged – is not as severe and unlikely to be as anxiety provoking. It is possible that children were more anxious at the start because the exact details of the task were unknown and they may have been worried about their ability to succeed at the task.

4.2.2.2 ***Button-pressing.***

Children were asked to press a button if they had a thought that they were concerned might damage the computer. This was used to elicit behavioural attempts to neutralise intrusive thoughts. Overall, low rates of button-pressing were found in this study: most children did not press the button at all. Therefore button-pressing was coded as a categorical variable; seven children pressed the button in the experimental group and 3 in the control group. This difference was not significant (p=0.083).

Rassin et al. (1999) found higher levels of button-pressing (mean = 5.2) and behavioural neutralisation has been noted in around half of participants following a sentence to induce thought-action fusion (Bocci & Gordon, 2007; Rachman et al., 1996; van den Hout et al., 2001; Zucker et al., 2002). Unlike the current study, these studies suggested a particular intrusion (e.g. the word ‘apple'). Wegner (1994) has demonstrated that attempts at thought-control, once a particular word or thought has been suggested, can bring about a paradoxical increase in unwanted thoughts. These studies were also significantly more anxiety provoking than the current study.

Further analysis suggested that children who pressed the button did so because of intrusive thoughts that they were concerned about. This result of the is consistent with that of Bocci and Gordon (2007) who found a significant association between behavioural neutralisation and ‘urge to cancel thoughts’ following a thought-action fusion manipulation, suggesting that the adults who used behavioural neutralisation strategies were doing so because of intrusive thoughts.

4.2.2.3 ***Responsibility.***

Responsibility was assessed using one measure of probability of harm and one measure of responsibility and severity of harm.

4.2.2.3.1 Probability of harm.

This study found low levels of probability of harm following the task, the between groups difference was not significant; therefore the hypothesis was not supported.

A small number of studies have measured likelihood of harm beliefs following a thought-action fusion manipulation using a sentence induction paradigm. Results have ranged from 2.6 out of 100 to 24.14 out of 100 (Bocci and Gordon, 2007; Rassin, 2001; Zucker et al., 2002) The lowest score of 2.6 (Rassin, 2001) was found after a 5 minute delay before completion of measures and seems to be consistent with the scores found in this study.

4.2.2.3.2 Responsibility and severity of harm.

The ‘responsibility’ item measuring responsibility and severity of harm had a mean score of approximately 8 out of 12 for the whole sample and both groups indicating that children ‘mostly agreed’ with statements about severity and responsibility. There was no difference in responsibility between the control and experimental groups, so the hypothesis was not supported.

Other experimental studies of thought-action fusion in adults have also found moderate levels of responsibility for harm, ranging from 41 to 63.61 using a 0–100 visual-analogue scale (Bocci & Gordon, 2007; Rassin, 2001; Rassin et al., 1999; Zucker et al., 2002). No other studies compared this measure between groups in a way comparable with the current study.

4.2.2.4 Thought-control.

In this study the mean score for thought-control was 3.51 in the experimental group and 2.91 in the control group. The difference was significant with a t-test at p=0.012, representing a medium effect size of 0.55. The means in both groups suggest that most children used thought-control strategies to some extent. In this study, thought-control probably involved thought suppression. Wegner (1992, 1994) proposed that suppression involves the deliberate search for thoughts unrelated to the target thought. In keeping with this theory, one child in this study commented: ‘I thought of chocolate, then I thought of my maths homework. I don't think I could have damaged the computer'. A number of other children made spontaneous statements about what they had chosen to think about (e.g. football) suggesting conscious strategies.

Rassin et al. (1999) measured 'efforts to avoid thinking' of the word 'apple' on a visual analogue scale ranging from 0–100, after telling participants in their experimental group that thinking this word would result in another participant receiving an electric shock. The experimental group scored significantly higher (59.2) than the control group (20.2). The results of the current study were in the same direction as that found by Rassin et al.

Other experimental studies, using a sentence to induce thought-action fusion, have measured types of thought-control on a visual analogue scale ranging from 0–100. Results have ranged from 27.7 to 80 (Bocci & Gordon, 2007; Rachman et al., 1996; Rassin, 2001; Zucker et al., 2002). These studies use a variety of different terms for thought-control, which may not be equivalent. However, the finding of relatively high levels of suppression or urge to cancel out bad effects seems consistent with the high levels of thought-control found in this study.

4.2.3 Hypothesis 3: Association between induced thought-action fusion and the dependent variables.

This hypothesis stated that induced thought-action fusion will be positively correlated with the dependent variables, i.e. with OCD-like behaviours and cognitions. There was a significant correlation between induced thought-action fusion and thought-control in the experimental group and in the whole group. No other significant correlations were found. In observational studies, correlation cannot suggest causality but the experimental design of this study, where thought-action fusion was induced first and an opportunity for thought-control followed, means that it is possible to conclude that thought-action fusion caused significant levels of thought-control in the experimental, but not the control group. This partially supports the hypothesis.

Experimental studies designed to induce thought-action fusion in adults have found relatively high levels of thought-control (discussed in section 4.2.2.4 above). The result in this study is consistent with this. Some studies have also found that inducing thought-action fusion has led to increased anxiety, responsibility, probability of harm and behavioural neutralisation including button-pressing (section 4.2.2 above). These results do not seem consistent with this study. However, methodological differences make it hard to compare this finding to previous research.

4.2.4 Hypothesis 4: Association between likelihood thought-action fusion and the dependent variables.

This hypothesis stated that children's baseline level of likelihood thought-action fusion beliefs will contribute significantly to the variance of the outcome measures, including induced thought-action fusion. There was no relationship between baseline likelihood thought-action fusion and any of the outcome measures. Therefore, the hypothesis was not supported.

A number of experimental studies with adults have also found no correlation between likelihood thought-action fusion and dependent variables similar to the ones used in this study (Bocci and Gordon, 2007; Rassin et al., 1999; van den Hout et al., 2001). In contrast, van den Hout et al. (2002) found likelihood thought-action fusion was significantly correlated with an increase in anxiety and with spontaneous neutralisation after a delay. Rachman et al. (1996) found it was significantly correlated with probability of harm, anxiety and responsibility. However, this study used participants high in thought-action fusion. These significant results are not consistent with those found in the present study, although it is interesting that the strongest correlation Rachman (1996) found was between likelihood-other thought-action fusion and probability of harm and the current study found a correlation approaching significance between these variables in the control group.

4.2.5 Hypothesis 5: Moderation by responsibility beliefs.

The hypothesis stated that the relationship between experimentally-induced thought-action fusion and button-pressing, anxiety and thought-control, will be moderated by responsibility beliefs. Moderation was tested, following the procedure suggested by Frazier et al. (2004). No moderating relationship was found, therefore the hypothesis was not supported.

4.2.6 Hypothesis 6: Mediation by perceived responsibility.

The hypothesis stated that the relationship between experimentally-induced thought-action fusion and the dependent variables will be mediated by perception of responsibility. Perceived responsibility did not mediate the relationship between induced thought-action fusion and thought-control or anxiety change therefore the hypothesis was not supported.

No other experimental studies have tested for this kind of mediating relationship. However, in this study, the experimental manipulation had no effect on responsibility. A number of other studies have found that, in adults, an experimental manipulation of thought-action fusion did increase responsibility (see section 4.2.3.2.2).

4.3 Overview of Additional Results

In addition to the main results described above, details of demographic and exploratory analyses are discussed below.

4.3.1 Correlations among the independent variables.

Correlations on the pre-task visual analogue anxiety measure, MASC-10, RAS, TAFQA and the morality and likelihood subscales of the TAFQA were calculated. These are discussed below.

4.3.1.1 Visual analogue scale (VAS) of anxiety.

The VAS scale was significantly correlated with the MASC-10, indicating that higher scores on the MASC-10 were associated with greater anxiety. This is consistent with previous literature which has found that visual analogue scales correlate with other mood measures (Lindsay & Powell, 1994). It also indicates that the VAS in this study was a valid measure of anxiety.

4.3.1.2 Correlations between MASC-10, RAS and TAFQA.

Scores on the RAS were reversed, so that a low score indicated high responsibility. The RAS had a significant negative correlation with scores on the MASC-10, TAFQA scale and both subscales. Scores on the MASC-10 were correlated with the overall and subscale scores on the TAFQA.

These results are consistent with Matthews et al. (2007) who found large negative correlations between RAS, thought action fusion total and subscales in a non-clinical sample of 13–16 year-olds. They are also consistent with Muris et al. (2001) who found significant correlations between anxiety and thought-action fusion total and both subscales in a non-clinical sample of 13-16 year-olds. Studies with adults have also found correlations between anxiety and likelihood thought-action fusion and smaller correlations between anxiety and moral thought-action fusion (Berle & Starcevic, 2005; Shafran & Rachman, 2004).

These results indicate that responsibility, thought-action fusion and anxiety are all correlated in this sample of non-clinical children, which is consistent with previous research.

4.3.2 Demographic differences.

Analyses showed that the total TAFQA scores and scores on both subscales for the current sample were significantly higher than those found by Muris et al. (2001) with a sample of 427 13–16 year-olds. Matthews et al. (2007) found scores very similar to those found by Muris et al. in another sample of 13–16 year-olds.

This is consistent with other research on thought-action fusion and magical thinking which suggests that it decreases with age. An unpublished study by Laing et al. (2007) found thought-action fusion was highest in children aged 7–10, before declining in early adolescence and Mathews et al. (2007) found that thought action fusion was negatively correlated with age in a sample of 13–16 year olds.

4.4 Methodological Critique

This section evaluates the strengths and weaknesses of the research presented and their implications for the interpretations of results.

4.4.1 Design.

This study used a between-subjects experimental design to investigate whether thought-action fusion beliefs led to obsessive-compulsive behaviours, cognitions and emotions. The use of an experimental design has a number of advantages. Firstly, the manipulation of a variable and the inclusion of a control group allows causality to be implied. In this case, the experimental design allowed some conclusions to be drawn about the way in which thought-action fusion affected obsessive-compulsive behaviours like thought-control in children. This attempted to overcome the problem that most previous research on thought-action fusion has used observational designs, which cannot adequately show causality. With children, there has only been one previous experimental study of thought-action fusion (Rassin et al., 1999) and this included older adolescents and a number of adults, limiting its relevance for understanding thought-action fusion in children.

Thought-action fusion is, by definition, a belief which does not have a rational explanation. The helmet used in this experiment provided a rational real-world explanation for how thoughts could have a real effect. However, there are a number of reasons why this was necessary: 1) Children of this age range are less likely to endorse magical explanations than younger children (Subbotsky, 2005) and simply telling the children that their thoughts could turn the pictures red, without providing the helmet, may well have failed to generate high enough levels of belief to investigate the effects of thought-action fusion. 2) Using the helmet minimised the risk that children would develop generalised thought-action fusion beliefs about the power of their thoughts. 3) Theories of the effect of thought-action fusion on OC behaviours and emotions do not depend on the way the thought-action fusion beliefs develop, rather it is the belief itself that is important. Therefore, the cause of the belief should not change its effects. For these reasons, the helmet was considered to a necessary and appropriate part of the experiment.

4.4.2 Advantages of the experimental manipulation.

This study developed and used a novel method of manipulating thought-action fusion in children in an experimental task. Two previous experimental methods have been used with adults: a sentence designed to induce thought-action fusion concerns (e.g. Rachman et al., 1996) and an experiment where participants in the experimental group were given a helmet and told that a computer could read their thoughts and thinking ‘apple’ could cause someone else to be given an electric shock (Rassin et al., 1999). There are a number of difficulties with both these methods: (1) participants do not see evidence that their thoughts could really cause harm; (2) participants' belief in the thought-action fusion manipulation is not measured; (3) they are too anxiety provoking to be used ethically with young children and (4) a particular ‘damaging’ thought is suggested, which may introduce a confounding factor of a suppression effect as a specific thought is made salient and then becomes difficult not to think about (e.g. Wegner, 1994). The novel method used in this study was developed in order to overcome these difficulties.

The current study asked children to wear a special helmet and ‘think red’, showing children in the experimental group pictures which turned redder. This was intended to be a more ecologically valid demonstration of thought-action fusion in children because participants could see the effects of their thoughts on a real world object. It is suggested that thought-action fusion beliefs may develop when children assume causality after particular thoughts are paired with events (Tallis, 1994). This method means that it is possible to establish how easily children make the assumption that their thoughts can cause events and whether this belief might lead to concerns about harm. It was also possible to measure children's task-induced thought-action fusion beliefs in both the experimental and control group, to confirm that it really was these beliefs that were affecting dependent variables.

A further advantage to this method is that a particular ‘damaging thought’ was not suggested to participants. Participants were given a non-specific suggestion about ‘high energy’ thoughts. The current study sought to find out whether participants would become worried about particular thoughts, if they believed their thoughts could affect the computer. Another advantage was that the experimental design allowed thought-action fusion to be manipulated in children in an ethical way. By restricting the thought-action fusion to the computer and carefully debriefing children afterwards, children could develop strong beliefs in the power of their thoughts without risk of harm.

4.4.3 Disadvantages of the experimental manipulation.

The experimental manipulation was novel and carrying it out revealed a number of significant disadvantages. The thought-action fusion induction gave children evidence about the power of their thoughts to influence the computer (positive thought-action fusion) but it did not give them direct evidence that their thoughts could damage the computer. The suggestion of damage was made and it was hoped that children who thought they could influence the computer would be more concerned about damaging it. This design was used because of ethical concerns that evidence of damage could cause high levels of anxiety. It was hoped that children's belief in the suggestion that they could damage the computer would be tested by the ‘probability of harm’ question, but problems with this question, not apparent during piloting, make the interpretation of the results uncertain (see section 4.4.4).

An unforeseen consequence of inducing thought-action fusion before suggesting the possibility of damage is that the experimental manipulation may have had a positive mood-induction effect in children who believed they had influenced the computer. From observation it appeared that children in the experimental group received inadvertently a positive mood-induction in comparison to children in the control group, who were disappointed and therefore had a relatively negative mood-induction. This mood effect may have counterbalanced the anxiety-provoking effects of the suggestion of damage. The impact of mood on thought-action fusion has been identified by Abramowitz, Whiteside, Lynam and Kalsy (2003) who found that the relationship between likelihood thought-action fusion and OCD symptoms was mediated by negative affect. This was an observational study, so mediation must be interpreted with caution, but it suggests that an unforeseen mood-induction effect may have affected the relationship between induced thought-action fusion and the OCD related dependent variables. In the current study, there were no significant between groups differences in self-reported anxiety but there was no measure of positive affect.

A further drawback was that the negative consequence suggested to children did not increase anxiety. Children's anxiety was low at baseline and reduced over time. Other studies on thought-action fusion have used more anxiety-provoking potential consequences, such as another participant receiving an electric shock (Rassin et al., 1999). In the current study children were told that they might damage an expensive computer. This less serious outcome was suggested for ethical reasons. However, cognitive theories of OCD suggest that the desire for anxiety relief strongly motivates the performance of mental strategies and physical compulsions and that anxiety contributes to intrusive thoughts (e.g. Rachman, 2003; Salkovskis, 1985). Consistent with this, Gaskell, Wells and Calam (2001) found a large and significant correlation between anxiety and number of intrusions during a thought suppression task in a sample of 7–11 year-olds. It is possible that children may not have been anxious enough to provide a realistic demonstration of the effects of thought-action fusion.

4.4.4 Timing of measures.

Further difficulties were caused by the timing of the measures. The measures of thought-action fusion, responsibility and thought-control were given after the children had been reassured that the computer was not damaged. This was done for ethical reasons, to minimise anxiety. However, it is possible that the reassurance would have discharged feelings of responsibility in particular and the retrospective question required children to reflect on previous feelings they may not have been very aware of. This effect would not apply to the question about thought-action fusion because children would continue to believe (or not believe) that they had influenced the computer until they were debriefed. It is also likely that answers to the thought-control question were not affected by the timing of the question, as thought-control would have been a conscious strategy and so easier for children to reflect on than feelings of responsibility.

The timing of the measures was problematic for other reasons. Children completed the second anxiety measure immediately after the first part of the task, but before the suggestion that they could damage the computer was made. This was because it was anticipated that the children's anxiety might decrease from Time 1 to Time 2, as they became familiar with the equipment and knew more about the task. Time 2 was effectively intended to be a ‘baseline’ measure. The final measure of anxiety was taken 1 minute after the suggestion that they might damage the computer was made. During this time the ‘risk’ of damage to the computer remained present. However, opportunities for thought-control and neutralisation were there and it is possible that anxiety decreased during the minute. This is discussed further in section 4.5.1.3.

4.4.5 Blinding.

The researcher was blind to the condition the children were in because children were allocated according to a computer program immediately before they took part. The blinding is an advantage, because knowing which experimental condition a participant is in can introduce systematic bias in support of the study's hypothesis (Tilly, 1996).

There was one threat to the blinding. At times, children who thought they were making the pictures turn red got very excited and told the researcher. This suggested to the researcher that a child was probably in the experimental group. However, it became apparent early on that some children in the control group responded in the same way. The majority of children did not tell the researcher how the experiment had gone and the researcher made every effort to quickly move on to the next part without engaging in conversation about the first part of the task.

4.4.6 Sample and recruitment.

During the recruitment process, steps were taken to achieve a diverse sample of participants. The sample included children from small rural schools as well as a large city school. The ethnicity of the sample was predominantly white British. The groups were balanced on gender, although there were somewhat more females overall. Exclusion criteria were kept to a minimum.

The sample size did not reach that required by power calculation. Three results approached significance: (1) a correlation between likelihood thought-action fusion and probability of harm in the control group (2) a between groups difference in button-pressing and (3) a correlation between induced thought-action fusion and probability of harm in the control group. The smaller than planned sample size reduced power to detect significant differences and relationships. However, the nature of the study may have made recruitment more difficult. Three schools reported that they did not want to take part because the study involved deception.

4.4.7 Independent Measures.

A strength of this study was the use of a reliable questionnaire to assess children's baseline anxiety symptoms. The brief nature of the MASC-10 reduced time taken by children to complete measures and allowed the researcher to score it before children completed the task. This meant that children above the clinical cut-off could be given a different version of the task.

The TAFQA was designed for use with adolescents and has good psychometric properties with this group (Muris et al., 2001). Use of this measure means that it was possible to compare levels of thought-action fusion in this younger age group to those found in adolescents (Muris et al., 2001). However, a disadvantage of using the TAFQA is that scores cannot be compared to scores on the Thought-Action Fusion Scale – Revised (Shafran et al., 1996) which is the most common measure of thought-action fusion with adult participants. This means that participant's level of thought-action fusion cannot be compared to those found in clinical or non-clinical adult samples.

The RAS has acceptable reliability in a similar-aged sample (Reeves et al., 2010). However, as reported in that study, some of the words are difficult for younger children and the present study made two changes to make the scale easier to understand. Nonetheless, some children were unsure about the meaning of certain questions, introducing the potential for misunderstanding and inaccurate responding. However, the researcher was able to support children and minimise this risk.

Visual analogue scales were used to assess state anxiety over short time periods. The single item has shown sensitivity to changes in anxiety over short time periods in children (Bernstein et al., 1994) and is quick to complete. However, very few studies have used these measures in children and as there was only one item, it was not possible to calculate reliability for this measure. The item at Time 1 did correlate significantly with the MASC-10, suggesting it was a valid measure of anxiety.

4.4.8 Dependent measures.

A number of Likert scale measures were developed for this study, some based on those used by Reeves et al. (2010), to assess induced thought-action fusion, perception of responsibility, control of thoughts and reason for button-pressing. These were short and children appeared to understand the questions. The 3-item measures for thought-action fusion and responsibility and severity of harm had good internal consistency.

The inclusion of a measure of task-induced thought-action fusion was an advantage of the current study. This made it possible to (1) check the manipulation was successful, (2) confirm that thought-action fusion was causing any between groups differences and (3) establish whether independent variables contributed to the variance in belief strength. It also allowed analyses using correlations, which maximise power because they maintain the continuous nature of the variable.

However, there were some disadvantages to the post-task measures. It was not possible to establish the internal consistency of the single-item measures for probability of harm and thought-control, although both items have face validity. A further disadvantage was the ambiguity of the question about probability of harm. This was in the form of a statement: ‘some of my thoughts could have damaged the computer’. During testing, some children thought this was referring to damage which had just occurred to the computer, which they had just been reassured was not damaged. This interpretation would lead to low scores. It was also possible to interpret the statement as being about the possibility that their thoughts could, in theory, damage the computer.

This was the interpretation intended. Responses may also have been influenced by a ‘social desirability effect’ as children wanted to show the researcher that they had not damaged the computer. A number of children, while completing this question, stated out loud that they had not thought anything that could have harmed the computer. These difficulties mean the results for this question must be interpreted with caution.

A further difficulty with these measures is that it is hard to compare them to the 0–100 visual analogue scales used in experimental manipulations of thought-action fusion with adults. However, this disadvantage was considered to be outweighed by the suitability, demonstrated by previous studies, of this kind of measure for children.

4.5 Theoretical Interpretations of Research Findings

This section presents the implications of the research in terms of theory and clinical practice.

4.5.1 Implications for the role of thought-action fusion in OCD in childhood.

This study developed and used a new research paradigm and there were a number of methodological difficulties which make it difficult to interpret findings, particularly the non-significant findings.

4.5.1.2 Thought-action fusion and thought-control.

The experimental group showed significantly higher levels of thought-control with a t-test. There was also a significant correlation between thought-action fusion and thought-control in the whole group and the experimental group. Taken together, these results suggest that thought-action fusion beliefs caused thought-control. It is likely that the main form of thought-control would have been thought suppression, where children chose to think about particular things in order to avoid thoughts they were worried could be harmful and this was supported by children's spontaneous comments.

These results suggest that the role of thought-action fusion in OCD may apply to children.

Cognitive models of OCD suggest thought-control is an important maintenance factor in OCD for three reasons: (1) thought-control ends exposure to the thoughts, preventing dis-confirmation of beliefs about their significance and danger (Newth & Rachman, 2001; Rachman, 1997, Rachman & Hodgson, 1980); (2) it causes hypervigilance to thoughts and increases the salience of unwanted thoughts (Rachman, 1997; Salkovskis, 1998); (3) it may cause a paradoxical increase in intrusive thoughts (Salkovskis & Campbell, 1994; Wegner, 1994). Purdon and Clark (2000) have proposed that thought suppression is also problematic because it supports unhelpful meta-cognitive beliefs about the importance of thought-control, which are also associated with OCD (OCCWG, 1997).

Research has supported the role of thought suppression in OCD. Adults with OCD use thought suppression more than non-anxious controls (Amir, Cashman & Foa, 1997) and it is associated with OCD symptoms in non-clinical samples (Purdon, 1999; Rassin et al., 2000; Smári & Hólmsteinsson, 2001). Barrett and Farrell (2006) found a large and significant correlation between thought suppression and OCD symptoms in a clinical sample of children, adolescents and adults. In adolescents, thought suppression has been shown to have a large and significant correlation with worry (Gosselin et al., 2007). However, Gaskell, Wells and Calam (2001) found that thought-suppression did not result in increased intrusions in 7–11 year-olds and Barrett and Farrell found that children with OCD had significantly less thought suppression than adults. These results suggest that thought suppression is related to OCD in children, but may not be as important a factor as it is in adults.

The current study found that perceived responsibility did not mediate the relationship between induced thought-action fusion and thought-control and neither was this relationship affected by prior responsibility beliefs. These null results are consistent with Rachman's (2003) personal significance model of OCD and the metacognitive model of OCD (Wells & Matthews, 1994), which suggest that thought-action fusion can contribute directly to OCD symptoms. However, methodological problems with the timing and ambiguity of key measures, along with low levels of anxiety, mean that these null results cannot be interpreted. The opportunity for thought suppression before the final measures may also have decreased children's responsibility beliefs; this is discussed further in section 4.5.1.3.

4.5.1.3 Thought-action fusion and other OCD behaviours, cognitions and emotions.

Button-pressing, anxiety and beliefs about responsibility and probability of harm did not differ between groups and did not show a relationship with thought-action fusion. The methodological difficulties make these null results hard to interpret and there are a number of possible explanations.

It is possible that the significant association between thought-action fusion and thought-control may, in part, account for the absence of other significant results. Suppression or delay for 2 – 5 minutes following a thought-action fusion manipulation significantly reduces responsibility, anxiety and probability of harm estimates (Rachman et al., 1996; Rassin, 2001; van den Hout et al., 2001, 2002). Suppression may have a particularly strong effect on estimates of probability of harm. Rassin (2001) found that participants instructed to suppress thoughts had significantly lower estimates of probability of harm than did non-suppression participants after the same delay. In the current study, the risk of harm remained present during the last part of the task, which lasted one minute. For this reason, it was thought that having measures immediately afterwards would be appropriate. However, the salience of the risk may have declined over time and because of the suppression, so that no between groups differences were detected. Suppression may also have contributed to the low levels of button-pressing. Analyses showed that children who pressed the button were more likely to have done so in response to intrusive thoughts than ‘to be on the safe side’. A meta-analysis of studies of thought suppression (Abramowitz, Tolin, & Street, 2001) found that in the short term, suppression does reduce intrusive thoughts. Gaskell et al. (2001) found that children instructed to suppress reported fewer intrusions that a non-suppression group. In this study suppression may have resulted in fewer intrusions and hence lower levels of button-pressing.

A further possible explanation for the lack of significant results is that children from a non-clinical population are quite robust to the effects of thought-action fusion. Children of this age have stronger thought-action fusion beliefs and may be used to coping with these concerns. Thought-action fusion appears to cause thought suppression and suppression may have fewer negative consequences in younger children (see section 4.5.1.2). It is also the case that other OCD-related beliefs, such as responsibility, which may interact with thought-action fusion, seem to be at a lower level in children of this age (Reeves et al., 2010). However, developmentally, there may be a critical period beyond which point magical thinking or thought-action fusion becomes more unusual and also more associated with anxiety and associated disorders. If responsibility beliefs do mediate the relationship between thought-action fusion and OCD symptoms, developmental increases in these – and other OCD-related beliefs or strategies – may make thought-action fusion beliefs become more problematic.

A further likely contributor to the lack of significant results, and the low levels of button-pressing, are methodological difficulties, most of which worked against type 1 error. These include: (1) possible positive mood-induction effect of the task in the experimental group; (2) low anxiety levels; (3) timing of the measures; (4) ambiguity of the probability of harm measure and (5) reduced power.

4.5.2 Clinical implications.

The findings provide preliminary support for a link between thought-action fusion and thought-control in children. A causal relationship between thought-action fusion and other OCD behaviours and anxiety was not demonstrated but because this was a novel experimental task it is difficult to interpret the null result. Nonetheless, thought-control and excessive concern about the importance of controlling one's thoughts are both associated with OCD (OCCWG, 1997). If thought-action fusion beliefs cause children to use unhelpful thought-control strategies and support beliefs about the importance of thought-control, then it would make sense to measure children's thought-action fusion beliefs during OCD assessment. Particular attention could also be paid to how these might relate to beliefs about thought-control and thought-control strategies. Both these assessments could contribute to the development of a more thorough individual formulation.

An appropriate assessment tool might be the TAFQA, which was found to have a high internal consistency in the current study and significant correlations with anxiety and responsibility. Children in this study did not have difficulty understanding or completing this measure. However, in the current study, it had no significant relationship with the dependent variables, whereas a Likert scale measure of induced thought-action fusion, which was specifically related to the task, did. This suggests that, as well as measuring general thought-action fusion beliefs, it might be appropriate to develop individualised Likert scale measures of thought-action fusion based on a child's OCD-related thoughts, such as the measures used by Barrett and Healy (2003).

If children were found to have high levels of thought-action fusion, the results of this study supports the use of strategies to reduce thought-action fusion. In the adult literature, normalising information about intrusive thoughts, together with an educational message describing and challenging thought-action fusion beliefs, led to fewer OCD-related symptoms following a thought-action fusion manipulation compared to a control group (Zucker et al. 2002). If psycho-educational approaches were used with children, these could be adapted to be developmentally appropriate. Ronen (1997) suggests the use of concrete language, common metaphors and practical examples. Friedberg and McClure (2002) illustrate the use of cartoons, comic strips and games to support cognitive therapy techniques.

Rachman (2003) has advocated the use of behavioural experiments challenging thought-action fusion beliefs with adults. These can include behavioural experiments about positive thought-action fusion, for example asking participants to estimate how likely they would be to win the lottery if they thought hard about it for a week and then test this out. More anxiety-provoking experiments can also be used, for example predicting and then testing what will happen in terms of anxiety and outcome if the client thinks of an accident happening to the therapist, or a loved one. A hierarchy of increasingly anxiety- provoking thoughts could be developed and gradually tested out. March and Mulle (1998) emphasise the important of client control when developing a hierarchy, so that exposure does not feel like punishment. They suggest that a hierarchy can be developed by looking initially at situations where the child is able to resist OCD.

March and Mulle (1998) suggest the use of pie charts to evaluate risk factors which would contribute to a feared outcome. Children are encouraged to think of all the things that could potentially contribute to a feared event and give each a slice of a responsibility ‘pie’. This technique can help children to consider factors other than themselves or their thoughts which could cause a feared outcome.

If thought-action fusion is particularly likely to cause thought-control, this suggests that, in children with high levels of thought-action fusion, strategies designed to minimise thought-control might be especially important. Cognitive therapy with adults often includes a demonstration of the paradoxical effects of thought suppression, where the therapist can ask the patient ‘not to think of a white bear’ (Abramowitz, Franklin, & Cahill, 2003). This helps clients to realise that if they try not to experience a thought, they may experience it more. Mindfulness-based approaches to obsessional thought in OCD encourage the non-judgemental acceptance of obsessional thoughts and have been used in adults to reduce thought suppression (Hannan & Tolin, 2005). There is preliminary evidence that mindfulness techniques can be successfully adapted for use with children with anxiety (Semple, Lee & Miller, 2004; Semple, Reid & Miller, 2005).

Although individualised CBT strategies to target thought-action fusion and thought-control may be important and helpful, it is widely recognised that a family intervention component is an important part of therapy with children. March and Mulle (1998) emphasise the importance of family sessions and the gradual withdrawal of families from rituals. Barrett et al. (2004) developed a family-based CBT treatment based on March and Mulle, which involves parents in psycho-education, problem-solving skills and the development of strategies to reduce parental involvement in symptoms and encourage family support for home-based ERP. More research looking at how families could be involved in helping children use cognitive techniques would be important.

4.6 Implications for Future Research

There is a great deal of scope for research into thought-action fusion in OCD in children. Current research is relatively sparse (see Table 1). There has only been one experimental study of thought-action fusion with children and this has used older adolescents and adults (Rassin et al., 1999). This section considers the implications for future research, including ways to improve the current study and suggestions for other areas of investigation.

A key improvement to the current study would be a manipulation of thought-action fusion which provided 'evidence' to an experimental group that their thoughts could cause damage. This would more accurately represent the development of thought-action fusion beliefs in OCD (Shafran & Rachman, 1996; Tallis, 1994) as well as providing a more anxiety-provoking manipulation. During the initial part of the task as children in the experimental group see the pictures turn red, the computer could appear to 'crash'. The researcher could look concerned and inform children that he or she has been told the computer can be damaged by 'high energy thoughts'. The computer could be 're-started' and the final part of the task carried out as usual. Participants in the experimental group would have been exposed to direct evidence that the computer can be affected in a negative way by their thoughts. This more powerful manipulation is likely to be more anxiety provoking and avoid the positive mood-induction effect that may have been present in the current study. As a result it would probably be a more powerful test of the effects of thought-action fusion.

A further alteration could be to the timing of the measures. In the current study, anxiety was measured before the second part of the task was explained to children. It would be possible to also measure anxiety after the explanation. In the current study, the final measures took place after children were reassured there was no damage to the computer. It would be possible for the computer to appear to ‘re-start’ after the final part of the task. The researcher could make it clear that the computer needed to re-start before he or she could tell that no damage had been done. Children could complete measures during the ‘re-start’ and be reassured that the computer was undamaged immediately afterwards. These changes are designed to be more anxiety provoking, but the anxiety would be of very short duration – approximately 2 minutes. Piloting could be used to make sure that anxiety levels were not too high. The low anxiety levels in the current study suggest that this manipulation would not be too anxiety provoking.

The current study would also benefit from some changes to the measures. The ambiguous measure of probability of harm could be altered. Two measures of thought-control and probability of harm would also allow checks of internal consistency to be performed. Further measures, or questions, to establish more clearly the nature of the thought-control used by children could provide a more detailed understanding of the relationship between thought-action fusion and thought-control.

Future studies testing the relationship between thought-action fusion and responsibility would be useful. Reeves et al. (2001) successfully manipulated responsibility in children of this age group by giving different instructions before a sorting task. A similar manipulation could be used to build on the current study. Based on this, the experimental group could be split into a ‘low responsibility’ group and a ‘no responsibility manipulation’ group. The ‘low responsibility’ group could be told that if any damage did occur, it would be entirely the responsibility of the researcher and not the child. With careful piloting, a ‘high responsibility’ condition, along with the thought-action fusion manipulation, might also be possible.

Given the high levels of thought-control found in this study and the relationship between thought-action fusion and thought-control, further studies investigating cognitive processes of thought suppression in children would be important. Gaskell et al. (2001) found that children did not experience increased intrusions after suppression and Farrell and Barrett (2006) found that children with OCD displayed significantly less thought suppression than adults. A greater understanding of the effects of cognitive development on thought suppression and how this might relate to other beliefs like thought-action fusion would help to develop a cognitive conceptualisation of OCD in childhood.

4.7 Final Summary and Conclusions

Childhood OCD is more prevalent than has previously been thought (Heyman et al., 2001); it has a severe impact on social and academic functioning and typically continues into adulthood (Pauls et al., 1995; Piacentini et al., 2003). The role of cognitive factors in OCD in adults is well established and evidence suggests that many of these factors may also be relevant for children with OCD. Thought-action fusion is one of the beliefs associated with OCD in adults and children (Barrett & Healy, 2003, Libby et al., 2004). It may be of particular interest in understanding childhood OCD because beliefs about the power of thoughts and wishes are a part of normal development (Subbotsky, 2005). Current research suggests that, while responsibility beliefs may have less of a role in OCD in childhood than adulthood, thought-action fusion beliefs are comparable across the age range (Farrell & Barrett, 2006).

Different cognitive models of OCD suggest different roles for thought-action fusion beliefs. Rachman's (2003) personal significance model and Wells and Matthew's (1994) meta-cognitive model both suggest that thought-action fusion beliefs can directly contribute to the development and maintenance of OCD symptoms. In contrast, Salkovskis's inflated responsibility model (1985) suggests that thought-action fusion beliefs contribute to inflated responsibility which then causes OCD symptoms. There has been little experimental research investigating the causal relationship between thought-action fusion, inflated responsibility and obsessive-compulsive symptoms in children.

The current study investigated whether thought action fusion was causally related to obsessive-compulsive symptoms by experimentally manipulating thought-action fusion and examining the effects on a number of dependent variables. The manipulation was found to be successful, showing that thought-action fusion can be experimentally manipulated in children of this age range. A large and significant correlation was found between thought-action fusion and thought-control in the experimental group. The experimental group also showed significantly higher levels of thought-control with a t-test, but this has to be interpreted with caution because data was not normally distributed. Perceived responsibility did not differ between groups and did not mediate the relationship between thought-action fusion and thought-control. These findings suggest that thought-action fusion can cause thought-control and hence offer preliminary support for a causal role for thought-action fusion in OCD in children. However, a number of methodological limitations mean that the study can give little additional information about the relationship between thought-action fusion and responsibility beliefs and how this relates to obsessive-compulsive symptoms.

More broadly, this study provides support for the growing body of research which suggests that cognitive models developed to understand OCD in adults may also be important for childhood OCD. Thought-action fusion beliefs appear to be affected by cognitive development. This study found higher levels of thought-action fusion than have been found in a sample of 13–16 year-olds (Muris et al., 2001). Further research may help to identify differences in the way that cognitive models may apply to children compared to adults. A number of possibilities for further research have been suggested, in particular, experimental studies improving on the current study, as well as research looking at the role of thought suppression in OCD in children. The use of clinical as well as non-clinical samples would be particularly helpful.

The results suggest that cognitive assessment of thought-action fusion beliefs in children with OCD, as well as their relationship to thought-control strategies may be helpful. Techniques to address these beliefs in adults might also be helpful in children. It is too early to draw firm conclusions about the role of thought-action fusion in OCD in children, but the current study has provided a potentially useful method of research, as well as some preliminary evidence which suggests further research would be helpful.

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Appendix A

Power Calculation

The sample size was determined using an estimated effect size of 0.50, with power – the probability of correctly rejecting a false null hypothesis – at 80%. This gave a sample size of 100. The workings are shown below.

For power = 0.8, $\delta = 2.50$ for a one-tailed test:

$n = 2\,(\delta/d)^2$

$= 2(2.5/0.5)^2$

$= 50$

Therefore 50 participants are needed per group, giving a total of 100.

Appendix B

Information about Participating Schools from Ofsted Website

Primary School A (report dated 01/02/2008)

School A is a large primary school in an urban area of a city. At the date of the last Ofsted report, there were 343 pupils aged 3-11 at the school, including nursery classes. The proportion of pupils entitled to free school meals, the proportion of pupils identified as having learning difficulties and/or disabilities, the number of pupils from minority ethnic groups and those who speak English as an additional language are all above the national average.

Primary School B (report dated 08/06/2007)

School B is a village primary school, close to a large city. It is slightly smaller than average, with 217 pupils aged 4-11. Most pupils are from a White British background and no pupils speak English as an additional language. The proportion of pupils with learning difficulties and those eligible for free school meals is below average.

Primary School C (report dated 23/07/2010)

School C is a small village primary school close to a large city. It has 93 pupils aged 4-11. Most pupils are of White British heritage, few are eligible for free school meals and the proportion of pupils with special educational needs is average.

Primary School D (report dated 25/09/2007)

Primary School D is a small primary school in a medium-sized town. It has 108 pupils aged 4-11. Almost all pupils come from White British families and very few are eligible for free school meals. The proportion with learning difficulties and/or disabilities is above the national average.

Appendix C

Letter to Head Teachers

School of Medicine, Health Policy and Practice
Doctoral Programme in Clinical Psychology

University of East Anglia
Department of Clinical Psychology
Norwich
NR4 7TJ

Telephone
01603 456161
Fax
01603 458553
Email
a.sillence@uea.ac.uk

Date:

LETTER TO HEAD TEACHERS

Dear Head Teacher:

My name is Alison Sillence; I'm a trainee clinical psychologist in my third year of the Doctoral Programme in Clinical Psychology at the University of East Anglia. I am carrying out a research project with children as part of my training. The aim of the research is to examine children's 'magical thinking'.

Magical thinking refers to beliefs that defy scientific laws of causality, for example telepathy, or beliefs in the power of wishing. Many children go through a phase of magical thinking and then grow out of it. However, for some children, magical thinking becomes more of a problem and is associated with psychological difficulties like anxiety. Therefore, it is important that we find out more about it in normal children. Attached is an information sheet with more details about the study.

I am aiming to recruit 80 children aged 9-11 to take part in the research and am contacting head teachers in Cambridgeshire schools to see if they would like their school to take part. If you are interested I would like to come and meet you at your school to answer any questions you might have. If you agree to take part, the school would receive a £2 book voucher for each child who participates.

Participation in the study is completely voluntary. If you agree to your school's taking part , I would send parents full information about the study and ask for their consent to involve their child. I would also ask children for their assent. The study has been approved by the Faculty of Health Research Ethics Committee at UEA   I have an enhanced CRB check and am experienced in working with children and their families.

I hope you are interested in taking part. I will contact your secretary next week to follow up this letter. If you would like to contact me my e-mail address is a.sillence@uea.ac.uk. Alternatively, you can contact me or my supervisor Professor Shirley Reynolds at the School of Medicine, UEA, on the telephone number above.

Thank you for taking the time to read this letter. I look forward to speaking to you.

Your sincerely,

Alison Sillence
Trainee Clinical Psychologist

Appendix D
Information for Head Teachers

How Magical Thinking Develops in Children

Information Sheet for Head Teachers

What is this research about?

The aim of the research is to examine children's 'magical thinking'. Many children go through a phase of magical thinking and then grow out of it. However, for some children, magical thinking becomes more of a problem and is associated with psychological difficulties like anxiety; therefore it is important that we find out more about it in normally developing children.

We want to examine how asking children to 'think magically' about a computer task affects their thoughts, feelings and behaviours. We hope that the research will contribute towards our understanding of psychological difficulties in children and help us develop effective treatment.

We want to test our ideas with children aged between 9 and 11 years old, who have *not* been identified as having psychological difficulties.

What will children be doing?

If parents decide they would like their child to take part, I will meet each child at school and tell them about the study. If they want to take part, this is what would happen:

1. I would ask them to complete some short questionnaires about their current mood, their feelings and their magical thinking beliefs. This should take about 25 minutes and they can take a break when they want to.

2. Next, I would ask them to put on a helmet. I would show them some pictures on a computer screen and tell them that if they think hard enough, the helmet may be able to pick up their thoughts and change the pictures on the computer. In fact, the helmet cannot really pick up their thoughts, but it is important that they think it might be able to, so that they try hard to influence the computer.

Half the children would see the pictures changing on the computer and half would see the pictures stay the same. This means that half of the children would be encouraged to think that their thoughts can influence the computer. Children would allocated at random to one of these two groups.

3. Next, I would ask the child to keep the helmet on for another minute while I finished off another task. While they were waiting I would ask them to press a button on the keyboard if at any time they thought their thoughts might interfere with the experiment or damage the computer.

4. I would then ask them to take the helmet off and tell them that the computer is absolutely fine.

5. Finally, I would ask them about their thoughts and feelings about the task. This would take about 5 minutes.

6. At the end of the school day, I would explain to all the children who took part in the study that

they did not really influence the computer. I would tell them what the study was about and encourage them to ask questions and discuss it with each other and with me. To thank them for taking part, I would give them a reward, which would be a small toy.

How much will parents and children be told about the study?

Parents will be given full information about the study, explaining its purpose and what their child will be asked to do. They will be asked not to pass this information about the study to their child. Often, if parents tell their children, children can tell their friends and this could affect the outcome of the study.

Children will not be given all the information parents have about the study until after they have taken part. This is because the experiment would not work if children knew they could not really influence the computer.

Are there any risks to the children?
We are not aware of any risks arising from the task itself. However, some children might feel slightly disappointed when I tell them that they did not really influence the computer. To minimise this risk, I will explain that the helmet is very convincing and adults have also believed they can change the pictures. I will also explain that the experiment will help us to understand more about why some children feel anxious and how we can help them. They will then be given a small toy, to thank them for taking part.

Any child who is confused or upset will be spoken to individually and their teacher informed. During the experiment, if a child did become upset, the task would be stopped immediately. The child would be comforted and the reason for their distress would be discussed and their teacher would be notified.

If a child’s answers about their mood suggest that they might be experiencing psychological difficulties I would contact their parents and recommend that they contact their GP.

What are the potential benefits?
For schools, this is an opportunity to engage with the UEA and for children to take part in research. We hope that the results of the research will contribute to improving our understanding of psychological difficulties in children.

For every child that participates in the study, a £2 book voucher will be given to the school. I would be happy to visit the staff or parents at the school to talk about children's psychological problems and/or the results of our study.

Can parents and children change their minds?
Parents and children are free to withdraw from the research at any time, without giving a reason.

Who will have access to the results?
Data management will follow the Data Protection Act. Written records will be kept in a locked cupboard at the University of East Anglia. All children and parents will be identified by unique identity numbers. I will not keep any information that could identify individual parents or children to someone else. The research data will be password protected and available only to myself and my

UEA supervisor Professor Shirley Reynolds.

Who has reviewed the study?
The University of East Anglia Faculty of Health Research Ethics Committee has reviewed and approved this research project.

Who do I speak to if problems arise?
If there is a problem please let Alison Sillence (Trainee Clinical Psychologist) or Professor Shirley Reynolds (Chartered Clinical Psychologist) know. You can contact them at the following address:

School of Medicine, Health Policy and Practice
University of East Anglia
NORWICH
NR4 7TJ
Tel 01603 593310

Thank you for reading this.

Appendix E

Information for Parents/Guardians

Parent/Guardian Information Sheet

Hello, my name is Alison Sillence. I am a Trainee Clinical Psychologist studying at the University of East Anglia. I am CRB checked and have experience working with children. I would like to invite your child to take part in a research project. Please could you take time to read the following information to help you decide whether you would like your child to take part. If there is anything that is not clear, or if you would like more information please contact me on the number below, I'm very happy to talk to you. Thank you for reading this.

What is this project about?

Many children believe that their thoughts and wishes can have an effect in the real world, this is called 'magical thinking'. Children usually go through a phase of magical thinking and then grow out of it. However, for some children, magical thinking carries on for longer and is associated with anxiety. Anxiety is one of the most common psychological problems experienced by children and it can be very disabling. We hope that if we can understand more about how magical thinking works in normally developing children, this will contribute to our understanding of anxiety problems in children and help us develop effective treatments.

We want to test our ideas with children aged between 9 and 11 years old, who have *not* been identified as having psychological difficulties.

Your child has been asked to take part because your child's Primary School is helping with the research.

I'm interested, what should I do?

If you want to hear more about the project, please read on. *Please don't pass the information about the study on to your child, even if you decide you do not want them to take part*. This is because the project can only work if the children who take part do not know what we are looking for. At the end of the day, all every child who takes part will be told about the study.

What will my child be doing?

If you decide you would like your child to take part, I will meet them at school and tell them about the study. If they want to take part, this is what will happen:

1. I will arrange to see your child at school along with some of their classmates.

2. I will ask them to complete some simple questionnaires about their current mood, their feelings and their magical thinking beliefs. This should take about 25 minutes and they can take a break when they want to. I will go through these questions step by step so children understand what is asked of them and have support with their reading.

3. Next, I will ask your child to put on a helmet. I will show them some pictures on a computer screen. I will tell them that if they think hard enough, the helmet may be able to pick up their thoughts and change the pictures on the computer. In fact, the helmet cannot really pick up their thoughts, but it is important that they think it might be able to, so that they try hard to influence the computer.

Half the children will see the pictures changing on the computer and half will see the pictures stay the same. This means that half of the children will be encouraged to think that their thoughts can influence the computer. Each child will be randomly allocated to see the pictures change or to see them stay the same. This random allocation will happen on the day and I will not be able to influence it. After 2 minutes that part of the task is finished.

4. Next, I will ask your child to keep the helmet on for another minute while I finish off another task. While they are waiting I will ask them to press a button on the keyboard if at any time they think their thoughts might interfere with the experiment or damage the computer.

5. I will then ask them to take the helmet off and tell them that the computer is absolutely fine.

6. Finally, I will ask your child about their thoughts and feelings about the task using another simple questionnaire. This will take about 5 minutes

7. At the end of the school day, I will explain to all the children who took part in the study that they did not really influence the computer. I will tell them what the study was about and encourage them to ask questions and discuss it with each other and with me. To thank your child for taking part, we will give them a reward, which will be a small toy.

Are there any risks to my child?

Children who have done this task have enjoyed it and it is very unlikely that the task would upset your child . However, if your child did become upset, I would stop the task immediately. I would comfort them, talk about what upset them and if they remained upset I would let their teacher know.

Some children might feel slightly disappointed when I tell them that they did not really influence the computer. To minimise this risk, I will explain that the helmet is very convincing and adults have also believed they can change the pictures. I will also explain that the experiment will help us to understand more about why some children feel anxious and how we can help them. They will then be given a small toy, to thank them for taking part.

If your child’s answers about their mood suggest that they might be experiencing psychological difficulties I would contact you and recommend that you contact your GP.

What are the potential benefits?
This is an opportunity to get involved in research that could contribute to improving our understanding of psychological difficulties in children.

For every child that participates in the study, a £2 book voucher will be given to the school.

Will it affect my child’s care or education?
No, your child’s care or education will not be affected in any way. This research is being carried out with the permission and co-operation of your child’s school.

Can I change my mind?
Yes. It is up to you and your child to decide whether or not to take part. You are both free to withdraw from the research at any time, without giving a reason. Your decisions about this will not affect your child's education in any way..

Who will have access to the results?
Data management will follow the Data Protection Act. Written records will be kept in a locked cupboard at the University of East Anglia. All children and parents will be identified by unique identity numbers. I will not keep any information about your or your child that could identify you to someone else.

Who has reviewed the study?
The University of East Anglia Faculty of Health Research Ethics Committee has reviewed and approved this research project.

Who do I speak to if I have a question or if problems arise?
If there is a problem please let Alison Sillence (Trainee Clinical Psychologist) or Professor Shirley Reynolds (Professor of Clinical Psychology) know. You can contact them at the following address:

School of Medicine, Health Policy and Practice
University of East Anglia
NORWICH
NR4 7TJ
Tel 01603 593310

OK, I want to take part – what do I do next?
If you and your child would like to take part, please fill in the information sheet about your child and the consent form that are both enclosed and return them to the school office in the envelope provided. Your child can only take part if you return these forms to the school office by Friday 2nd July.

Even if you do not want to take part in the study please do not pass this information about the study to your child. Often, if parents tell their children, children can tell their friends and this will effect the outcome of the study.

Please contact me if you have any questions. I hope you are happy for your child to take part, thank you.

Appendix F

Demographic Questionnaire

Participant Identification Number:

DEMOGRAPHIC QUESTIONNAIRE

Title of Project: How Magical Thinking Develops in Children

Name of Researcher: Alison Sillence, Trainee Clinical Psychologist.

Please complete the following information about your child by circling the appropriate response. Please return this questionnaire in the envelope provided with the consent form if you are willing for your child to participate in the research.

1. Is your child a girl or boy Boy / Girl

2. How old is your child ____ years

3. How would you describe your child's ethnic group? (you can leave this blank if you do not want to give the information)

4. Is your child colour blind? Yes / No

(We ask this as the task involves looking at coloured pictures)

5. Does your child have epilepsy? Yes / No

(We ask because this task involves images changing on a computer screen)

Please return this with the consent form in the envelope provided to the school office.

Thank you for your help.

Appendix G

Parent/Guardian Consent Form

Participant Identification Number:

PARENT/GUARDIAN CONSENT FORM

Title of Project: How Magical Thinking Develops in Children

Name of Researcher: Alison Sillence, Trainee Clinical Psychologist.

Please initial box

1. I confirm that I have read and understood the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐

2. I understand that my child's participation is voluntary and that I am free to withdraw my child at any time without giving any reason and without my child's medical care or legal rights being affected. ☐

3. I understand that my child will not be given complete information about the study until after they have taken part. ☐

4. I agree that my child may take part in the above study. ☐

Please complete the following:

______________________	________________	______________________
Name of Child	Child's Date of Birth	Name of School and class
______________________	______________	______________________
Name of Parent / Guardian	Date	Signature

Thank you for your help.

Please return this consent form to the school office in the envelope provided.

Office use only

_____________________	_______________	______________________
Name of Researcher	Date	Signature

Appendix H

Information for Children

Information for children

My name is Alison. I am doing a research project and I would like to invite you to take part. You can choose if you want to take part. Before you choose I would like you to read this information. You can ask me as many questions as you like .

What is research? Why is this project being done?

Research tries to find out the answers to questions. In this project, I will be asking children to put on a special helmet and try to change some pictures on a computer. I want to see how you go about doing this and how you feel about the task.

Why have I been asked to take part?

This project is interested in children aged between 9 and 11 years old, which is why you have been asked to take part.

What would I have to do?

If you and your parents/guardians choose that you would like to take part, this is what will happen:

- I will come and see you at school
- I will ask you some questions about your feelings
- You will complete a task on the computer. This is not difficult and should be fun.
- I will ask you some more questions about your feelings after the task
- All these parts together should take less than an hour.

Do I have to take part?

You do not have to take part in this project and you can change your mind at any time, without giving a reason.

Who will know what I said?

Only people involved in the project will know what you say. If you tell me something that is worrying you then I might share it with your parents or guardians.

Appendix I

Tinting of Images Shown to Experimental Group

1) baseline mean tint: 10%

2) Baseline tint SD: 17%

3) Max tint mean: 100%

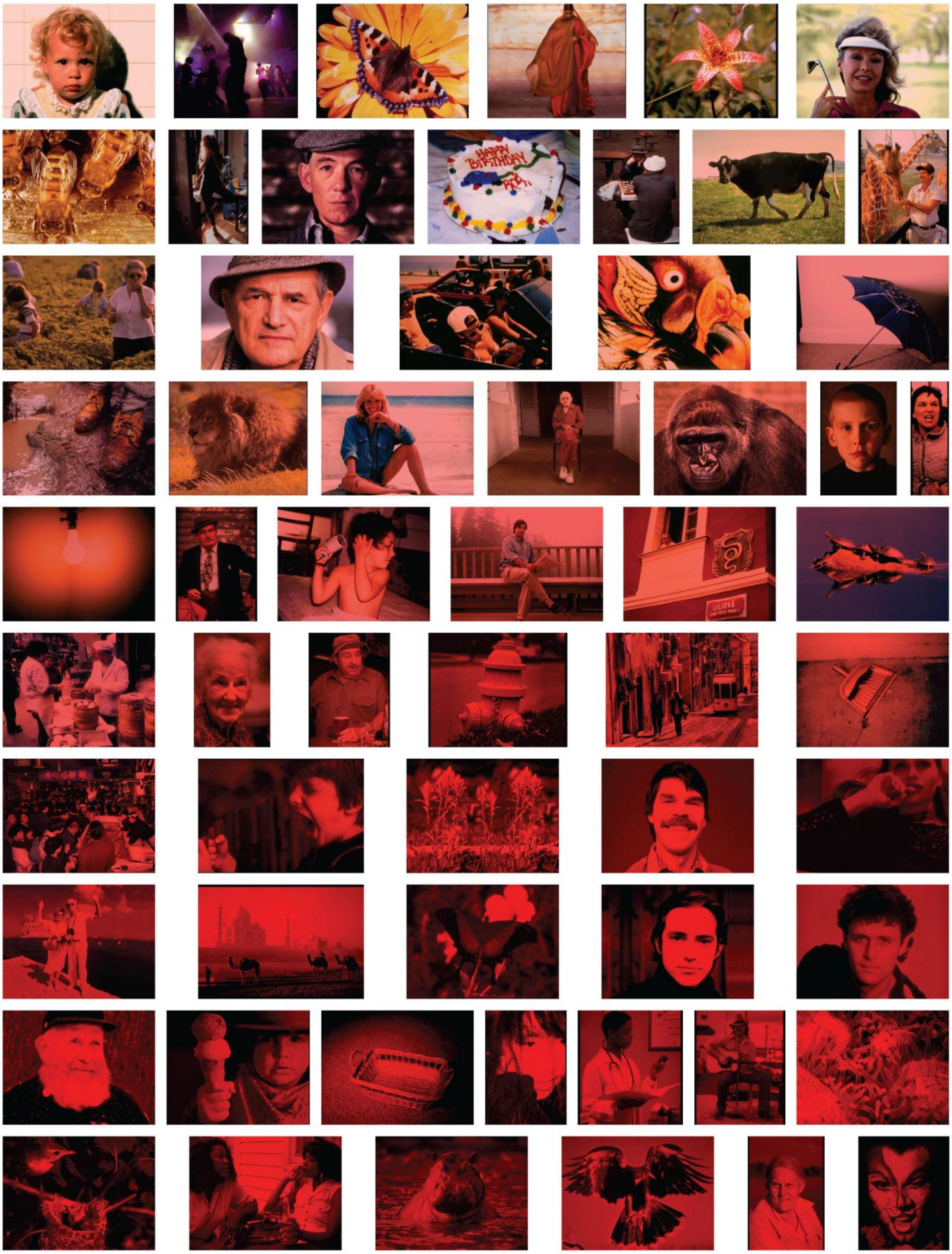
4) Max tint SD: 20%

5) tinting increased after 3 images

6) tinting reaches its maximum after 45 images

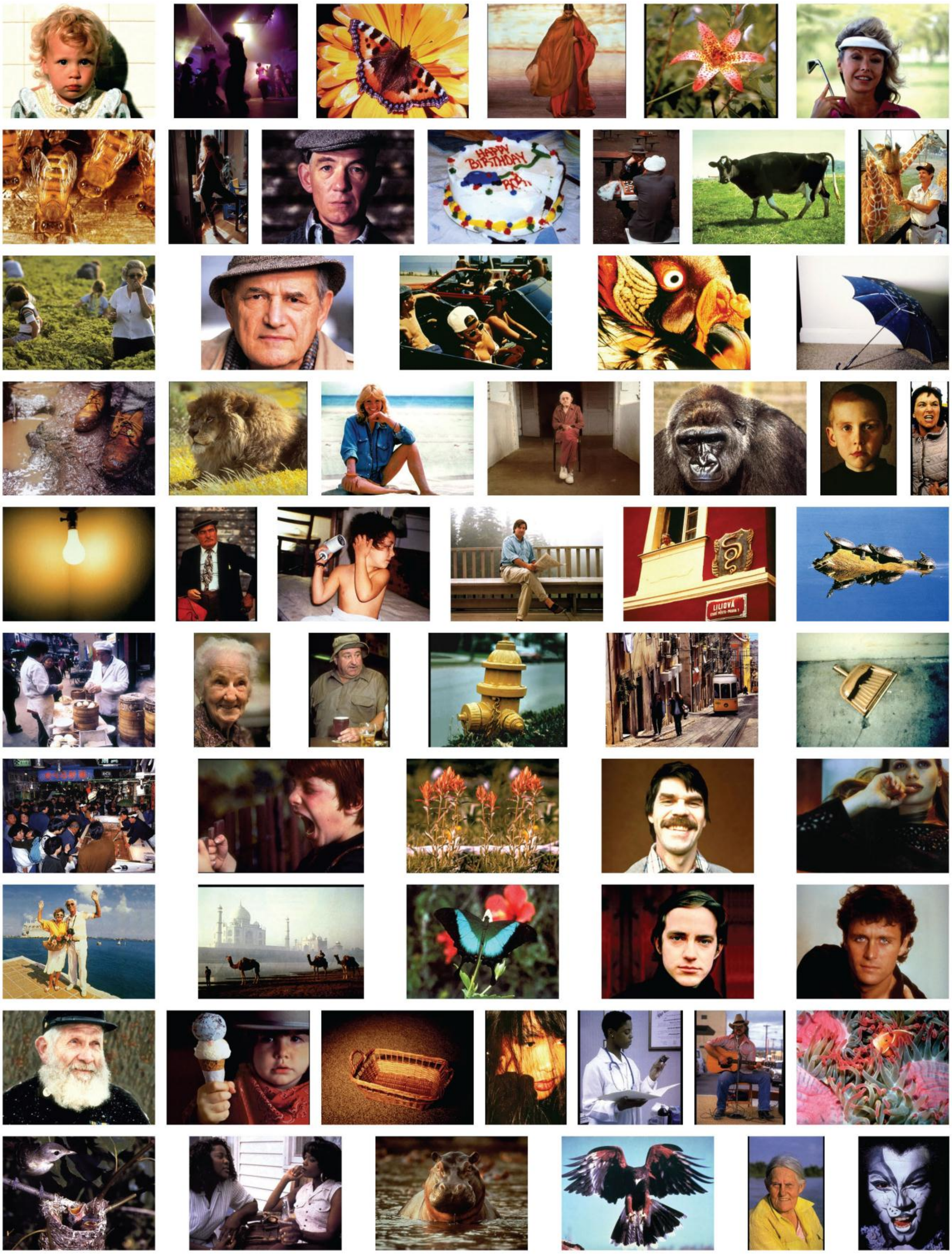
Appendix J

Images Shown to Experimental Group



Appendix K

Images shown to control group



Appendix L

Ethics Approval Letters

Faculty of Health Research Ethics Committee

University of East Anglia

Mrs Alison Sillence
30 Great Eastern Street
Cambridge
CB1 3AD

Research Office, Room 1.04
Chancellor's Drive Annexe
University of East Anglia
Norwich NR4 7TJ
United Kingdom

Email: margaret.rhodes@uea.ac.uk
Direct Dial: +44 (0) 1603 59 7190
Research: +44 (0) 1603 59 1720
Fax: +44 (0) 1603 59 1132

Web: http://www.uea.ac.uk

5th March 2010

Dear Alison

An experimental manipulation of thought-action fusion in children – Reference 2009-001

The amendments to your above proposal have now been considered by the Chair of the FOH Ethics Committee and we can now confirm that your proposal has been approved.

Please could you ensure that any amendments to either the protocol or documents submitted are notified to us in advance and also that any adverse events which occur during your project are reported to the committee. Please could you also arrange to send us a report once your project is completed.

The committee would like to wish you good luck with your project.

Yours sincerely,

Maggie Rhodes
Research Administrator

Faculty of Health Research Ethics Committee

Faculty of Health Research Office
Elizabeth Fry Building, Room 2.30
University of East Anglia
Norwich NR4 7TJ

Email: margaret.rhodes@uea.ac.uk
Direct Dial: +44 (0) 1603 59 7190
Research: +44 (0) 1603 59 1720
Fax: +44 (0) 1603 59 1132

Web: http://www.uea.ac.uk

Mrs Alison Sillence
30 Great Eastern Street
Cambridge
CB1 3AD

18th June 2010

Dear Alison

An experimental manipulation of thought-action fusion in children – Reference 2009-001

The amendments to your above proposal have now been considered by the Chair of the FOH Ethics Committee and we can now confirm that your proposal has been approved.

Please could you ensure that any amendments to either the protocol or documents submitted are notified to us in advance and also that any adverse events which occur during your project are reported to the committee. Please could you also arrange to send us a report once your project is completed.

Yours sincerely

Maggie Rhodes
Research Administrator

Appendix M

Procedure for Children Scoring Above Cut-Off on the MASC-10:

The same procedure was followed, with the following exceptions, so that the experiment did not induce anxiety:

- Children were told that it is very unlikely they would be able to influence the computer because the design is in the very early stages.
- They were put in the control group, and shown unaltered images..
- When they had finished this part, they did not complete the final part and were not told that their thoughts could damage the computer.
- They were thanked and asked to complete the measures as usual, where relevant.

Appendix N
Letter for Parents of Anxious Child

UEA NORWICH
University of East Anglia
Norwich NR4 7TJ England

Telephone
01603 593310
Fax
01603 591132

Date

Dear Mr/Mrs,

Thank you once again for agreeing to take part in my study. As you know, when I met with (name of child), s/he completed some questionnaires. One of these asked about his/her fears and worries. (name of child) reported that s/he was worried about more things than most children of his/her age. Sometimes the questions are not very accurate for a particular child or the fears they report are short-lived. However if you are concerned about (name of child), you might find it useful to talk to your GP or his/her teacher.

Thank you again for your help and please get in touch with me if you have any questions about this letter or the study.

Yours sincerely,

Alison Sillence
Trainee Clinical Psychologist

Supervised by:

Prof Shirley Reynolds	Prof Malcolm Adams
Professor of Clinical Psychology	Professor of Clinical Psychology

Appendix O

Responsibility Attitude Scale

Participant identification number*:*

This questionnaire lists beliefs which people sometimes have. Read each statement carefully and decide how much you agree or disagree with it.

For each of the beliefs, put a circle round the words which **BEST DESCRIBE HOW YOU THINK**. Choose only one answer for each attitude. Because people are different, there are no right or wrong answers.

To decide whether a given attitude is like your way of looking at things, simply keep in mind what you are like **MOST OF THE TIME**.

1. I often feel responsible for things that go wrong.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

2. If I think bad things, this is as bad as <u>doing</u> bad things.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

3. I worry a lot about what might happen because of things that I do or don't do.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

4. Not stopping bad things happening is as bad as making them happen.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

5. I should always try to stop harm happening, when I have thought it might.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

6. I must always think through what might happen as a result of even the smallest things I do.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

7. I often take responsibility for things which other people don't think are my fault.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

8. Everything I do can cause serious problems.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

9. There are often times when I nearly cause harm

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

10. I must protect others from harm.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

11. I should never cause even the smallest amount of harm to others.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

12. People will think very badly of me because of my actions.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

13. I must try to stop bad things from happening, if there is any chance that what I do might make a difference.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

14. Doing nothing when bad things might happen is the same as making it happen.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

15. You should never be careless, when what you do might affect someone else.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

16. If I do nothing that can cause as much harm as doing something bad.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

17. I can’t forgive myself, once I think it is possible that I have caused harm.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

18. Lots of things I have done, have been meant to prevent harm to others.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

19. If I am careful enough then I can prevent any harmful accidents.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

20. I often think that bad things will happen if I am not careful enough.

TOTALLY AGREE	AGREE VERY MUCH	AGREE SLIGHTLY	NEUTRAL	DISAGREE SLIGHTLY	DISAGREE VERY MUCH	TOTALLY DISAGREE

Appendix P

Thought Action Fusion Questionnaire

Each question describes a situation and has a sentence that you might or might not agree with. Read each sentence carefully and DECIDE HOW MUCH YOU AGREE OR DISAGREE with it.

Put a circle round the words which **BEST DESCRIBE HOW YOU THINK**. Choose only one answer for each attitude. Because people are different, there are no right or wrong answers.

1. You are with a friend. Suddenly without any reason you think that your friend is a stupid person

Having this thought is almost as bad as really saying to your friend that he is stupid.

not at all true **somewhat true** **rather true** **very true**

2. Suddenly without any reason you have the thought that you are dying.

Having this thought increases the chance that you really are going to die.

not at all true **somewhat true** **rather true** **very true**

3. You are alone in a church standing in front of a large statue of Jesus. Suddenly you have the thought of spitting on the statue.

Having this thought is almost as bad as spitting on the statue.

not at all true **somewhat true** **rather true** **very true**

4. Suddenly without any reason you have the thought that your father loses his job and that there are money problems at home.

Having this thought increases the chance that your father really will lose his job.

not at all true **somewhat true** **rather true** **very true**

5. You meet a classmate. Suddenly without any reason you think of a nasty name for this person.

Having this thought is almost as bad as calling this person a nasty name.

not at all true **somewhat true** **rather true** **very true**

6. Suddenly without any reason you have the thought that you are hit by a car.

Having this thought increases the chance that you really will be hit by a car.

not at all true **somewhat true** **rather true** **very true**

7. You are sitting in the classroom. All your classmates are quietly working. Suddenly you have the thought of shouting at the top of your voice.

Having this thought is almost as bad as really shouting at the top of your voice in the silent class.

not at all true **somewhat true** **rather true** **very true**

8. Suddenly without any reason you have the thought that you will fall seriously ill.

Having this thought increases the chance that you really will fall seriously ill.

not at all true **somewhat true** **rather true** **very true**

9. In a silent street, you meet a younger child. Suddenly without any reason you think of pushing the child down.

Having this thought is almost as bad as really pushing the child down.

not at all true **somewhat true** **rather true** **very true**

10. Suddenly without any reason you have the thought of your father being in a car accident.

Having this thought increases the chance that your father really will have a car accident.

not at all true **somewhat true** **rather true** **very true**

11. You walk on the street and meet an unfamiliar person. Suddenly you have the thought of making a rude gesture to this person.

Having this thought is almost as bad as really making the rude gesture to this person.

not at all true **somewhat true** **rather true** **very true**

12. Suddenly without any reason you have the thought that your mother is dying.

Having this thought increases the chance that your mother really is going to die sometime soon.

not at all true **somewhat true** **rather true** **very true**

13. You have heard that the parents of one of your classmates are getting a divorce. Suddenly you have the thought of teasing the classmate with this information.

Having this thought is almost as bad as really teasing your classmate with this information.

not at all true **somewhat true** **rather true** **very true**

14. Suddenly without any reason you have the thought that you have to repeat a year at school.

Having this thought increases the chance that you really will repeat a year.

not at all true **somewhat true** **rather true** **very true**

15. You come across the purse of your mother. Suddenly you have the thought of stealing some money from the purse.

Having this thought is almost as bad as really stealing money from the purse.

not at all true **somewhat true** **rather true** **very true**

Appendix Q

Visual-Analogue Anxiety Measure

Appendix R

Induced Thought-Action Fusion and Responsibility Measure

What did you think?

I am interested in how you feel and what you think about the task you just finished. Please read the following statements carefully and circle the number that shows how much you agree or disagree with the statements.

	Completely disagree	**Mostly disagree**	**Not sure if I agree or disagree**	**Mostly agree**	**Completely agree**
1. I was able to make the pictures redder	0	1	2	3	4
2. I found it easy to make the pictures redder	0	1	2	3	4
3. I am confident I influenced the computer with my thoughts	0	1	2	3	4
4. Some of my thoughts could have damaged the computer	0	1	2	3	4
5. If the computer had been damaged it would have been really bad	0	1	2	3	4
6. If the computer had been	0	1	2	3	4

damaged it would have been my fault					
7. If the computer had been damaged it would have been because of my thoughts	0	1	2	3	4
8. I tried to control my thoughts to avoid damaging the computer	0	1	2	3	4
9. I pressed the button only when I had a thought that could damage the computer	0	1	2	3	4
10. I pressed the button just to be on the safe side	0	1	2	3	4

Appendix S

Task Instructions

1. Tell the child:

"I'd like you to help with an experiment that I'm doing. I'm asking children to put on a special helmet, think hard about the colour red and try to change some pictures on the computer screen. I want to find out how well the helmet works and what you think about the task".

"Before you do the task, I'll be asking you some questions about your thoughts and feelings. It's not like a test, because there are no right or wrong answers; I just want to know what you think. I won't be telling your teachers or your mum or dad about your answers, they are just for my project."

2. Give the child the information sheet to read or read this out loud to them.

3. Ask the child:

"Are there any questions you'd like to ask me?"

4. If they are happy to participate give them the assent form to complete and give each child their participant number.

5. Tell the child:

"*Before you do the experiment with the helmet, I'd like you to answer some questions about your thoughts and feelings. We can go through these together."*

Give each child the MASC-10, RAS and TAFQA.

6. If in a group, decide which child will do the experiment first and ask the other children to return to their class.

7. Ask the child to put the helmet on and sit in front of the computer. Put in child's age, gender and participant number. Click ‘next’.

8. Tell the child:

“*First of all, the computer is asking you how you are feeling. Some children feel a bit nervous and anxious; if that's how you feel you can use the mouse to drag the bar this way [point to screen]. Some children feel quite calm and steady and if that's you, you can drag the bar this way [point to screen]"* Click Next.

9. Tell the child:

“*You are going to see a series of pictures come up on the screen one after another. Think hard about the colour red; try to visualise it in your mind. The computer will try to pick up on what you're thinking and begin to turn the pictures red. It won't work straight away, because the computer needs time to tune in and it doesn't always work so don't be disappointed. Just try your hardest. If you want to stop, for any reason, that's fine - just call my name or hold up this ‘STOP’ card. When the computer's finished, let me know. When you're ready to begin click ‘next'*.”

10. Child lets researcher know they have finished.

11. Tell the child:

“*Now the computer is asking you about how you are feeling again. If you feel a bit jittery or nervous, you can drag the bar this way, and if you feel quite calm and steady, you can drag it this way* [point to screen].”

12. Tell the child:

"*Now the computer needs to take some background readings. You don't have to think about anything in particular, but if the computer is sensitive to your thoughts, it can be damaged by surges of energy and the equipment is very expensive. When I click 'next' you will see a big button that says 'disconnect'. If you have a thought you're worried might damage the computer, please press the disconnect button. You can press it every time you have a thought you are worried might damage the computer. This part takes about a minute, so let me know when it's finished, or if you want to stop let me know or hold up the 'STOP' card."*

13. Child lets researcher know they have finished.

14. Tell the child:

"*Now the computer is asking you about how you are feeling one more time. If you feel a bit jittery or nervous, you can drag the bar this way, and if you feel quite calm and steady, you can drag it this way* [point to screen]."

15. Tell the child:

"*Now I have some questions to ask you, so I can find out what you thought about the experiment. There are no right or wrong answers, I just want to know what you thought."*

Give the child the questionnaire including measures of: induced thought-action fusion, probability of harm, responsibility, severity of harm, thought-control and reasons for button-pressing.

16. Tell child:

"Thank you for helping me, you've done a brilliant job! I'm going to ask [name next child] to have a turn now. When everyone who is helping me today has taken part, I'm going to call you back in your

group so you can choose your thank-you present and I can tell you a bit more about the experiment.”

Appendix T

Debriefing for Children

Children were debriefed in their groups, one group after another. This was so that the researcher could assess each child's reaction to the debrief and because it was expected that children will feel more confident to ask questions in a smaller group.

1. Show children the bag of presents and ask each child to choose one item.

2. Tell the child or children:

- Because I was doing science, I told you something that was not quite true. I told you that if you thought red, you might be able to make the pictures on the computer more red.
- In fact, the helmet I asked you to wear was just pretend. Electricity in our heads can't get into the wires in the computer, so our brainwaves cannot change the pictures on the screen.
- For some of you, I changed the pictures on the computer so that they were more red, but this was not affected at all by your thoughts, the computer just showed you a different set of pictures. Some of you saw the pictures made more red, and some of you saw pictures that weren't changed.
- There are very very expensive computers, costing hundreds of thousands of pounds, in a few laboratories in the world which can pick up electricity in our heads, but they are very special computers, built by scientists. None of the computers you can buy in the shops can do this and none of your computers at home will be able to.
- Why did I do that? I did it because sometimes, people believe their thoughts can change things in the world and make things happen and this can make some people feel worried and upset. I wanted to understand a bit better what happens when people think their thoughts can change things. I hope that this knowledge will help us understand better how to help people

who feel upset and worried.

- You have really helped me by doing the study today and I'm very grateful.
- Do you want to ask any questions?
- Sometimes people can feel a bit cross or disappointed when they find the helmet isn't real, does anyone feel that way?

3. If more children at this school are to be tested:

- I'm coming back again tomorrow so that some more children can have a turn. For this to work, it’s really important that they try hard to change the pictures and think that they might be able to. Do you think you can help me by keeping the secret until [name day] and not telling anyone else that the helmet is just pretend?

Appendix U

Demographic Data and Comparisons on Independent Measures for Participants who Completed the Thought-Control Question

Demographic Data for Participants who completed the thought-control measure

The demographic characteristics of the sample and each of the experimental groups was explored. Table U1 shows the gender distribution of the whole sample and each of the experimental groups for those children who completed the thought-control question.

Table U1

Frequency of Males and Females for Participants Who Completed the Thought-Control Question

	N	Males	Females
Whole sample	67	27	40
Experimental group	35	14	21
Control group	32	13	19

The mean age of participants was 122 months (10 years 2 months; SD = 9.92 months) and the range was 9 years 0 months to 11 years 10 months (Table U2). The mean age in both groups was not significantly different.

Table U2

Mean Age in Groups for Participants who Completed the Thought-Control Question

	N	Mean age (months)	SD
Whole sample	67	122.1	10.02
Experimental group	35	122.6	9.75
Control group	32	121.6	10.45

Comparisons between Experimental and Control Groups on Age, Gender and Independent Variable Measures for Participants who completed the Thought-Control Question

Participants were matched across the groups on age and gender, however, data from some participants could not be included, so it was important to check that the matching had been successful and the groups did not differ on age or gender. Participants were not matched across the groups on anxiety, responsibility beliefs or prior thought-action fusion beliefs, so it was important to determine whether they differed significantly on any of these variables. If there were significant differences, these would have to be covaried out in further analyses, to ensure differences in the groups were due to experimental manipulation, rather than pre-existing differences.

Age, TAFQA , morality subscale of the TAFQA, likelihood subscale of the TAFQA, RAS and MASC-10 were compared using a MANOVA (Table U3). MANOVA was used to reduce Type 1 error and to maximise power (Field, 2005). Cases were excluded listwise, and there was missing data for one participant. Therefore the total number in the analysis was 66. The variables met the assumptions of MANOVA as outlined by Field (2005). The data were randomly sample and normally distributed. Initial Levene's tests for homogeneity of variance were non-significant, indicating that the assumption of univariate normality was met. Box's test indicated that the covariance matrices were not significantly different in each group, $F(21, 14586) = 1.025$, $p=0.43$; therefore the assumption of homogeneity of covariance matrices was also met.

The MANOVA was not significant: $F(6,59) = 0.036$, $p=1.000$. Therefore the groups did not differ at baseline on the key variables.

Table U3

Descriptive Data, F Values and p Values for the Independent Variables for Participants who Completed Thought-Control Question

	Experimental Group		Control Group		F*	P
	Mean	SD	Mean	SD		
Age (months)	122.57	9.75	121.58	10.61	0.156	0.694
MASC-10	11.11	5.64	10.97	5.29	0.012	0.914

	Experimental Group		Control Group		F*	P
	Mean	SD	Mean	SD		
RAS	66.74	13.45	66.16	16.05	0.026	0.873
TAFQA	31.14	8.41	31.10	8.49	0.000	0.982
TAFQA - likelihood[1]	2.42	0.91	2.46	0.85	0.043	0.837
TAFQA – moral	18.49	5.35	18.32	5.46	0.015	0.903
VAS 1					0.008	0.931

Note. N = 66
*df(1, 65).
[1]This variable has been transformed

Pre-task anxiety on the visual analogue scale was not normally distributed. A non-parametric Mann-Whitney test showed no significant difference between the groups (U=556.5, p=0.96).