

**Attentional Biases in Children's Anxiety:  
The Role of Executive Control**

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## Overview

The construct of 'Effortful Control' relates to the efficiency of executive attention. It is the self-regulatory aspect of temperament which involves the ability to inhibit a dominant response and activate a subdominant response. The literature review explores evidence for the link between anxiety in children and attentional biases to threat, and whether this can be explained in terms of individual differences in effortful / executive control. The empirical paper presents a study using a multi-informant methodology carried out on a normative population of nine to eleven year old school children. It employs questionnaire and computerised measures of effortful control and anxiety. The results provide evidence for a weak attentional bias effect in anxious children to angry faces linked to difficulties with disengagement of attention. Unexpectedly, no significant interactions were found between effortful control and anxiety in relation to the anger disengagement effect. However, there were significant effects for self-reported aggression, teacher reported externalising problems, and IQ on the anger disengagement effect. The critical appraisal highlights some of the limitations of the study, explores some of the clinical implications of the research, and suggests some ideas for the direction of future investigations into attention and anxiety in children.

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## **Paper 1: Literature Review**

**Attentional Biases in Children's Anxiety:**

**The Role of Executive Control**

## **Abstract**

This paper reviews research that has investigated the link between anxiety in children and attentional biases to threat and considers whether attentional biases can be understood in terms of individual differences in effortful / executive control. Consideration is given to how attentional biases operate, and to how anxiety could be linked to specific difficulties with the disengagement of attention. The paper reviews in detail recent theorising by Lonigan and Phillips (2001) who have specifically argued that attentional biases in anxiety reflect the joint effect of temperamental neuroticism and poor attentional/effortful control. Evidence is presented from adult studies and from indirect studies of effortful control and internalising disorders in children, which lends broad support to this theory. Following this, the review considers the association between effortful control and anxiety in children. It concludes by examining the sparse available research which has examined the role of cognitive processes in children with anxiety from a more direct neuropsychological perspective. This research provides some evidence that anxiety disorders in children may be associated with difficulties with attentional control. However, there is so little existing neuropsychological research on attention in children with anxiety disorders, that this link must remain tentative at present.

## **Attentional Biases in Children's Anxiety: The Role of Executive Control**

It has only been in the past quarter century that researchers have become particularly interested in the development of childhood anxiety disorders. Before this time there was something of an absence of research in the area, largely due to the general overshadowing of internalising disorders by the more overt challenges presented by children with externalising problems (Vasey & Dadds, 2001). The relatively small amount of research that has been carried out on childhood anxiety disorders is surprising given that they include some of the most prevalent forms of psychopathology affecting children today (Anderson, Williams, McGee & Silva, 1987), with prevalence rates estimated to range between 5.7% and 17.7% (Costello & Angold, 1995). They are known to have a significant impact on a child's level of functioning (Last, Hanson & Franco, 1997), and place them at greater risk of wider psychopathology such as depression (Cole, Peeke, Martin, Truglio, & Seroczynski, 1998). Moreover, many adult anxiety disorders have a clear childhood onset (Burke, Burke, Reiger & Rae, 1990). Estimates from the Burden of Disease Project (Murray & Lopez, 1996) suggest that anxiety disorders represent one of the most significant health problems in terms of global burden of disease, exceeding the vast majority of physical health problems. Evidence also exists indicating that sub-clinical manifestations of anxiety disorders are prevalent among 'normal' children and adolescents. One study showed that symptoms of generalised anxiety disorder, separation anxiety and specific phobias were found in a considerable proportion (20-30%) of young people who had no psychiatric history at all (Bell-Dolan, Last and Strauss, 1990).

Increasing awareness of the prevalence of anxiety and its impact on society has triggered a renewed interest in the area. Ongoing research is still much needed if current understandings of the factors involved in the aetiology and maintenance of anxiety in childhood are to be advanced. It is only through this research that more effective interventions can be developed to help treat children suffering from anxiety and other co-morbid conditions.

### *Outline of the Review*

The focus of this review is on the development of anxiety in childhood in relation to attentional biases towards threat. Particular consideration is given to the role that effortful/executive control could play within this. The review begins by exploring the cognitive processes involved in anxiety and at how attentional biases operate in children. A focus is given to dot-probe studies in relation to this, as they appear to offer the most reliable measure of attentional bias. Following this, consideration is given to the possibility that anxiety might be linked to specific difficulties with the disengagement of attention, in contrast to the more established view of attentional biases as resulting from hyper-vigilance to threat.

Disengagement of attention has been linked to difficulties with executive control. Lonigan and Phillips (2001) have proposed that difficulties with the control and regulation of temperamental dispositions to anxiety may be critical to the development of attentional biases, which ultimately give rise to and maintain chronic anxiety states. Their theory, which implicates cognitive control processes as essential elements in models of anxiety, will be reviewed in detail and examined in the light of available evidence. Two main sources of evidence will be considered: 1) studies in adult

populations of cognitive control skills and biases in attention in relation to anxiety symptoms and 2) studies examining the relationship between cognitive or 'effortful' control in children and emotional and behavioural problems, particularly anxiety. It will be argued that despite limited evidence about the role of effortful control in children's anxiety-related biases in attention, evidence from both adult studies and from indirect studies of effortful control and internalising disorders in children, lend broad support to Lonigan and Phillip's (2001) proposal.

The review concludes by considering the real need to examine anxiety and attention much more directly from a neuropsychological perspective, and highlights the few studies to date which have attempted to do this. The need for more direct assessment is placed in the context of the considerable problem that exists in the research to date, namely the tendency to rely exclusively on less precise questionnaire measures of the constructs involved, and the concerns this naturally raises as to the level of confidence that can be placed in the findings.

## **The Cognitive Understanding of Anxiety**

Anxiety is an emotion that has been described as an “unpleasant feeling of fear and apprehension, accompanied by increased physiological arousal and avoidance behaviour” (Neale, Davidson & Haaga, 1996). Cognitive theories of anxiety emphasise the mechanisms involved in the processing of information, and the role of cognitions in the development and maintenance of anxiety states. Information processing biases are seen as central to the development and maintenance of anxiety disorders. Cognitive theorists see anxious individuals as being hypersensitive to real or perceived danger, and therefore vulnerable to developing clinical levels of anxiety. They believe that in anxious individuals, attention is readily drawn to stimuli that suggest possible harm or danger (MacLeod, Mathews & Tata, 1986).

Beck (1976) originally proposed that dysfunctional beliefs and schemata about threat or danger are central to anxiety disorders. He believed that schemata types differ amongst people and that vulnerability to emotional disorders like anxiety lies in the operation of these schemata. In his conceptualisation, anxious individuals have ‘hyperactive danger-schemata’ and this results in increased attention to external threat cues, a tendency to interpret ambiguous information in a threatening way, and an increased likelihood of recalling dangerous experiences. Hertel (2002) argues that an emphasis on attention in cognitive processing is essential for understanding cognitive styles in anxiety. This is because a ‘selective focus’ of attention on sources of threat determines performance in tasks across the spectrum of perceiving, interpreting and remembering.

Models of anxiety in childhood have traditionally been understood in terms of Crick and Dodge’s (1994) information processing approach which fits comfortably with

cognitive theories of adult anxiety. These theorists emphasise the interdependence of cognition and emotion, where emotions have a key role in strengthening or disrupting the efficiency of information processing (Vasey, Daleiden, Williams, & Brown, 1995). Their framework is highly consistent with adult anxiety theories in proposing that anxious children are more sensitive to threat cues, and this sensitivity is seen as being responsible for the generation of anxiety and fear-related behaviours. Their model highlights that, as with adults, anxious children are likely to show systematic cognitive biases in attention and in the processing of threat-relevant information.

What is both relevant and unusual about Crick and Dodge's model (1994) is that it was developed through research with children, unlike other cognitive theories of anxiety. This makes it especially well-suited for understanding the role of attention in behaviour in childhood. In the model, the processing of activity is influenced by the content and organisation of memory stores. Children are seen to focus on certain cues in a situation, which is a process that determines whether or not a stimulus is observed and the amount of attention subsequently directed towards it. An attentional bias has a key role at the point of encoding as it is seen as having an impact on the interpretation of the stimulus and therefore on the subsequent emotional and behavioural response which follows it.

### **Attentional Biases in Children's Anxiety**

There is a wealth of literature on factors involved in cognitive processing in anxious adults. This research has largely focused on attentional biases to threat. The body of research on information-processing in children with anxiety disorders is very much smaller, with most attentional bias work being largely based on an appreciation of

the findings from adult populations. Rapid attentional biases to threat have been observed in clinically anxious and trait anxious adults with a degree of consistency (Mogg & Badley, 1998). However surprisingly, relatively few studies have actually investigated the issue of how attentional biases might manifest themselves in children (eg Vasey, El-Hag & Daleiden, 1996; Vasey, Schippell, Cravens-Brown & Bretveld, 1998).

Broadly speaking, researchers have used a few main categories of tasks to examine attentional biases in children. Each of these assesses, in a slightly different way, whether threat-relevant information is being attended to and encoded in preference to non-threatening information. The most common methodological paradigms used are modified Stroop tasks (eg Matthews & MacLeod, 1985) and probe detection tasks (MacLeod, Matthews & Tata, 1986).

The modified Stroop task involves measuring the time taken to name the colour in which threatening, versus non-threatening, words are written. It is assumed that the longer time taken to name threatening words implies that they have captured an individual's attention to a greater extent than non-threatening words. As an alternative to this method, the probe detection task involves two words being shown on a computer screen, one below the other. One word is threat-relevant and the other is emotionally neutral. When the words disappear, a small dot probe appears where one of the words was. The speed at which this probe is detected produces a measure of how much attention was directed towards the word that had just appeared on the screen. It is assumed that faster latencies to detect probes when a threat rather than a neutral word appears indicate an attentional bias towards the threat word.



Before some of the studies in this area are reviewed, it should be noted that the use of these quite different methodological approaches to investigate attentional bias in anxious children has meant that it can be very hard to draw clear conclusions from the data. Vasey and MacLeod (2001) carried out a comprehensive review of each of the methodologies used in attentional biases studies, and concluded that research employing the dot probe paradigm with adults and children is more consistent than that which relies on the modified Stroop task, and that dot probe tasks in fact provide a more sensitive index of attentional bias than Stroop tasks. They also studied differences in procedural details on Stroop tasks (eg card format versus single-trial format) and concluded that they may not be equivalent in their ability to assess attentional effects. One of the major difficulties of the card version for instance, is that latency data and errors are confounded (Mogg & Bradley, 1998).

Given these findings, this review will focus on evidence linking anxiety and attentional bias using the probe detection methodologies, as they seem to offer the most accurate measure of attention.

### **Dot-Probe Studies with Anxious Children**

Vasey and MacLeod (2001) have thoroughly explored much of the dot-probe literature with anxious children. Their review highlights that in general there is evidence for an attentional bias towards threat cues in high-anxious children and for an attentional bias away from threat cues in low anxious children. However, they have been careful to point out that the evidence from dot probe studies can be contradictory in places, and that there is something of a lack of consistency within the findings overall. Some of the key studies they included in their review will be outlined below in order to highlight this

point.

Vasey, Daleiden, Williams & Brown (1995) carried out a study in which a group of children with clinical levels of anxiety were compared to a control group of non-clinically anxious children using presentation of threat-relevant and neutral words. All the participants were 9-14 years old. The words were presented for 1250ms, after which time a probe replaced threat or neutral words. Those in the clinically anxious group showed evidence of an attentional bias towards the threatening words. This was demonstrated by the fact that detection latencies for probes located in the lower screen location were significantly faster for this group of anxious children when threatening rather than neutral words had just been shown on the same screen location. When the results were looked at in terms of younger and older anxious children within the sample, some variability was discovered in the bias towards threat. There was a trend towards this effect in the younger anxious children when probes were presented in the upper screen position, although the result was not significant. Older anxious children were more likely to show this effect for probes located in the lower location. Children in the control group with non-clinical levels of anxiety did not show any sign of an attentional bias either towards or away from the threat words.

There is some indication that variations in attentional response to threatening stimuli are associated with individual differences in levels of trait anxiety (ie sub-clinical levels of anxiety). Dot probe studies on non-clinical children provide us with evidence which points to this. For instance, Bijttebier (1998) studied non-clinical children and showed that it was only those with high levels of trait anxiety who demonstrated attentional biases towards threatening stimuli; low-trait anxious children showed an attentional bias away from threat. Bijttebier demonstrated this by comparing high- and

low-anxious children in grades 3-8 (mean age 10.8 years) and discovered that it was only the children in the high-trait anxious group who showed the pattern of speeded detection of probes near the threat words. Children in the low-trait anxious group showed slowed responses to detect probes near the threatening words. The indication from this was that low-trait anxious children show an attentional bias away from threatening stimuli.

Additional evidence pointing to the significance of trait anxiety in individual differences in patterns of attentional bias comes from Schippell, Vasey, Cravens-Brown, and Bretveld (2003). They used a dot probe task to study a non-clinically anxious sample of 12-14 year olds, carrying out a regression analysis to look at the emotional correlates of performance in these children. Their results showed that trait anxiety was positively correlated with rapid finding of probes near threatening words. The slower detection times of low-trait anxious children also suggested an attentional bias away from threat in these children. The implication of their work, in line with Bijttebier's, was that attentional bias towards threat words was more pronounced in high-trait anxious subjects, and that slower response times to detect probes near threatening words in low-trait anxious subjects indicated an attentional bias away from threat.

Although this evidence largely seems to point to a relationship between attentional bias towards threat in high-trait anxious children, and attentional bias away from threat in low-trait anxious children, Ehrenreich, Coyne, O'Neill and Gross, 1998, cited in Ehrenreich & Gross, 2002) carried out research which did not support this association. They studied 9-11 year old children in a normative population using a dot-probe task with a presentation time of 1250ms. They found that self-reported anxiety levels were not significantly related to attentional bias. Ehrenreich et al. (1998)

hypothesised that the reason for this may have been because levels of anxiety need to reach clinically-significant levels in order for an attentional bias to be seen consistently. This hypothesis does not explain however, the fact that the certain other studies, such as those as highlighted above, have found attention bias effects in non-clinical groups. This is an example of one of the inconsistencies apparent in the literature.

Having reviewed the evidence for trait anxiety, attention will now be turned to the impact of state anxiety on attentional bias. Here, the picture seems to be a little different. There is no evidence that raised levels of state anxiety in children are associated with an attentional bias to threat. In fact, studies suggest that the reverse pattern may occur to that generally seen with trait anxiety.

With state anxiety, the association between anxiety and attention to threat appears to be negative rather than positive, with lower state anxiety being associated with attentional bias towards threat and elevated state anxiety being linked to reduced attention to threatening information (ie avoidance). Evidence for this comes from a study on a sample of high- and low-test anxious children 12-14 years of age (Vasey, El-Hag, and Daleiden, 1996) These researchers discovered that elevated levels of state anxiety did not act to increase attention to threat, and instead seemed to reduce it. This effect has also been shown by Vasey & Schippell (2000) who studied a slightly older group of children (14-18 years old) without a clinical anxiety disorder. They found that state anxiety was negatively associated with speed of probe detection latencies, indicating the same attentional bias away from threat. Thus, both Vasey & Schippell (2000) and Vasey et al. (1996) have produced evidence to show that raised levels of state anxiety appear to reduce attentional bias towards threatening stimuli. This seems to indicate that there is something different about the processes operating in trait and state anxiety.

In summary, dot probe studies have shown some evidence of an anxiety-linked attentional bias in children, although the research is not entirely consistent. The literature has demonstrated that anxious children do seem to display the same attentional bias towards threat cues as anxious adults do. As in the case with adults, it also appears that low levels of anxiety in childhood (which do not reach clinical levels) can be linked to an attentional bias away from threat cues (eg Bijttebier, 1998; Schippell et al., 2003). As Vasey and MacLeod (2001) have argued from the evidence presented in their review, this pattern of attentional bias in general seems to be a direct function of trait anxiety. There is no evidence that this attentional bias is increased by high levels of state anxiety. In fact, the results of some studies suggest that raised levels of state anxiety in children may inhibit the selective allocation of attention towards threatening material (Vasey et al., 1996; Vasey & Schippell, 2000).

### **Attentional Disengagement**

Although the focus of most research in this area has been on biases in the orientation of attention towards threat, more recent research with adults has begun exploring the intriguing, potential role of attentional disengagement in anxiety. It has been suggested that attentional bias in anxious individuals may in fact result from difficulty disengaging attention, rather than the traditional understanding of attentional hyper-vigilance to threat. This newer idea sees anxious people as having difficulty disengaging from threatening stimuli, rather than from the more established view of them demonstrating increased sensitivity to fearful information.

Variations in speed of disengagement of attention from emotional stimuli between high and low trait anxious people have been demonstrated using facial stimuli

differing in emotional expression, or with pictures varying in threatening content. Fox, Russo, Bowles, and Dutton (2001) carried one of the key studies on attentional disengagement, using an emotional cueing paradigm to investigate the mechanism. They presented students with threatening words and happy, neutral or angry faces on a computer screen for either 100 or 250ms. After an interval of 200ms or 500ms, the students then had to respond to a neutral target either in the same location, or opposite where the face had been. Fox et al. did not find an attentional bias to threat with words or faces, even when the students were highly state-anxious. This is in line with the studies of state anxiety reviewed which have shown that elevated levels of state anxiety are not associated with an attentional bias towards threat. What they did find was that threatening cues (words and faces) had a strong effect on their ability to disengage their attention. Specifically, finding the target in the opposite location after presentation of an angry face resulted in a delayed response for high state-anxious individuals, suggesting a difficulty with disengaging attention from threat related stimuli. This finding seems an important one in thinking about alternative factors which could lead to the maintenance of anxiety.

Disengagement has also been investigated from the perspective of trait anxiety. Yiend and Mathews (2001) used threatening and non-threatening pictures from the international affective pictures system (IAPS; Lang, Bradley & Cuthbert, 1995) to examine the links between anxiety and attention. Participants were presented with a target in the same location (ie validly cued) or in a different location (ie invalidly cued), with a target arrow pointing either up or down to replace one of the two picture cues, and were asked to say whether the arrow was facing up or down. The design of this task allowed for a distinction to be drawn between 1) speeding due to attentional engagement

with a picture if the target appeared in the same location, and 2) slowing when participants had to disengage attention to find a target elsewhere. The results demonstrated that when the picture was threatening, the high anxious group was slower to detect the orientation of an invalidly cued target than a validly cued target at short exposure time (500ms). When cue exposure time was longer (2,000ms), both high and low trait anxious adults took more time to disengage their attention from threatening rather than non-threatening stimuli. The researchers concluded from this that displaying threatening stimuli led to the process of disengagement of attention being delayed. There was little evidence of hyper-vigilance in the form of increased speed of detection of threat targets, as might have been assumed. Their results rather showed that anxious individuals have difficulties disengaging their attention from threatening stimuli, a finding similar to that of that of Fox et al. (2001).

Koster, Crombez, Verschuere and De Houwer (2004) carried out a study aimed at more precisely teasing apart whether it is the mechanism of vigilance or disengagement that is more important in anxiety. Their conclusions have added to the growing weight of opinion that challenges the view that the results of dot probe studies provide an exclusive case for vigilance to threat. Amir, Elia, Klumpp and Prezworski (2003) related this difficulty disengaging attention to social anxiety. They highlighted a comment frequently made by social phobics, that it is not that they tend to detect threat cues from their environment, but that they have problems disengaging from negative social threat cues once detected.

In summary, the above studies on disengagement seem highly significant. Although dot probe studies have suggested that a bias towards threat is shown by people who are anxious, the findings of Fox et al. (2001) and Yiend and Mathews (2001)

suggest that the historical explanation of this in terms of hyper-vigilance may be inadequate. The work indicates that the results of probe detection studies may in fact be at least partly due to disengagement. Crucially it suggests that cognitive control processes, possibly involving processes associated with executive function, may play a critical role (Mathews & MacLeod, 2006).

### **Effortful Control, Attentional Bias and Anxiety**

Adult studies have shown that disengagement of attention plays a central role in anxiety, which has been argued to reflect difficulties with the control of attention. Although there are no studies investigating this directly in children, there is evidence that children with anxiety and wider psychopathology have problems controlling their attention and behaviour. Children with ADHD for instance, are known to have difficulties focusing and shifting their attention and hence show low levels of attention control (Barkley, 1997). It seems plausible that this defective self-regulation has a role in the development of co-morbid emotional and behavioural problems. Indeed, recent theorising by Lonigan and Phillips (2001), has directly implicated cognitive control processes in the development of childhood anxiety. These authors have suggested that as with adults, when children are unable to sufficiently control their attention in relation to threatening stimuli, chronic difficulties with anxiety result. Specifically, they argue that a failure to regulate attention leads to the biases in attention to threat, which in turn heighten and maintain anxiety symptoms. This innovative model of anxiety provides a useful framework for thinking about control processes relevant to anxiety within a developmental framework.

Lonigan & Phillips' (2001) model has its origins in research on temperament. The



proposal is that the development of anxiety results from an interaction of the temperamental factors of neuroticism and effortful control, rather than anxiety resulting from an association with neuroticism alone. Effortful control (outlined in more detail later) refers broadly to the capacity to inhibit a dominant action in order to perform a sub-dominant action and to delay or otherwise control pre-potent responses including, significantly, the focus of attention (Rothbart, 1989). Their theory suggests that in order to develop pathological anxiety, a combination of low effortful control and high temperamental neuroticism/negative affectivity is needed. In their words, “Although high neuroticism is a necessary condition for the development of anxiety, it is not sufficient..a dynamic combination of low effortful control and neuroticism is required” (p.70).

Their model sees neuroticism as making children prone to display anxiety and arousal in response to novel and aversive stimuli, but effortful control processes enabling them to direct their attention away from the anxiety-provoking stimuli and situations. Temperamental neuroticism is accompanied by strong emotional reactivity. It makes children vulnerable to states of anxiety, which in turn orients attention towards sources of threat. However, when children become anxious and aroused in the face of threat, high levels of effortful control may function as a buffer through the use of self-regulative processes in the form of attention regulation and other coping behaviours. Children with high effortful control may deliberately re-orient their attention towards sources of non-threatening information, which may help them re-appraise the threat and hence reduce anxious responding. When effortful control is low though, children are more at the ‘mercy’ of their temperamental disposition. They may be less capable of self-regulation and hence struggle to regulate their arousal, to encode non-threatening

information and ultimately to re-appraise the threatening stimulus. Essentially, this is how Lonigan and Phillips (2001) outline that effortful control (and attention control in particular) influences the development of childhood anxiety disorders.

Lonigan and Phillips propose that a failure of effective effortful control, perhaps because of low temperamental ability, leads to reactive control and hence to anxiety in highly aversive situations or in those with a low tolerance for distress. Essentially, this means that individuals with high negative affectivity/neuroticism need a higher level of effortful control to achieve emotional stability. These authors have specifically proposed that high negative affectivity/neuroticism individuals have an automatic attentional bias to threat which leads to emotional dysregulation and raised levels of anxiety. This risk is moderated by effortful control which, in high levels, inhibits the attentional bias to threat. Low effortful control on the other hand, prevents the overriding of automatic processing biases and so individuals remain at risk of emotional dysregulation and clinical anxiety. Thus, an attentional bias towards threat and aversive information may provide the path through which temperament results in psychopathology (Vasey & MacLeod, 2001; Rothbart et al., 1994). Their model predicts that children with chronic anxiety will show poor cognitive effortful control skills and that temperamentally anxious children (in the normal range) will demonstrate systematic attentional biases to threat when they also have difficulties with the effortful control of attention.

### **Evidence for Lonigan and Phillips' (2001) Model**

Whilst there is limited evidence currently for Lonigan and Phillips' idea that effortful control plays a critical role in the development and maintenance of anxiety,

wider interest and support for it is beginning to emerge. One of the only studies so far that has attempted to test their model on the interactive effects of neuroticism and effortful control on anxiety is that of Derryberry and Reed (2002). They investigated the role of self-reported attentional control (which is a key feature of effortful control) in regulating attentional bias related to trait anxiety (which strongly resembles neuroticism). Their study utilised a reaction time paradigm designed to assess orienting responses to threatening and non-threatening cues. Threatening stimuli were presented with peripheral cues used to orient people to a positive location, where points could be gained if the response was fast enough, or to a negative location where points were lost if the response was too slow. The findings showed a clear attentional bias effect: high trait anxious adults had more difficulty disengaging their attention from negative threat cues than low trait subjects. They also discovered that individual variations in levels of attentional control modulated this effect. High trait anxious adults with poor attentional control remained slow in disengaging from threat, whereas those with good attentional control were better at not dwelling and shifting away.

Thus, the work of Derryberry & Reed (2002) was able to confirm the conclusions of Lonigan and Phillips (2001) by showing that the presence of attentional biases linked to threat in anxious adults is moderated by effortful control, and that the moderating effect of effortful control on anxiety is most effective at the disengagement stage. Derryberry & Reed have argued from this that processing biases should not be seen as universal to everyone with anxiety, but only shown in those who are unable to control their attention effectively. Their findings fit well with Lonigan and Phillips' model, in that the skilled voluntary control of attention appears to allow for the impact

of threatening information to be reduced in anxious adults. In this way, they have shown that EC can play a preventative role in the development of clinical anxiety in adults.

Muris, de Jong & Engelen (2004) have also looked in more detail at Lonigan and Phillips' (2001) model. They studied a normative sample of over 300 children aged 8-13 (mean age 10.8 years) using questionnaire measures of neuroticism, attentional control (focusing and shifting) and anxiety. As expected, their findings showed a positive association between neuroticism and anxiety, and a negative one between anxiety and effortful control. Neuroticism and attentional control both explained a unique and significant proportion of the variance in anxiety disorder symptoms (thereby suggesting their independent contribution to anxiety disorder symptoms). However, their findings did not support Lonigan and Phillips's idea that high neuroticism and low attentional control have to interact in order for anxiety problems to develop.

Although Muris et al. were unable to provide support for Lonigan and Phillips's (2001) theory, there were a number of limitations to their study which seen significant. As the authors themselves admit, these may have affected the results. One major limitation was the research relied solely on self-report measures from children. It is possible that parent data, collected to provide cross-validation of the children's reports, would have had made a difference to the pattern of the results. Secondly, this study and that of Lonigan and Phillips relied solely on self-reports of attentional control, which obviously limits the conclusions that can be drawn. It is doubtful, for example, that children, or even adults, can accurately report on their capacity to control their attention. In order to establish that such a general cognitive process is involved in anxiety more stringent tests of cognitive control would be needed. Thirdly, it is also possible that the interactive effect was missing from their study because it would only become apparent

when children were faced with a threatening stimulus. Neuroticism and attentional control may make independent contributions, but they may also only interact under stressful conditions.

Thus, there is some, albeit limited, evidence that factors related to cognitive control may be implicated in the attentional biases that are a feature of children's anxiety symptoms. This means that the model must be considered tentative at present. A larger volume of evidence exists regarding the more general role played by effortful control in children's emotional and behavioural functioning, and this provides indirect support for Lonigan and Phillip's model. In the sections that follow, a more detailed consideration of the construct of effortful control is presented, followed by a review of developmental and clinical studies that have searched for links between effortful control and children's emotional functioning. This is done with particular reference to anxiety.

### **The Construct of Effortful Control**

'Effortful Control' is a concept that was originally introduced by Rothbart and colleagues (Posner & Rothbart, 2000; Rothbart, 1989; Rothbart & Bates, 1998), referring to "the child's capacity to inhibit a dominant response and initiate a subdominant response" (Rothbart & Bates, 1998, p.137) or the "efficiency of executive attention, including the ability to inhibit a dominant response and/or activate a subdominant response, plan, and detect errors" (personal communication from Rothbart, cited in Eisenberg et al., 2004). In other words, it relates to how able a child is to modulate impulsive responding according to situational demands. It is taken to be the self-regulatory aspect of temperament and includes both the important construct of

attentional control (the skills needed to focus or shift attention from one stimulus to another and persist with tasks) and activational or inhibitory control (the skills to activate or inhibit behaviour when appropriate).

Effortful Control is believed to appear in the latter half of the first year of life, in conjunction with the development of the anterior attention network. Its role is to regulate the more reactive aspects of personality such as fear and anger (Rothbart, Derryberry, & Posner, 1994). During the toddler and pre-school years, individual differences in effortful control can be seen to be established rapidly (Posner & Rothbart, 2000), becoming stable across tasks by 45 months, by which time it is classed as a trait-like characteristic of a child's personality (Kockanska & Knaack, 2003). One of its key aspects is that it is believed to underpin the development of competent self-regulation, something widely seen as critical in the management of emotions and behaviour.

Whilst effortful control is understood to be under voluntary control, there are other aspects of control (reactive control) that occur so involuntarily that they are seen as being outside the bounds of control. Reactive over-control is thought to present as behavioural inhibition (ie the tendency to react slowly to new, uncertain or stressful situations with rigid, inhibited behaviour). Reactive under-control refers to impulsive behaviour which an individual appears to have little control over. There is some discussion in the literature about what the neurological underpinnings of reactive and effortful control are. In general the two systems are recognised as representing different aspects of functioning, but being temperamentally based capacities that are related in some way (Eisenberg et al., 2004). Indeed, factor-analytic and physiological evidence has found a difference between executive control and motivational (ie reactive) control (Mezzacappa, Kindlon, Saul, & Earls, 1998).

One of the real difficulties in reviewing the effortful control literature is the considerable lack of clarity and agreement amongst researchers as to its exact conceptualisation as a construct. Some authors clearly see it and executive functioning as one and the same. However, many others view them as operationally different, seeing executive function much more in terms of the general collection of inter-related cognitive, emotional, and behavioural skills responsible for purposeful, goal-directed activity. Key to this latter understanding would not only be the ability to inhibit dominant impulses and shift attention, but more widely to plan and initiate tasks and use working memory (Luria, 1966; Pennington & Ozonoff, 1996).

One of the problems this difference in conceptualisation generates is that it becomes difficult to draw firm conclusions from the studies as a result of the wide range of measures and methodologies used to evaluate the concept in different ways. Ongoing research is undoubtedly needed in order to help refine and develop current understandings of the concept. In the meantime, there is a need to proceed with caution when researching in this area in recognition of this overlapping, and at times contradictory, nomenclature within the effortful control literature.

### **Measuring Effortful Control**

As has been highlighted, one of the natural consequences of the variation in nomenclature is the variety of different approaches employed to measure effortful control. Murray & Kochanska (2002) justly raise concern about this, reporting that these varied methods include amongst others, delayed gratification tasks (eg Olson et al., 1990), resistance to temptation and “go-no-go” tasks (eg Reed, Pien, & Rothbart, 1984), and motor inhibition tasks (eg Olson, Bates, & Bayles, 1990). Valid comparison

between studies is problematic given that even when similar tasks are used, there is variation in the exact procedures employed. Murray & Kockanska (2002) argue that assessment of multiple aspects of effortful control demands a comprehensive, theoretically driven behavioural battery encompassing a range of related age-appropriate tasks. This battery includes a variety of activities aimed at assessing specific aspects of effortful control such as delayed gratification, slowing down motor activity, go-no-go tasks, modulating voice, and effortful attention. Kochanska, Murray & Coy (1997) outline this battery of tasks in more detail. They argue persuasively that reliable assessment of effortful control should involve multiple, developmentally relevant approaches (eg multiple-source observations of behaviour, children's self-report), to ensure the complexity of the construct is fully captured.

On the one hand, it does indeed seem that theoretically-driven measures such as these could provide a specific and important evaluation of the construct, and in that sense Murray & Kockanska's argument is therefore a sensible one. However, on the other hand, there are clear costs involved in the deployment of their battery in terms of time and resources and this surely makes it an idealistic but sadly impractical choice for many effortful control researchers. Added to this, whilst the authors provide evidence that their battery coheres factor-analytically, this is in fact partly only a result of the balance of tasks (the majority of which involve self-control in social demand situations).

Amongst the variety of approaches currently used to measure effortful control, self-report/parental/teacher report measures tend to be the most commonly used. The Child Behaviour Questionnaire (CBQ: Rothbart, Ahadi, Hershey & Fisher, 2001) is frequently used as a parent report questionnaire to assess temperament in children. The teacher version provides a view of the child's temperament from the perspective of an



adult who knows the child well. Examples of items included on the CBQ are: “Can’t concentrate, can’t pay attention for long”, and “Can’t get his/her mind off certain thoughts”. Capaldi & Rothbart (1992) have revised the Early Adolescent Temperament Questionnaire (EATQ) to provide an improved measure of temperament related to self-regulation in adolescents (EATQ-R: Ellis & Rothbart, 2001). Their subscales of attention, activation control and inhibitory control are seen as extremely useful in assessing effortful control. The EATQ-R has been designed by the same team of researchers as the CBQ, to assess temperament by specifically tapping experiences common to adolescents. Examples of items contained in it include, “Has a hard time waiting his/her turn to speak when excited” and “When asked to do something, does it right away, even if he/she doesn’t want to”.

### **Effortful Control and Anxiety**

Effortful control is understood to be one of the key personality traits with significant implications for social-emotional competence (Rothbart & Bates, 1998; Derryberry & Rothbart, 1998). For some time, deficits in self-regulation or effortful control have been linked to externalising behaviour problems (Olson, Schilling & Bates, 1999), with two of the main disorders which link poor executive functioning and psychopathology in adolescence being ADHD and conduct disorder (Barkley, 1997; Pennington & Ozonoff, 1996). Whilst links between children’s externalising behaviour problems and low effortful control (or high impulsivity) are well established, the evidence base linking internalising problems to effortful control is much smaller. This is partly because research in the area began more recently. What is clear from the little research which does exist currently is that studies have shown there tends to be a

negative association between effortful control and anxiety.

One such study which has looked into this in a normative population is that of Muris et al. (2004), who were the first to attempt to test Lonigan and Phillips' (2001) theory on the role of neuroticism and attentional control in childhood anxiety. As mentioned earlier, their study was carried out on a large sample of over 300 non-clinical children aged 8-13 years. Attentional control was assessed using the Attentional Control Scale for Children (ACS-C; Derryberry & Reed, 2002) which measures attentional control and attentional shifting, along with other questionnaires to assess neuroticism and anxiety. They found that the correlation between attentional control and anxiety was negative, and this link was unrelated to temperamental neuroticism. This negative correlation is not surprising given the evidence indicating that anxiety disordered children show a variety of cognitive biases and distortions (Vasey & MacLeod, 2001).

Lemery et al. (2002) also investigated non-clinical children, this time at 3 and 4 years of age using parental questionnaire measures such as the CBQ and separate measures of symptoms of behaviour problems. These authors found that mothers' reports of anxiety and fearfulness correlated with their reports of poor attentional focusing and inhibitory control. The study was particularly valuable as it was longitudinal in design, and so the predictive nature of early temperamental variables on behaviour problems at an older age could be looked at. The results showed that attentional focusing and inhibitory control were both significant predictors of later parent reported internalising problems.

Perhaps one of the most comprehensive studies to date in this area is that of Caspi, Henry, McGee, Moffitt & Silva (1995, cited in Lonigan and Philips, 2001) who also demonstrated that internalising symptoms are negatively associated with effortful

control. They were able to demonstrate this in a 12-year longitudinal study with over 800 child participants. The authors not only used parent and teacher reports of problem behaviour (CBCL) at ages 9, 11, 13, and 15, but also trained examiners to make temperament-related behavioural ratings at ages 3 and 5. One of the temperament dimensions of behaviour which was rated and found to be consistent across age, was 'Lack of Control'. This temperamental construct is understood to be closely related to effortful control because it involves emotional lability, restlessness, short attention span, negativism, and sensitivity to challenge. The results showed that Lack of Control was found to be an independent predictor of anxiety in both boys and girls. The findings demonstrated that children with low levels of control in childhood were more likely to present with internalising problems 12 years later. This study therefore provided evidence for effortful control as a causal factor in the development of children's internalising problems.

There are only a very small number of studies to date which have looked at the relationship between effortful control in children and clinical levels of anxiety. The main one is that of Eisenberg et al. (2001), which is particularly interesting in its use of behavioural measures of regulation, rather than relying on questionnaire measures alone which risk reflecting reporter bias. These researchers investigated a sample of over two hundred 4.5 to 8 year olds, which included children classed as having internalising problems (although not referred to services). Those in the internalising group were classed as such because they had a CBCL (Achenbach, 1991) *T* score equal to or over 60 indicating that they were at moderate risk of developing internalising problems. These children were carefully matched with non-clinical control children with scores of below 60. This was done using parental and teacher reports of attentional and behavioural

regulation (ie CBQ subscales of attention shifting, attention focusing, and inhibitory control) alongside observations of behavioural regulation. The behavioural observations involved assessing the children's ability to wait (sitting still and inhibit movement), to be persistent (assemble a hidden puzzle without cheating) and their display of emotion in a disappointing situation (reaction to an unattractive prize).

The results showed that children with pure (ie not co-morbid) internalising problems were lower on attentional effortful control, based on adult reports, in comparison with non-disordered children, although the two groups did not differ in behavioural inhibition. The authors argued that "the finding that internalising children were low in attentional regulation is consistent with the notion that they have specific difficulty regulating the internal experience of emotions such as anxiety." (p.1129). The authors hypothesised from this that children with internalising behaviour problems such as anxiety, would be low in at least some types of effortful control, especially the ability to manage emotion with effortful attentional processes.

Eisenberg et al. (2004) carried out a two-year follow up of their study in order to investigate whether the relationship between effortful control and internalising symptoms held over time when factoring in early levels of internalising problems. They also studied the role of personality resiliency in mediating the relationship between effortful control and children's adjustment. Children with internalising problems such as anxiety tend to lack flexibility in dealing with novel and stressful situations and have been found to be low in resiliency (Huey & Weisz, 1997). A relatively low level of effortful attentional control may reduce children's ability to recover from stress, which results in them being more likely to develop internalising problems.

The emphasis in their study was on the distinction between effortful control and

impulsivity, rather than on the distinction between attentional and behavioural aspects of control. They viewed this clarification as important because of a belief that the difference between effortful and reactive control is more fundamental to explaining adjustment problems than differences among various aspects of effortful control. Their belief was that effortful control, not simply inhibition of attention or behaviour, would be expected to promote adaptive behaviour. Conceptually, the researchers expected effortful control and reactive control to relate to children's social functioning because adjustment problems were seen as defined in terms of the ability to control emotions (eg showing high levels anxiety) or behaviour (eg aggression).

Parents and teachers completed parts of the CBQ on two occasions, two years apart, to measure effortful control (attention shifting, attention focusing, and inhibitory control subscales) and impulsivity (impulsivity subscale). Measures of resiliency and children's problem behaviours were also employed. The researchers found that effortful control (ie regulation) and impulsivity (reactive under-control) had unique relations to internalising problems and that these were mediated by resilience. In other words, children who were low in effortful control or impulsivity tended to be low in resiliency and this, in turn, predicted low levels of internalising problems. Eisenberg et al. argued from this that children who are low in effortful control may have difficulties managing their negative emotional states (eg shifting attention to other thoughts or focussing on positive thoughts) and as a consequence find it difficult to recover from negative experiences.

### **Limitations to the studies**

In reflecting on the literature linking effortful control and anxiety, it is clear that

a number of methodological difficulties exist which limit the conclusions it is possible to draw from the data. One limitation involves the mixed populations that have been used within the research. Comparison of data can be hard when some research uses clinical populations, and others use children from normative populations. For example, Eisenberg et al. (2001) used children with internalising problems and Muris et al. (2004) used non-referred children with some symptoms of anxiety.

Another problem relates to the correlational design of some of the data. This means it is impossible to draw conclusions on cause-effect relationships between attentional control and anxiety. In relation to Eisenberg et al., it is possible that individual differences in effortful control, resiliency, or problem behaviours are all caused by some other factors other than effortful control having a causal effect on resiliency and problem behaviours. Clearly more longitudinal research on effortful control and anxiety is needed in order to gain greater certainty into the exact nature of the relationships.

However, perhaps the greatest limitation relates to the lack of objective measures of attentional control (ie cognitive tasks), and the tendency of researchers to instead rely on the use of third party reports to measure constructs like attentional control and anxiety. This is a significant problem because when parents and teachers are asked to provide ratings in children, they are being asked to make assumptions about the internal states of children through observation of their behaviour. It is easy to see how inaccuracies could arise from this and how careful one needs to be in making interpretations from the findings of the research as a result. Relying on third party ratings makes the links between the constructs less clear and raises considerable doubts as to the confidence one can draw from the findings of many of these studies.

In summary, the research on effortful control and anxiety reviewed above has shown that there is some evidence linking low levels of effortful control to high levels of anxiety. It is easy to see from this why the development of the temperamental construct of effortful control is increasingly being viewed as potentially important to healthy psychological functioning in children and to the absence of internalising pathology, as well as externalising pathology.

### **Neuropsychological Assessment of Anxiety Mechanisms**

As has been highlighted, unfortunately virtually no studies exist which have investigated the nature of the cognitive processes underlying the negative thought content of children with anxiety disorders from a more precise, neuropsychological perspective. Unfortunately, this makes it very difficult to draw firm conclusions from the literature about the exact processes involved. In this final section, the few neuropsychological studies which have tried to do this will be reviewed.

Whilst most researchers have failed to directly assess anxiety in children, Toren, Sadeh, Wolmer, Eldar, Kren, Weizman & Laor (2000) are an exception to this. They carried out a neuropsychological evaluation of the particular cognitive processes that characterise children with anxiety disorders. They matched nineteen children aged 6-18 years with anxiety disorders (Separation Anxiety Disorder or Overanxious Anxiety Disorder) with fourteen aged matched 'healthy' controls (ie without any history of psychopathology). The two groups were comparable for age and gender and both scored within the normal range on the Wechsler Intelligence Scale for Children-Revised

(WISC-R). One of the tests included in their assessment battery, to measure cognitive flexibility, was the Wisconsin Card Sorting Test (WCST) (Lezak, 1995).

The findings showed that the anxiety group had a significantly greater number of errors, perseverative responses, and incorrect answers after negative feedback on the WCST than the control group. Making a mistake was found to induce a repetition of the mistake in the children with anxiety disorders, whereas the control children were able to use the negative feedback productively. This indicates that children with anxiety disorders display a rigid adherence to a specific pattern and a decreased ability to shift focus to another pattern when required (Kendall & Chansky, 1991). The researchers concluded from this that in children, anxiety disorders may be associated with lowered cognitive flexibility and difficulties with attentional control. The conclusions of this study allow for a greater level of confidence in the findings of the questionnaire-based studies linking anxiety with effortful control.

There is almost no other research to date on the neuropsychological assessment of attention in children with various anxiety disorders. Greisberg & McKay (2003) have highlighted this problem in relation to the paucity of neuropsychological evidence in circulation on children with Obsessive Compulsive Disorder (OCD). It seems that for children with OCD, like those with other types of anxiety disorders, the evidence base is still developing. Behar et al. (1984) carried out almost the only study in the area and did not find any differences in neuropsychological results between children with OCD versus controls. This finding was replicated by Beers et al. (1999), who compared the neuropsychological performance of children with OCD with normal, healthy controls. Their battery of tests included assessment of attentional control through the use of the Stroop, Go-No-Go task and WCST. As with Behar et al., they did not find any



significant differences between OCD children and controls on neuropsychological performance. However of note, is that no intellectual screening was used on this latter study and it is possible that if this had been done in conjunction with the neuropsychological assessment, it may have had some impact on the results.

In summary, there is evidence highlighting the association between effortful control and problem behaviours in children linked to emotional development. Some evidence from longitudinal studies also indicates a link between aspects of children's early executive function and later emotional and behavioural competence. Despite the current paucity of evidence from neuropsychological studies, researchers are becoming more interested in the application of the links between specific aspects of executive function and emotional and behavioural problems in children. This is in recognition of the fact that application of the association may be very important to improving outcome in children at risk of psychopathology. One of the reasons Lonigan and Phillips' model is so valuable is that it raises a number of theoretical possibilities for intervention work with anxious children, such as helping them improve their attention and self-control in order to better regulate their emotions. To date however, not enough formal tests of cognitive flexibility and attentional control have consistently discriminated anxious from non-anxious children. This does not fit well with Lonigan and Phillips' model or with similar proposals made by Eisenberg.

## **Conclusion**

This review has highlighted some of the literature on cognitive theories of adult anxiety, and explained how these relate to cognitive processing anxious children. It has examined evidence linking attentional biases and anxiety, and demonstrated how although hyper-vigilance has always been understood to be the cause of these biases, more recent studies have indicated that they might instead result from difficulty disengaging attention.

Difficulties with attentional disengagement in anxiety have been understood to reflect problems with executive control. Lonigan and Phillips's (2001) innovative model has been presented as it directly implicates cognitive control processes in the development of childhood anxiety. Evidence for their theory has been reviewed (e.g. Derryberry & Reed, 2002) which has tended to show that effortful control is indeed directly linked to the ability to disengage from threatening stimuli. This means that it may have its effect on behaviour via attentional biases, and that effortful control skills can limit the impact of threatening information. There may be a similar process operating in wider psychopathology in children, and some evidence has been presented which highlights that children with poor effortful control skills are more at risk of developing anxiety and other social-emotional problems.

Although only in its infancy, the research suggests that executive control may serve as a generic risk factor for psychopathology. More studies are needed in order to confirm this, particularly those which assess attentional control and anxiety from a more direct, neuropsychological perspective. This research is important in order to evaluate

the association between effortful control and anxiety more precisely, and to develop the evidence base in this area more widely. The clear limitations which exist through the widespread use of questionnaire measures of anxiety and effortful control mean that there is a lack of firm evidence to confirm the associations, which can therefore only remain tentative at present.

## References

- Allen, S. (2005) Effortful Control, Attentional Biases and Problem Behaviours in Children. *D.Clin.Psy. thesis*. UCL (unpublished)
- Amir, N., Elia, J., Klumpp, H. & Przeworski, A. (2003). Attentional bias to threat in social phobia: facilitated processing of threat or delayed disengaging attention from threat. *Behaviour, Research and therapy*, 41, 1325 - 1335
- Anderson, J. C., Williams, S., McGee, R., & Silva, P. A. (1987). DSM-III disorders in preadolescent children: Prevalence in a large sample from the general population. *Archives of General Psychiatry*, 44, 69 – 76
- Barkley, R. A. (1997). Behavioral inhibition, sustained attention, and executive functions: Constructing a unifying theory of ADHD. *Psychological Bulletin*, 121, 65 – 94
- Beck, A. T. (1976). Cognitive therapy and the emotional disorders. New York: International Universities Press. In J. S. Beck (1995) *Cognitive Therapy: Basics and Beyond*. New York: Guilford Press.
- Beers, S., Rosenberg, D., Dick, E., Williams, T., O'Hearn, K., Birmaher, B. & Ryan, C. (1999). Neuropsychological study of frontal lobe function in psychotropic naïve children with obsessive-compulsive disorder. *American Journal of Psychiatry*, 156, 777 - 779
- Behar, D., Rapoport, J. L., Berg, C. J., Denckla, M. B. Mann, L., Cox, C., Fedio, P., Zahn, T. & Wolfman, M. G. (1984). Computerized tomography and neuropsychological test measures in adolescents with obsessive-compulsive disorder. *American Journal of Psychiatry*, 141, 363 - 369

- Bell-Dolan, D. J., Last, C. G., & Strauss, C. C. (1990). Symptoms of anxiety disorders in normal children. *Journal of the American Academy of Child and Adolescent Psychiatry, 29*, 759 – 765
- Bijttebier, P. (1998). Monitoring and blunting coping styles in children. Unpublished Doctoral Thesis. Catholic University of Leuven, Belgium.
- Burke, C. B., Burke, J. D., Reiger, D. A., & Rae, D. S. (1990). Age at onset of selected mental disorders in five community populations. *Archives of General Psychiatry, 47*, 511 – 518
- Capaldi, D. M., & Rothbart M. K. (1992). Development and validation of an early adolescent temperament measure. *Journal of Early Adolescence, 12*, 153 - 173
- Caspi, A., Henry, B., McGee, R. O., Moffitt, T. E. & Silva, P. A. (1995). Temperamental origins of child and adolescent behaviour problems: From age three to age fifteen. *Child Development, 66*, 55 – 68
- Cole, D. A., Peeke, L. G., Martin, J. M., Truglio, R., & Serocynski, A. D. (1998). A longitudinal look at the relation between depression and anxiety in children and adolescents. *Journal of Consulting and Clinical Psychology, 66*, 451 - 460
- Costello, E. J., & Angold, A. (1995). Epidemiology. In J. S. March (Ed.), *Anxiety disorders in children and adolescents*, 109 – 124. New York: Guilford Press.
- Crick, N. R., & Dodge, K. A. (1994). A review and reformulation of social information-processing mechanisms in children's social adjustment. *Psychological Bulletin, 115*, 74-101.

- Derryberry, D., & Reed, M. A. (2002). Anxiety-related attentional biases and their regulation by attentional control. *Journal of Abnormal Psychology, 111*, 225 - 236
- Derryberry, D., & Rothbart, M. K. (1998). Affect, arousal, and attention as components of temperament. *Journal of Personality and Social Psychology, 55*, 958 – 966.
- Ehrenreich, J. T., Coyne, L. W., O'Neill, P. & Gross, A. M. (1998). Attentional bias to threat cues in childhood anxiety: A preliminary investigation of lexical and facial cues. Poster session presented at the annual convention of the Association for the Advancement of Behaviour Therapy, Washington, DC.
- Ehrenreich, J. T., & Gross, A. M. (2002). Biased attentional behaviour in childhood anxiety: A review of theory and current empirical investigation. *Clinical Psychology Review, 22*, 991 - 1008
- Eisenberg, N., Cumberland, A., Spinrad, T. L., Fabes, R. A., Shepard, S. A., Reiser, M., Murphy, B., Losoya, S. H. & Guthrie, I. K. (2001). The relations of regulation and emotion to children's externalising and internalising problem behaviour. *Child Development, 72*, 1112 – 1134
- Eisenberg, N., Spinrad, T. L., Fabes, R. A., Reiser, M., Cumberland, A., Shepard, S. A., Valiente, C., Losoya, S. H., Guthrie, I. K. & Thompson, M. (2004). The relations of effortful control and impulsivity to children's resiliency and adjustment. *Child Development, 75*, 25 – 46
- Ellis, L. K., & Rothbart, M. K. (2001). Revision of the Early Adolescent Temperament Questionnaire. Poster presented at the 2001 Biennial Meeting of the Society for Research in Child Development, in Minneapolis,

Minnesota.

<http://darkwing.uoregon.edu/~maryroth/LesaEllisSRCDPosterReprint.rtf>

- Fox, E., Russo, R., Bowles, R. & Dutton, K. (2001). Do threatening stimuli draw or hold visual attention in subclinical anxiety. *Journal of Experimental Psychology*, 130, 681 – 700
- Greisberg, S. & McKay, D. (2003). Neuropsychology of obsessive-compulsive disorder: a review and treatment implications. *Clinical Psychology Review*, 23, 95 - 117
- Hertel, P. (2002). Cognitive biases in anxiety and depression: Introduction to the Special Issue. *Cognition and Emotion*, 16, 321 – 330
- Huey, S. J., & Weisz, J. R. Jr. (1997). Ego control, ego resiliency, and the five-factor model as predictors of behavioural and emotional problems in clinic-referred children and adolescents. *Journal of Abnormal Psychology*, 106, 404 – 415
- Kendall, P. C. & Chansky, T. E. (1991). Considering cognition in anxiety disordered youth. *Journal of Anxiety Disorders*, 5, 167 - 185
- Kochanska, G. & Knaack, A. (2003). Effortful Control as a Personality Characteristic of Young Children: Antecedents, Correlates, and Consequences. *Journal of Personality*, 71:6, 1087 – 1112
- Kochanska, G., Murray, K., & Coy, K. C. (1997). Inhibitory control as a contributor to conscience in childhood: From toddler to early school age. *Child Development*, 68, 263 - 277
- Koster, E. H. W., Crombez, G., Verschuere, B. & De Houwer, J. (2004). Selective attention to threat in the dot probe paradigm: differentiating vigilance and difficulty to disengage. *Behaviour Research and Therapy*, 42, 1183 – 1192

- Lang, P. J., Bradley, M., & Cuthbert, B. N. (1995). International affective picture system (IAPS). Gainesville, FL: NIMH Centre for the Study of Emotion and Attention, University of Florida
- Last, C. G., Hanson, C., & Franco, N. (1997). Anxious children in adulthood: A prospective study of adjustment. *Journal of the American Academy of Child and Adolescent Psychiatry*, 35, 645 – 652
- Lemery, K. S., Essex, M., & Smider, N. (2002). Revealing the relationship between temperament and behaviour problem symptoms by eliminating measurement confounding: Expert ratings and factor analyses. *Child Development*, 73, 867 – 882.
- Lezak, M. D. (1995). *Neuropsychological assessment*. (3<sup>rd</sup> edition). New York: Oxford University Press.
- Lonigan, C. J. & Phillips, B. M. (2001). Temperamental influences on the development of anxiety disorders. In M. W. Vasey & M. R. Dadds (Eds.), *The Developmental Psychopathology of Anxiety*. New York: Oxford University Press.
- Luria, A. R. (1966). *Higher cortical functions*. New York: Basic Book.
- MacLeod, C., Mathews, A., & Tata, P. (1986). Attentional bias in emotional disorders. *Journal of Abnormal Psychology*, 95, 15 – 20
- Mathews, A., & MacLeod, C. (2006). Cognitive vulnerability to emotional disorders. *Annual Review of Clinical Psychology*, 1, 667-195
- Mathews, A., & MacLeod, C. (1985). Selective processing of threat cues in anxiety states. *Behaviour Research and Therapy*, 21, 233 – 239
- Mezzacappa, E., Kindlon, D., Saul, J. P., & Earls, F. (1998). Executive and motivational control of performance task behaviour, and autonomic heart-rate



- regulation in children: Physiological validation of two-factor solution inhibitory control. *Journal of Child Psychology and Psychiatry*, 39, 525 – 531.
- Mogg, K., & Bradley, B. P. (1998). A cognitive-motivational analysis of anxiety. *Behaviour Research and Therapy*, 36, 809 – 848
- Muris, P., de Jong P. J., & Engelen, S. (2004) Relationships between neuroticism, attention control, and anxiety disorders symptoms in non-clinical children, *Personality and Individual Differences* 37, 789 – 797
- Murray, K. T. & Kochanska, G. (2002). Effortful Control: Factor Structure and relation to Externalizing and Internalizing Behaviors. *Journal of Abnormal child Psychology*, 30, 503 – 514
- Murray, C. J. L., & Lopez, A. D. (1996). *The global burden of disease*. Boston: Harvard University Press.
- Neal, J. M., Davidson, G. C. & Haaga, D. A. F. (1996). *Exploring Abnormal Psychology*. John Wiley and Sons
- Olson, S.L., Bates, J.E., & Bayles, K. (1990). Early antecedents of childhood impulsivity: The role of parent-child interaction, cognitive competence, and temperament. *Journal of Abnormal Child Psychology*, 18, 317-334.
- Olson, S. L., Schilling, E. M., & Bates, J. E. (1999). Measurement of impulsivity: Construct coherence, longitudinal stability, and relationship with externalizing problems in middle childhood and adolescence. *Journal of Abnormal Child Psychology*, 27, 151 – 165
- Pennington, B. F., & Ozonoff, S. (1996). Executive function and developmental psychopathology. *Journal of Child Psychology and Psychiatry*, 1, 51 – 87

- Posner, M. J., & Rothbart, M. K. (2000). Developing mechanisms of self-regulation. *Development and Psychopathology, 12*, 427 – 441
- Reed, M., Pien, D., & Rothbart, M. K. (1984). Inhibitory self-control in preschool children. *Merrill-Palmer Quarterly, 30*, 131 - 147
- Rothbart, M. K. (1989). Temperament in Childhood: A framework. In G. Kohnstrom, J. Bates & M.K. Rothbart (Eds.), *Handbook of Temperament in Childhood* (pp.59-73). New York: Wiley.
- Rothbart, M. K., Ahadi, S., & Hershey, K. L., & Fisher, P. (2001). Investigations of temperament at three to seven years: The Children's Behavior Questionnaire. *Child Development, 72*, 1394 - 1408
- Rothbart, M. K., & Bates, J. E. (1998). Temperament. In N. Eisenberg, & W. Damon (Eds.), *Handbook of Child Psychology: Volume3. Social, emotional, and personality development*, 105 – 176. New York: Wiley.
- Rothbart, M. K., Derryberry, D., Posner, M. I. (1994). A psychobiological approach to the development of temperament. In J. E. Bates & T. D. Wachs (Eds.), *Temperament: Individual differences at the interface of biology and behavior*, 83 – 116. Washington, DC: American Psychological Association.
- Schippell, P. L., Vasey, M. W., Cravens-Brown, L. M. & Bretveld, R. A. (2003). Suppressed attention to rejection, ridicule and failure cues: unique correlate of reactive but not proactive aggression in youth. *Journal of Clinical Child and Adolescent Psychology, 32*, 40 – 55
- Toren, P., Sadeh, M., Wolmer, L., Eldar, S., Koren, S., Wiezman, R. & Laor, N. (2000). Neurocognitive Correlates of Anxiety Disorders in Children: A Preliminary Report. *Journal of Anxiety Disorders, 14*, 239 – 247

- Vasey, M. W. & Dadds, M. R. (2001). *The developmental psychopathology of anxiety*. New York: Oxford University Press
- Vasey, M. W., Daleiden, E. L., Williams, L. L., & Brown, L. M. (1995). Biased attention in childhood anxiety disorders: A preliminary study, *Journal of Abnormal Child Psychology*, 23, 267 – 279
- Vasey, M. W., El-Hag, N., & Daleiden, E. L. (1996). Anxiety and the processing of emotionally threatening stimuli: Distinctive patterns of selective attention among high- and low-test-anxious children. *Child Development*, 67, 1173 – 1185
- Vasey, M. W., & MacLeod, C. (2001). Information-processing factors in childhood anxiety. In M. W. Vasey & M. R. Dadds (Eds.), *The developmental psychopathology of anxiety*, 253 – 257. New York: Oxford University Press
- Vasey, M. W., & Schippell, P. (2000). Beyond anxiety: Coping preferences and depression as correlates of threat-relevant attentional bias in adolescence. Manuscript in preparation.
- Vasey, M. W., & Schippell, P., Cravens-Brown, L., & Bretveld R. (1998). Patterns of threat-relevant attentional bias in childhood: distinctive patterns related to anxiety versus externalizing behaviour problems. Poster session presented at the annual convention of the Association for the Advancement of Behavior Therapy, Washington, DC.
- Yiend, J., & Mathews, A. (2001). Anxiety and attention to threatening pictures. *Quarterly Journal of Experimental Psychology: Human Experimental Psychology*, 54, 665 - 681

## **Paper 2: Empirical Paper**

### **Attentional Biases in Children's Anxiety: The Role of Executive Control**

## **Abstract**

This study examined the hypothesis that children's anxiety may be linked with difficulties in disengaging attention from threat cues. In addition, the study tested the hypothesis that individual differences in performance on objective tests of executive or 'effortful' control would be implicated in this threat-disengagement difficulty in anxious children. The study consisted of a sample of 50 non-clinical school children aged 9-11 years of age and used a multi-informant methodology to assess attentional disengagement from threat (emotional cueing task), anxiety symptoms, aggression, and executive performance (the Attention Network Task, Go-No-Go task). A control measure of general intelligence was also obtained. Results showed a trend for the hypothesised disengagement effect in anxious children for angry faces. However the study was unable to confirm previous findings on the link between executive control and anxiety in relation to attentional disengagement. Theoretical and clinical implications of the results are discussed.

## **Attentional Biases in Children's Anxiety: The Role of Executive Control**

### **Introduction**

Attentional biases have increasingly been recognised as having an important role in the development of psychopathology, and to the aetiology and maintenance of anxiety disorders in particular. Despite a growing awareness of this, surprisingly little research has been carried out to investigate how these biases might operate in childhood and how they might impact on the development of anxiety. This research is much-needed given that anxiety disorders include some of the most prevalent forms of psychopathology affecting children in modern society (Anderson, Williams, McGee & Silva, 1987), have a considerable effect on a child's functioning (Last, Hanson & Franco, 1997), and tend to lead to the onset of adult anxiety (Burke, Burke, Reiger & Rae, 1990). Research has also demonstrated that symptoms of anxiety disorders can be seen widely within normative populations of children and adolescents who have no clinical history (Bell-Dolan, Last and Strauss, 1990).

### **Attentional Biases and Anxiety**

Cognitive anxiety theorists see cognitions and information processing biases as central to the development and maintenance of anxiety (Beck, 1976). They view anxious adults as having their attention easily and rapidly drawn to stimuli that suggest possible danger (MacLeod, Mathews & Tata, 1986), and as tending to interpret ambiguous information in a threatening way. This is thought to place them at risk of developing an anxiety disorder and of maintaining this disorder.

The vast majority of the attentional bias literature to date has focused on adults. Only a handful of studies in the literature have investigated how these

attentional biases might manifest themselves in children (eg Ehrenreich, 1998; Vasey, El-Hag & Daleiden, 1996; Vasey, Schippell, Cravens-Brown & Bretveld, 1998).

It has been argued that the most sensitive and reliable method of assessing attentional bias involves dot probe tasks (Vasey and MacLeod, 2001). However, a review of studies which have employed this methodology shows the results to be mixed. Amongst non-clinical populations, one study found a bias towards threatening stimuli in attentional tasks in high trait anxious children (Bijttebier, 1998: cited in Vasey & MacLeod, 2001) but another found that self-reported anxiety was not significantly associated with an attention bias towards threat (Ehrenreich, Coyne, O'Neill and Gross (1998, cited in Ehrenreich & Gross, 2002). Moreover, with high-state anxious children, an attentional bias has been found away from threat (avoidance) (Vasey, El-Hag & Daleiden (1996) and Vasey and Schippell (2000, cited in Vasey & MacLeod, 2001).

The results from a rare dot probe study with clinically anxious children are not able to add much clarity to the picture. Vasey, Daleiden, Williams & Brown (1995, cited in Ehrenreich & Gross, 2002) used a probe detection task with words (presentation speed 1250ms), and matched clinically high-anxious children with low-anxious children of the same gender, age, verbal intelligence, reading ability and socioeconomic status. Consistent with evidence from adult studies, high-anxious children did bias their attention towards threat. However, the anticipated bias away from the probes which replaced the threat cues was not observed in low-anxious children.

One of the possible causes of inconsistency in the results is that some researchers have compared a clinical sample of anxious children to normal controls

(Vasey et al., 1995), whilst others have studied variations in state or trait anxiety within “normal” samples of school children (Ehrenreich et al., 1998). Inconsistency in dot probe tasks with words may also result from the fact that the reading skills of children are not that well established in middle childhood. Consequently, the tasks have been designed with a word presentation time of 1250ms to allow for this, but this may undermine the capacity to reliably detect biases given such a long presentation time, as several shifts of attention may have occurred during this time.

In an attempt to improve on the validity of dot probe tasks which rely on words with a long presentation time, an alternative task with faces and a presentation time of 500ms was designed to provide a more rapid stimulus. Ehrenreich et al. (1998) made use of two probe localisation tasks, one measuring attention bias to threat cues using words, and the other using faces as cues. The findings of both added support to the notion that children with non-clinically high levels of anxiety fail to show an attention bias towards either form of threatening stimulus. In line with suggestions from Vasey’s general research, it may be that levels of anxiety need to be near clinical levels for reliable childhood attentional biases towards threat stimuli to be seen .

Thus, it seems that whilst there is some evidence that attentional biases can be seen in middle-childhood in children with high levels of anxiety, more research is needed in order to consistently draw conclusions about the specific circumstances in which these attentional biases develop and operate. The use of different methodologies on populations with varying levels of anxiety has produced a varied pattern of results. A consistent pattern of findings has yet to be demonstrated within clinical and non-clinical groups.



## **Disengagement**

Historically attentional biases have been conceptualised in terms of hyper-vigilance to threat. That is, anxious adults and children have been understood to show a tendency to detect threat cues more quickly than their non-anxious counterparts, thereby contributing to the presence of their maladaptive threat schemas. More recently however, the view that findings of dot probe tasks provide exclusive evidence for a facilitated vigilance to threat in anxious individuals has been challenged. Researchers have instead begun to wonder whether the key attentional bias is more to do with problems with the disengagement of attention from threatening information than it is to do with hyper-vigilance to threat.

Variations in speed of disengagement of attention from emotional stimuli between high and low trait anxious people have been demonstrated using facial stimuli differing in emotional expression, or with pictures varying in threatening content. Fox, Russo, Bowles, and Dutton (2001) used an emotional cueing paradigm to investigate attentional disengagement by presenting students with threatening words and happy, neutral or angry faces on a computer screen for either 100 or 250ms. After an interval of 200ms or 500ms, the students then had to respond to a neutral target either in the same location, or opposite where the face had been. The results did not show an attentional bias to threat either with words or faces, even when the students were highly state-anxious. However, the threat cues (words and faces) had a strong effect on their ability to disengage their attention. In other words, finding the target in the opposite location after presentation of an angry face resulted in a delayed response for high state-anxious individuals. This suggests a difficulty with disengaging attention from threat related stimuli.

Disengagement has also been investigated from the perspective of trait

anxiety. Yiend and Mathews (2001) used threatening and non-threatening pictures to study the association between anxiety and attention. Participants were presented with a target in the same location (ie validly cued) or in a different location (ie invalidly cued) with a target arrow pointing either up or down to replace one of the two picture cues, and were asked to say whether the arrow was facing up or down. The results demonstrated that when the picture was threatening, the high anxious group was slower to detect the orientation of an invalidly cued target than a validly cued target at short exposure time (500ms). When cue exposure time was longer (2000ms), both high and low trait anxious adults took more time to disengage their attention from threatening rather than non-threatening stimuli. Rather than providing any evidence of hyper-vigilance in the form of increased speed of detection in the face of threat, their findings showed that anxious participants had problems disengaging their attention from threatening stimuli, as Fox et al. (2001) also found.

The results of these studies are exciting in their suggestion that disengagement may be more important than orienting to threat. No-one has studied this disengagement phenomenon in children yet, which could go some way to explaining why the results of child dot-probe studies have not been reliable or conclusive.

### **Effortful Control, Attentional Bias and Anxiety**

Problems with the disengagement of attention are understood as representing difficulties with the cognitive control of attention. Lonigan and Phillips (2001) have proposed an interactive model which directly implicates cognitive control processes in the development of childhood anxiety. They have proposed that as with adults, when children are unable to control their attention in relation to threatening stimuli,

difficulties with anxiety may result. The model sees individuals who are unable to regulate their attention sufficiently, developing biases in attention to threat, which heighten and maintain anxiety symptoms.

Lonigan and Phillips (2001) propose that anxiety results from an interaction of the temperamental factors of neuroticism and effortful control. Their theory suggests that a combination of low effortful control and high temperamental neuroticism/negative affectivity is needed in order for clinical anxiety to develop. Neuroticism may make children prone to anxiety and to orienting their attention toward threat, but high levels of effortful control allow them to regulate their attention and re-direct it away from the anxiety-provoking cues, thereby reducing their anxious responding. Children who have low levels of effortful control are less able to self-regulate their arousal, encode non-threatening information and control their anxiety. Hence, effortful control inhibits the attentional bias to threat. Their model predicts that children with chronic anxiety will show poor cognitive effortful control skills and that temperamentally anxious children (in the normal range) will demonstrate systematic attentional biases to threat when they also have difficulties with the effortful control of attention.

The temperamental construct of Effortful (Executive) Control is seen as an attentional element of temperament. It relates to the efficiency of executive attention, and has been defined as the ability “to inhibit a dominant response and initiate a subdominant response” (Rothbart & Bates, 1998, p.137). Included within it is the construct of attentional control (the skills needed to focus or shift attention from one stimulus to another and persist with tasks) and activational/inhibitory control (the skills to activate or inhibit behaviour and respond in a way one may not necessarily want to).

Support for Lonigan and Phillips' (2001) model is limited at present, but is increasing. Derryberry & Reed (1996) tested the model in adults by directly measuring attentional bias using a reaction time paradigm to assess orienting responses to threatening and non-threatening cues. They found that the presence of attentional biases linked to threat in anxious adults was moderated by effortful control, and that the moderating effect of effortful control on anxiety was most effective at the attentional disengagement stage.

However, not all research has been able to support their model (eg Muris, de Jong & Engelen, 2004). A general difficulty with such studies has been the reliance on questionnaire measures of attentional control and anxiety, which limits the conclusions that can confidently be drawn about the associations between neuroticism, attentional control and anxiety. As a result, although evidence for the model seems promising in many respects, it must remain tentative at present.

Whilst direct evidence for Lonigan and Phillips' (2001) model may be limited, much more evidence exists about the role played by effortful control in children's emotional and behavioural functioning. It is this research which has been able to provide indirect support for the model.

### **Effortful Control and Internalising Problems**

Effortful control is increasingly seen as a key personality trait in relation to children's competence (Rothbart & Bates, 1998; Derryberry & Rothbart, 1998; Eisenberg et al., 2000; Kochanska et al., 1998; Barkley, 1997). Deficits in self-regulation or effortful control have been linked to externalising behaviour problems for some time (Olson, Schilling & Bates, 1999; Barkley, 1997; Pennington &

Ozonoff, 1996; Rothbart & Bates, 1998) and to internalising problems more recently. Most research on internalising problems has shown a negative correlation between effortful control, as rated by parents, and anxiety. Some of this research has been carried out on non-clinical child populations (Muris et al., 2004; Lemery et al., 2002; Caspi, Henry, McGee, Moffitt & Silva, 1995, cited in Lonigan and Philips, 2001), and others on children with clinical anxiety (Eisenberg et al., 2001; Eisenberg et al., 2004).

### **Neuropsychological Assessment**

To date, almost no studies have investigated effortful cognitive capacities in children's anxiety using objective measures of performance. One of the very few neuropsychological studies which has tried to do this (eg Toren, Sadeh, Wolmer, Eldar, Kren, Weizman & Laor; 2000), involved 6-18 year old children with anxiety disorders being matched with healthy controls. The neuropsychological assessment battery used included the Wisconsin Card Sorting Test (WCST) to provide a measure of cognitive flexibility (Lezak, 1995). The results showed that children with anxiety disorders displayed a rigid adherence to a sorting pattern and showed less ability to shift focus when required. The conclusion drawn from this was that anxious children have lowered levels of cognitive flexibility, and may have particular difficulties with attentional control. This study was therefore able to confirm the findings of wider questionnaire-based studies linking anxiety with effortful control, generating more confidence in their conclusions. That said, this is virtually the only study of its kind in the area, and so more precise research like this is certainly needed.

## **Predictions of the Study**

In assessing whether the link between anxiety in children and attentional biases to threat can be explained in terms of effortful/executive control, this study predicts that:

1. Children with anxiety problems will show an attentional bias in terms of difficulty disengaging from threat.
2. Children with poor executive/attentional control will show greater attentional biases to threat
3. Individual differences in executive control will have an interactive effect on the link between anxiety and attentional bias.

## **Method**

### **Participants**

Male and female children aged between 9 and 11 years of age (Years 5 and 6) were recruited from two schools in West London. All children in Year 5 and 6 within both schools were given an information letter about the study to take home to their parents, with a consent form attached. In total, 50 parents consented to their children taking part out of a possible 134. This represented a response rate of 37%. Of this sample, 31 were girls (62%) and 19 were boys (38%). The mean age of participants was 124 months (10 years 4 months). All participants had normal hearing and normal or corrected-to-normal vision. None were taking any medication at the time of the research.

Most pupils from School A (ages 4-11, roll = 197) were White British, from above average socio-economic backgrounds. An average proportion of its children were eligible for free school meals (25%). Standards of attainment were above the

national average. Thirty three of the children at the school had special educational needs (17%), mostly learning or behavioural. Five children had statements of need (2.5%).

School B (ages 4-11, roll = 274) was located in an area of below average social and economic circumstances where the proportion of pupils eligible for school meals (50%) was well above the national average. Whilst a significant proportion of children at the school were White British, the majority were Black or Black British African/Caribbean. Over half of pupils at the school (178) spoke English as an additional language. A higher than average proportion of children had special educational needs. Five pupils had a statement of special educational need (1.8%), and a further 63 (23%) were on the school's special educational needs register (School Action/School Action Plus). There was generally a below average level of attainment.

In terms of the overall ethnic mix of the sample size in this study, the majority of the total sample was White British (39%). Those of African origin represented the next largest proportion (29%). The remainder were Asian (14%), Western European (6%), Eastern European (6%), Middle Eastern (4%) or unknown (2%). This, combined with the balance of socio-economic backgrounds provided by the two schools, meant that the total sample was appropriately diverse.

Complete sets of data were collected for a total of 47 out of 49 participants. Whilst all 49 children and teachers successfully completed their measures in full, two of the parents failed to return the two parent questionnaires, despite several reminders.

Children in the high-anxious group were comprised of those for whom any of the 3 anxiety ratings (from self-reports, parents or teachers) fell above the 85<sup>th</sup>

percentile. The low-anxious group was comprised of children who did not fall into this category. The groups were formed in this way in order to capture meaningful variation in reports of anxiety from all perspectives, while avoiding multiple analyses and partially redundant hypothesis-testing. This resulted in a total of 19 children in the anxious group (6 males and 13 females) with relatively high levels of anxiety, and 30 in the non-anxious group (12 males and 18 females) with comparatively low levels of anxiety. The mean age of those in the anxious group was 10.1 years and 10.4 years in the non-anxious group.

### **Ethics**

Ethical approval for the study was obtained from the UCL Committee for the Ethics of Non-NHS Human Research (Appendix A). Parents who had a child taking part in the research were given detailed information about the research and had given written informed consent (Appendix B). All children taking part also signed consent forms (Appendix D) after they were provided with a sheet outlining details of the research (Appendix C) which was read to them. The children were also encouraged to ask any questions they might have to ensure they were giving fully informed consent. No child declined to participate or requested to terminate their involvement part way through the study, despite being given the opportunity to do so.

### **Procedure**

Year 5 and 6 teachers sent participants out of their class one after the other in alphabetical order. Each child was sent into a room with the researcher individually to undergo a series of tests which comprised three computerised tasks and a brief intelligence test (see Measures section for description of these). The tasks were



explained to each child and they were given the chance to ask any questions before starting. They were also allowed to practice to make sure they correctly understood task instructions. The computerised tasks took approximately 40 minutes to complete. After a short break, the intelligence test was administered which took a maximum of 10 minutes. Any queries were answered at the end of the testing before the child was sent back to their class.

Once this data had been collected, the researcher went into the various classrooms and asked participating children to complete two questionnaires (SCAS: Spence, 1999; CSBS-S: Crick & Grotper, 1995). These were administered as a group in the interests of time. The researcher read aloud the instructions on each questionnaire and remained present throughout to answer any queries about individual items, and to ensure the children did not influence each other in their answers.

Data collection took place two days a week over a period of four months, allowing for some variability to fit with the demands of school time-tables. Generally the children were seen on two separate occasions – once to complete the computerised tasks and intelligence test, and the other to complete the questionnaires. To prevent distraction by noise, assessment was not carried out during school breaks. The response rate from children was 100%. No cases were excluded.

After the data had been obtained from the children, the parent data was collected. The children were given an envelope to take home to their parents containing two questionnaires (SCAS Parent Report: Spence, 1999; EATQ-R: Ellis & Rothbart, 2001). They were instructed to return the data in sealed envelopes to their class teachers and were reminded that no-one other than the researcher would

see the information, and that it would not be shared with anyone at school. The response rate from parents was 96%.

Class teachers were then asked to complete a questionnaire on each participating child in their class (CBCL TRF, Achenbach & Edelbrock, 1986). Each teacher had an average of nine questionnaires to complete. The response rate from teachers was 100%.

## **Measures**

The computerised tasks included 1) an attentional cueing task (ECT) involving threatening and non-threatening faces and words to measure attentional bias to threat, and 2) two tasks tapping aspects of effortful control, namely response inhibition (the Go/No-Go task), and flexibility of attention (the Attention Network Task). In addition to this, as outlined above, the study involved parent, teacher, and child self-report questionnaires (CBCL, SCAS, and EATQ-R). The study also involved an intelligence task for children (Matrix Reasoning), and a measure of aggression (CSBS).

The attentional cueing task was chosen specifically for its ability to provide a measure of the disengagement of attention from threatening stimuli. The ANT and Go-No-Go tasks were chosen for their ability to assess aspects of effortful control most closely related to attentional control and inhibition. The matrix reasoning subtest of the WASI was used in order to provide a quick, rough estimate of a child's IQ, and the aggression measure was included as a covariate in recognition of the suggestion that has been made in the literature that attentional biases may conflate anxiety with aggression (Ehrenreich, 2002). The following section gives details of all the measures used in the study.

### Psychological Difficulties

*Child Behaviour Checklist – Teacher Report Form* (TRF; Achenbach & Edelbrock, 1986).

The CBCL is a frequently used rating tool for assessing self- and third-party reports of behavioural problems in 6 to 18 year old children. It is designed to assess diverse aspects of adaptive and maladaptive functioning and allows the researcher to assess eight different syndrome scales and to build up competence and adaptive functioning profiles. In this study, the teacher report form was administered. Teachers had to complete 113 items in total. They were asked to choose if each item was not true, somewhat true, or very true for each child. There are eight subscales of the CBCL, which have a mean alpha coefficient of .80 (Achenbach, 1991a). For this study, only the *Anxious/Depressed* subscale of the TRF was used (eg “cries a lot” and “fears going to school”) which had an alpha coefficient of .86.

The psychometric properties of the CBCL are well-known (see Achenbach, 1991a for an in-depth summary). Essentially, it is widely administered in clinical and research settings because of its demonstrated reliability and validity and applicability to both clinical and non-clinical samples (Drotar, Stein, & Perrin, 1995). It is highly correlated with the SDQ which is of comparable validity.

*Spence Anxiety Scale* (SCAS: Spence, 1999).

This measure is used to assess DSM-defined anxiety disorder symptoms in children in the general population. Both the parent and child self-report versions were administered. The scale contains 38 scored items that can be allocated to the following six subscales: *Panic attack and agoraphobia* (eg scared for no reason at all), *Separation anxiety* ( eg worried about being away from parents), *Physical injury*

*fears* (eg scared of dogs), *Social phobia* (eg scared when having to take a test), *Obsessive compulsive* (eg some things done over and over again, like washing hands, cleaning or putting things in a certain order), and *Generalised anxiety disorder/overanxious disorder* (eg worried about things).

Parents are asked to rate on a four-point scale how often each of the items happens to their child, and children self-report how often these items happen to them. The rating options are 'Never', 'Sometimes', 'Often', or 'Always'. The subscale scores are calculated by adding the individual item scores on the set of items. The total score is the sum of the six subscale scores. The alpha coefficients for the various subscales range between .54 and .83.

Research has indicated that there is good evidence for the reliability and validity of the SCAS. It possesses adequate internal consistency and test-retest reliability (Birmaher et al., 1997) and the factor structure of the questionnaire has been found to be in keeping with the hypothesised categories of anxiety symptoms (Muris, Merckelbach, Schmidt, & Mayer, 1999). There is also support for the concurrent validity of the scale. Scores on the SCAS correlate strongly with scores on traditional childhood anxiety measures (ie RCMAS, STAIC, and FSSC-R; Muris, Merckelbach, Mayer et al, 1998). The measure has also been found to be able to differentiate well between children with and without specific anxiety disorders (Birmaher et al., 1997). It is recommended as a screening instrument for normal children and as a diagnostic instrument in clinical settings.

*Children's Social Behaviour Scale* (CSBS-S: Crick & Grotpeter, 1995)

This measure was adapted from the *Children's Peer Relations Scale* (CPRS: Crick, 1991) used to assess children's perceptions of their peer interactions. For this

study, the three self-report subscales of aggression were used, involving children having to rate how often they engage in various aggressive behaviours. Responses range from 1 ('Never') to 5 ('All the Time'). The three aggression subscales are: *Relational Aggression* (eg "some kids tell lies about a classmate so that the other kids won't like the classmate anymore. How often to you do this?"), *Physical Aggression* (eg "some kids hit other kids at school. How often do you do this?") and *Verbal Aggression* (eg "some kids yell at others and call them mean names. How often do you do this?"). Responses to the items in each subscale are summed to yield total scores. The alpha coefficients for the various subscales were .82, .66, and .76 respectively.

Support for the reliability and validity of the scale has been demonstrated in research (eg Crick & Grotpeter, 1995; Crick, 1991). Evidence also exists for the validity and distinctiveness of the various aspects of aggression.

### Intelligence

*Wechsler Abbreviated Scale of Intelligence* (WASI: The Psychological Corporation, 1999)

The WASI is a nationally standardised, normed, and validated short form of both the *Wechsler Intelligence Scale for Children – Third Edition (WISC-III; Wechsler, 1991)* and the *Wechsler Adult Intelligence Scale (WASI-III, Wechsler, 1997)*. It provides a reliable and valid estimate of verbal, performance and general intellectual functioning for those aged 6 to 89.

The Matrix Reasoning subtest was the only one used in this study. It is similar to the Matrix Reasoning subtest in the WAIS-III and is a series of 35 incomplete gridded patterns that the child completes by pointing to the correct

response from five options. It is a measure of nonverbal fluid reasoning and general intellectual ability (Wechsler, 1997). The reliability coefficients of the subtest calculated from children's samples range from .86 to .96.

### Effortful Control

*Revised Early Adolescent Temperament Questionnaire* (EATQ-R: Ellis & Rothbart, 2001).

This measure, devised to assess temperament by specifically tapping into experiences common to adolescents, represents an updated version of the EATQ (EATQ: Capaldi & Rothbart, 1992). It has been developed by the same team of researchers as the *Child Behaviour Questionnaire* (CBQ: Rothbart, Ahadi, Hershey, & Fisher, 2001) which is a reliable and valid measure used extensively in research into temperament in younger children. The EATQ-R includes various subscales of temperament, three of which are particularly relevant to effortful control. These are *Attention* (eg "finds it easy to really concentrate on a problem"), *Inhibitory control* (eg "has a hard time waiting his/her turn to speak when excited") and *Activational control* ("eg has a hard time finishing things on time")

The parental questionnaire had 18 items (relating to the Attention, Inhibitory Control and Activational Control subscales) and published alpha coefficients of 0.65, .86 and .66 respectively. Scaled scores for the effortful control subscales were computed for the questionnaires by dividing the summed total of items by the number of completed items on that scale. In recently reported studies, there was good internal consistency (.84) for the EATQ-R. It has also been shown to be a reliable tool for the measure of temperament and has been found to be strongly related to socialisation relevant behaviours (Ellis & Rothbart, 2001).

## Attention

### *Attention Network Task* (ANT: Fan et al., 2002)

Fan et al., developed an integrated Attention Network Task in order to measure the efficiency of the attention networks of orienting, alerting, and executive control. The ANT was built upon many neuro-imaging studies that suggest different anatomies of the three networks (Fan, McCandliss, Flombaum, Thomas & Posner, 2003; Posner & Petersen, 1990). The test has relatively high test-retest reliability for each attentional network and allows for the efficiency of each network to be measured independently of each other. It has been shown to be a reliable tool for delineating components of attention and their development, and studies suggest that the efficiencies of these three networks are uncorrelated (Fan et al., 2002). The ANT has been widely used to provide information on the state of attention for genetic and therapeutic outcome studies.

The ANT has been adapted by Fan et al., to include child-friendly alerting and orienting cues in order to rapidly study the development of these networks in children. In the child version of the computerised task, either one or five colourful fish replace the arrows that appear in the adult version of the task. The child is asked to respond to the direction in which the fish is pointing by pressing a left or right button on a game pad. On congruent trials the flanking fish are pointing in the same direction, on incongruent trials they point in the opposite direction from the central fish, and on neutral trials the central fish appears alone.

From this reaction time task, three measures of attention are derived. The *alerting* measure is derived from examining children's reaction times to targets which provide a warning cue. The *orienting* effect is determined from children's reaction times to the target when they get a non-spatial (peripheral) cue compared to

a spatial (central) cue which tells them when the target will appear. The *conflict/executive control* task is determined by comparing the reaction times to the target when it is surrounded by flankers that are congruent with the direction of the target compared to incongruent flankers. For a detailed description of this task see Rueda et al (2004).

The ANT had of a total of four experimental blocks of 48 trials. Each trial represented one of 12 conditions in equal proportions: 3 target types (congruent, incongruent and neutral) x 4 cues (no cue, central cue, double cue and spatial cue). Accuracy and reaction time are recorded. Median reaction times were calculated for correct responses and percentages of errors for each condition.

#### *Emotional Cueing Task (ECT)*

A computer based emotional cueing task was designed to measure attentional bias to emotionally valenced stimuli, based upon the task used by Fox et al. (2001) (Appendix J) The task was adapted to use faces as cue stimuli as well as words, to counter for the fact that it can be hard to be sure of the capacity of a young children to rapidly process the content of a briefly presented word. Initially a cue (a picture of a face demonstrating an angry, fearful or neutral face or a physically, socially threatening, or neutral threat word) was presented, after which the child responded to a neutral target stimulus (a small spaceship). This neutral target spaceship was either pointing towards the left of the screen or towards the right and the child was instructed to press the corresponding button. They were told that the aim of the game was to make the spaceship disappear as quickly as possible. A noise sounded to provide feedback about whether or not the child had pressed the correct button.



At the beginning of a trial the screen was black, followed by the presentation of a white cross ('+'). In order to reduce possible anticipatory responses, the facial or word cue was presented after a random variable delay between 500ms and 1000ms following the presentation of the '+'. After a period of 500ms the cue was removed and a target spaceship was presented, either in the same location as the cue (referred to as valid trials) or in an alternative location either above or below the cue (referred to as invalid trials). A total of 240 trials were presented in a random order. In 5% of trials a cue was presented but no target followed ('catch trials'). This was designed in order to reduce anticipatory responding. The trials consisting of either an angry, fearful, or neutral facial expression were developed by Matsumoto and Ekman (1988; JACFEE and JACNeuF). A measure of reaction time was recorded automatically for each presentation.

The length of time it took a child to disengage their attention from the different type of facial expression or word and to locate the target stimulus in each possible presentation scenario was measured over numerous trials. Averages were obtained for each possible scenario. Once each child's mean reaction time had been computed, trials that were higher than two standard deviations above or more than one standard deviation below this mean were excluded. This was done in order to exclude probable anticipations and distractions.

#### *Go/No-Go Task* (Rubia, Taylor et al., 2001)

This task forms part of the Maudsley Attention and Response Suppression Task Battery (MARS). It is a selective response inhibition task where a motor response has to be either excluded or not. In order to make the task more challenging, it was divided in two subtests of 2 min and 32 s each, requiring a left-handed

response on the first subtest, and a right-handed response on the second block of trials to increase the pre-potent response tendency.

In the left-handed response subtest, green space ships of 33ms duration each pointing left appear in the middle of the screen and the child has to press the left-handed button response on the game pad provided. After the aeroplane appears there is a 1.3s blank screen. In 26.3% of trials green enemy planets (of 300ms duration each) appear in the middle of the screen instead of the space ships and the child has to inhibit their motor response. There are 95 trials in total: 70 Go trials and 25 No-Go trials.

In the right-handed response, the task is exactly the same in terms of the number of trials except that all green space ships point to the right side and a right-handed response is needed on the game pad. In 26.3% of trials green enemy plants appear on the screen and the child has to inhibit their motor response. The task lasted five minutes in total.

The dependent variable of the task is the number of commission errors to the No-Go stimuli. The task is highly correlated with other measures of cognitive and motor inhibition on the MARS battery (eg the Stop Task, the Motor Stroop Task, and the Switch Task), and with behavioural hyperactivity.

## **Results**

This study focused on attentional biases in children's anxiety, and specifically the role of attentional disengagement to threatening stimuli. The study also investigated the role of effortful control in relation to such anxiety-related disengagement processes.

The results section will first begin by presenting means and standard deviations from the various measures used in the study. This includes the teacher, parent, and child questionnaires, and the computerised neuropsychological tasks completed by the children. The scores obtained will be presented in relation to published normative data. In the following section the association between attentional biases to emotional faces and threat words and children's anxiety will be addressed. Correlations between the different measures of effortful control will be then carried out, followed by examination of the relationship between effortful control and anxiety, through the use of Independent T-tests. Finally, the associations among, and interactions between, effortful control, attentional bias and anxiety will be investigated through the use of regression analysis.

### **Means, Standard Deviations and Normative Data.**

The published norms for the scales are shown in Table 1, in order to place the data within a population context.

Table 1: Published means and standard deviations for anxiety, IQ and attention measures (totals and subscales) compared with overall means and standard deviations from the current sample

<b>Rating Measures</b>	<b>Published scores (means and SDS)</b>	<b>Current Sample (means and SDs)</b>
WASI IQ (scaled score)	10 (1.5)	10.53 (2.46)
CBCL total anxiety score (Teacher)	50 (5)	52.90 (3.82)
SCAS total score (Child)	30.3 (16.70)	35.76 (21.49)
SCAS total score (Parent)	14.2 (9.7)	15.85 (8.97)
CSBS-S total aggression score	16.3 (6.3)	14.50 (6.92)
ANT alerting score	41 (47) *	20.64 (49.73)
ANT orienting score	46 (44) *	17.57 (51.30)
ANT conflict score	69 (44) *	87.07 (56.34)
Go/No-Go Commission errors (%age)	19	46 (14)
EATQ-R activation control score	23.70 (5.80) **	16.77 (3.43)
EATQ-R inhibitory control score	18.37 (3.60) **	20.21 (4.30)
EATQ-R attentional control score	19.80 (5.16) **	22.43 (5.43)
EATQ-R – total score	61.87 (14.60) **	59.41 (11.22)

(CBCL: TRF; Achenbach & Edelbrock, 1986) (SCAS: Spence, 1998) (CSBS-S: Crick & Grotpeter, 1995) (EATQ-R: Ellis & Rothbart, 2001) (WASI: The Psychological Corporation, 1999) (ANT: Fan et al., 2002) (Go/No-Go: Rubia, Taylor et al., 2001)

\* Data for 10 years olds listed, representing the mean age of children within this sample, as no published data is available for 11 year olds.

\*\* No published data available for EATQ-R. Scores presented represent those found in a previous unpublished study by Allen, S (2005), n = 105 UK 9-11 year olds.

As can be seen from Table 1, the majority of the means and standard deviations obtained within the current study are broadly comparable with published community samples (ie they are largely within the range that would be expected within a non-clinical sample). Of particular note however, are the scores for the ANT and Go/No-Go task. For the ANT, the conflict core in the current sample was higher, and the orienting and alerting scores slightly lower than the published scores. That said, overall they are still broadly within a similar range. For the Go/No-Go task, the percentage of commission errors in this sample was substantially higher than published averages. This may be partly explained by the fact that the published scores represent children within a 7-15 year old age range (mean = 11.1), with the data showing there to be a strong negative correlation between age and the number of errors made. Thus, one would expect there to be a higher percentage of commission errors in a younger sample, as was found to be the case in this study.

### **Attentional Bias and Anxiety**

In order to investigate the hypothesis that anxious children would show delayed disengagement from threatening stimuli, reaction times (RTs) were analysed using a 2 x 2 x 3 repeated measures ANOVA. Anxiety group (anxious or not anxious) was the between subjects factor, with position (upper or lower), cue validity (valid or invalid), and threat (pictures: anger, fearful, or neutral; words: social threat, physical threat, or neutral words) as the within-subjects variables. The results will be looked at for faces first, and then words. The prediction was that the interaction between anxiety, threat and validity would be significant. The following table presents the mean RTs for the various conditions.

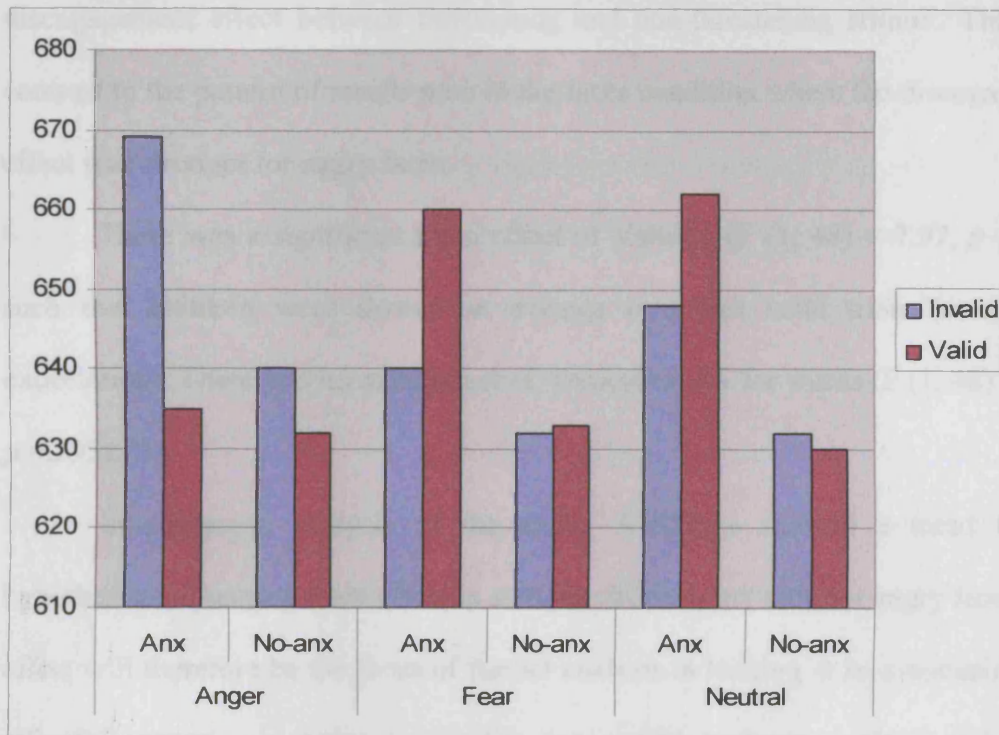
Table 2: Mean RTs for anxious and non-anxious children on valid and invalid trials for the faces and words conditions.

<u>Faces</u>		<b>Emotional stimulus</b>					
		Fear		Anger		Neutral	
		Valid	Invalid	Valid	Invalid	Valid	Invalid
<b>Anxiety * (N)</b>							
Yes	19	660.74	640.95	635.68	669.09	662.92	648.57
No	31	633.77	632.73	632.80	640.40	630.60	632.16
<u>Words</u>		Social Threat		Physical Threat		Neutral Threat	
		Valid	Invalid	Valid	Invalid	Valid	Invalid
<b>Anxiety (N)</b>							
Yes	19	692.20	677.36	689.30	675.70	680.18	661.62
No	31	650.71	642.23	660.93	645.00	651.41	640.23

\* Children classified as anxious were those in the top 15% of scoring by any rater (child, parent or teacher).

For the faces stimuli, the Anxiety x Validity x Emotion interaction fell short of significance but was at trend level ( $F(2, 47) = 2.55, p = .089$ ). Whilst not significant, inspection of the means (shown in Table 2 and illustrated in Figure 1) in the anxiety group showed a slowed responding to angry faces on invalid trials, consistent with the hypothesis.

Figure 1: Graph to show the mean RTs for different emotions for the various conditions (anxiety and validity).



In addition to this hypothesised effect, there were other main effects. There was a significant Position x Anxiety interaction ( $F(1, 48) = 6.92, p = .011$ ), where the RTs of anxious children were slower when presentation of faces was in the lower location. There was also a significant Validity x Threat interaction ( $F(2,47) = 4.48, p = .017$ ) with the means showing that RTs were slower on invalid trials when faces were angry. The Position x Validity x Anxiety interaction was also significant ( $F(1, 48) = 4.33, p = .043$ ) with anxious children showing slower RTs on valid trials when presentation of faces was in the upper location. There was no main effect of Anxiety on RT for faces ( $F(1, 48) = .35, p = .558$ ).

For the words stimuli, no significant interaction was found between anxiety, threat and validity of trials ( $F(2,47) = 0.96, p = .908$ ). Inspection of the means

revealed that anxious children showed a slowed responding to invalid trials across all three threat conditions. In other words, there was no difference in the strength of the disengagement effect between threatening and non-threatening stimuli. This is in contrast to the pattern of results seen in the faces condition where the disengagement effect was stronger for angry faces.

There was a significant main effect of Validity ( $F(1, 48) = 7.97, p = .007$ ) such that children were slower on average to detect valid trials (contrary to expectation). There was no main effect of Anxiety on RT for words ( $F(1, 48) = 1.12, p = .295$ ).

In summary, analysis of the above ANOVAs showed a trend for the hypothesised disengagement effect in anxious children, but only for angry faces. This effect will therefore be the focus of further analysis in looking at its association with effortful control. In order to simplify subsequent analyses, a single index was created representing this bias in the disengagement from angry faces. This was done using a similar method to that used by Mathews & MacLeod (1985) for computing attentional bias scores for dot-probe tasks. Specifically, the average disengagement latency (invalid trials - valid trials) for neutral and fearful faces was subtracted from the average disengagement latency for angry faces. This score was significantly different between the anxious and non-anxious children ( $t(48) = 2.21, p = .032$ ). This effect was equivalent in magnitude to a correlation of  $r = .30$ .

### **Effortful Control**

Prior to testing associations between anxiety and effortful control, it was necessary to examine the inter-relations between the measures of effortful control, in order to determine the extent to which one or more summary measures could be



created. As can be seen from Table 3 which follows, correlations between measures of effortful control were largely not significant. There was a negative correlation between the alerting and conflict score, although the association was relatively weak ( $r = - 0.297$ ). The Go/No-Go score did not correlate with any of the other measures of effortful control. All the EATQ-R subscale scores correlated well with each other, as expected from published data on the measure. As such, the correlations suggested that the various different measures yielded broadly independent measures of effortful control, which therefore could not be used to create a single overall measure. Instead, each variable will be analysed separately (using only the total score for the EATQ).

Table 3: Correlations between the different measures of effortful control

	ANT orienting score	ANT conflict score	Go/No-Go Commission errors	EATQ Inhibition scale	EATQ Attention	EATQ Activation Control	EATQ Total
ANT alerting score	.151	-.297(*)	.027	.075	.115	.074	.103
ANT orienting score		-.203	.039	-.090	.009	-.021	-.034
ANT conflict score			-.018	-.001	-.099	.038	-.020
Go/No-Go Commission errors				-.068	-.097	.001	-.057
EATQ Inhibition scale					.774(**)	.450(**)	.820(**)
EATQ Attention						.571(**)	.896(**)
EATQ Activation Control							.840(**)

### Effortful Control and Anxiety

In the next section, in order to test the hypothesis that anxiety is associated with poorer effortful control, Independent Samples T-tests were carried out with each of the effortful control measures. The results of these are shown in Table 4.

Table 4: The associations between measures of effortful control and anxiety.

	T-value	No anxiety		Anxiety	
		Mean	Std. Deviation	Mean	Std. Deviation
ANT alerting score	0.327	22.46	(49.24)	17.68	(51.73)
ANT orienting score	0.41	17.33	(45.21)	17.95	(61.29)
ANT conflict score	1.702	76.65	(61.27)	104.06	(43.51)
Go/No-Go Commission errors	0.951	23	(7.88)	25	(6.39)
EATQ Total	0.779	60.41	(12.48)	57.78	(8.93)

As Table 4 shows, none of the results were found to be significant, although there was a trend for significance between the mean of the scores in the anxious and non-anxious groups with the ANT conflict score ( $t(48) = 1.702, p = 0.095$ ). The effect was in the expected direction, with anxious children showing greater attentional conflict interference.

### Testing interactions between effortful control and anxiety

In this final section regression analyses were employed to test whether the previously found disengagement effect for angry faces would be more apparent when anxious children were relatively low in their levels of effortful control, as argued by Derryberry & Reed (1996). Regressions were run with interactions terms created by

multiplying the anxiety group variable with the 5 indices of effortful control, as well as their main effects. The regression coefficients for the interaction terms are shown below in Table 5.

Table 5: Regressions showing the interactions between effortful control and anxiety in relation to the disengagement effect for angry face stimuli

	Beta	t	p
Anxiety x Alerting	-.045	-.324	.747
Anxiety x Go-No-Go	-.139	-.976	.334
Anxiety x Orienting	-.081	-.568	.573
Anxiety x EATQ-R	.011	.073	.942
Anxiety x Conflict	.030	.197	.845

As can be seen from the table above, the results showed that there were no significant interactions between effortful control and anxiety in relation to the anger disengagement effect. In other words, the longer disengagement time from angry faces demonstrated by anxious children in this sample did not vary as a function of any index of effortful control.

### **Controlling for confounds**

In this final section, the association between anxiety and disengagement from angry face stimuli was tested after controlling for several potential sources of confound, namely IQ, age, gender and aggressive behaviour problems. This was done using a single multiple regression analysis, presented in Table 6. In order to look at the effects of externalising behaviour on the disengagement effect from angry

face stimuli, two variables were selected. These were the teacher reports of externalising problems (CBCL) and the child self-reports of physical aggression (CSBS).

Table 6: Regressions showing the interactions between anxiety and the disengagement effect from angry face stimuli, controlling for age, IQ, gender, and aggressive behaviour problems.

	Beta	T	P
Gender	.212	1.543	.130
Age	-.220	-1.608	.115
IQ	-.387	-2.766	.008
Externalising Problems	.354	2.532	.015
Physical Aggression	-.341	-2.450	.018

The results from table 6 above show that the anxiety effect remains even when controlling for gender, age, IQ, externalising problems and physical aggression. In addition to this effect however, there were also significant effects for self-reported aggression, teacher reported externalising problems and IQ. Children with higher IQ showed generally faster disengagement from angry faces than children with lower IQ. Surprisingly, teacher reports of externalizing behaviour problems and self-reports of aggression had effects operating in opposite directions. Higher teacher reported externalizing problems was associated with a slower disengagement from angry faces, while higher self-reported aggression was associated with a speeded disengagement from angry faces.

## **Discussion**

The aim of this study was to examine the role of effortful control in relation to attentional biases in children's anxiety and to examine, in particular links between anxiety and attentional disengagement from threat. This was done in order to further the evidence base in children about the links between attentional biases and anxiety (Ehrenreich et al., 1998; Vasey et al., 1998), effortful control and anxiety (Eisenberg et al., 2000), and the potential moderating role of cognitive control processes in the development of children's anxiety (Lonigan and Phillips, 2001). The study was organised by hypotheses stemming from the work of Lonigan and Phillips (2001) who proposed that when children are unable to control their attention in relation to threat, they develop biases of attention which heighten and maintain anxiety symptoms. The presence of these biases in anxious adults has been shown to be moderated by effortful control, the effect of which has been seen to be most effective at the attentional disengagement stage (Derryberry & Reed, 1996).

In the following discussion, the study's hypotheses will be considered in light of the results. The main limitations of the research will be considered, focusing particularly on measurement issues, the method of analysis chosen, and sampling issues. The clinical implications of the findings will then be explored very briefly in line with this.

### **Anxiety and Attentional Biases**

The most notable finding in this study was that anxious children showed a slowed responding to angry faces on invalid trials (i.e. when the target was displayed in a position opposite to where an angry face cue had been presented), consistent with the hypothesis. This indicates a bias in anxious children towards difficulty

disengaging attention after presentation of angry faces. Although the predicted interaction did not reach statistical significance the disengagement effect seen in anxious children was stronger for angry faces than it was for neutral or fearful faces. This was the first study of its kind to study this phenomenon in children. It provides further evidence to support the results of adult studies which have shown that anxious individuals have difficulties with attentional disengagement from emotional stimuli (Fox, Russo, Bowles, and Dutton, 2001; Yiend and Mathews, 2001).

It is unclear why it was that difficulties with disengagement were seen in response to angry, but not fearful faces. One possibility could be that angry faces are evaluated by children as more threatening than fearful faces, and so provide a more valid socially threatening stimulus. Another possibility could be that angry faces are particularly salient for children at this age, given that they are at a developmental stage where fear of social rejection features prominently. Peer, teacher, and parent reactions and responses are important to children of this age.

It is also unclear why the disengagement effect was seen to faces but not words. One explanation could be the greater ecological validity facial stimuli offer. Adult studies investigating avoidance have shown a greater emotional response to facial stimuli rather than words (Chen, Ehlers, Clark & Mansell, 2002). In this way, facial stimuli may offer a more intense or realistic threat to anxious children than words do. Another plausible possibility is that the long presentation time for word stimuli mitigates against detecting the relevant, probably quite rapid, attentional processes.

The results also showed that aggression was associated with the anger bias effect. Higher teacher reported externalizing problems was associated with a slower disengagement from angry faces, while higher self-reported aggression was

associated with a speeded disengagement from angry faces. It is unclear why parents and teachers reported effects occurring in opposite directions. The fact that aggression seems to have an effect on disengagement certainly merits further research. Vasey (1998; cited in Ehrenreich and Gross, 2002) found the effect of anxiety disappeared when controlling for aggression. The results of the current study also found that aggression independently contributed to the effect, but unlike Vasey's research, it was not strong enough to account for the effect. Certainly, theories of aggression also make references to biases in information processes (e.g. Crick and Dodge, 1994), so in that context the result is potentially significant. As well as further research being needed on the role of aggression, more is also needed on the role of intelligence, as this study also showed that IQ had a significant effect on speed of disengagement from angry faces. It is unclear what might give rise to such an association, as the bias effect should not be strongly influenced by general cognitive factors such as reaction time, or even general attentional disengagement capacities. It is conceivable that IQ is correlated with processes more closely related to social experiences that in turn impact on children's face processing (e.g. family climate, children's experiences of bullying).

### **Anxiety and Effortful Control**

There was no support found for the hypothesis that poor effortful control would be linked to anxiety, contrary to some of the research to date (Caspi et al, 1995; Eisenberg et al., 2004; Lemery et al. , 2002; Muris et al., 2004). Instead, the results showed that anxious children were not more prone to low levels of effortful control, apart from a marginal effect seen on the conflict score from the Attention Network Task. In consideration of why this might be the case, it is worth pointing



out that most of the research on effortful control to date has involved assessments of internalizing symptoms (not specifically anxiety) reported by parents/teachers (e.g. Lemery et al., 2002; Caspi et al, 1995). Firstly, low levels of effortful control tend to be linked consistently with externalising problems in the literature (Kockanska & Knaack, 2003; Olson, Schilling, & Bates, 1999; Rothbart, Posner, & Hershey, 1995), but less consistently with internalising problems. Krueger et al. (1996) for example found no relation between continuous measures of parent or teacher reported internalising and boys' ability to delay gratification, and Murray and Kochanska (2002) found that internalising problems were associated with very high levels of their observational measure of high effortful control. This suggests that further research is needed in order to clarify the nature of the association between effortful control and anxiety more conclusively.

Secondly, it is questionable how reliable studies are which use third party reports to measure attentional control. This is because they rely on adults to make assumptions about the internal states of children through observation of their behaviour. Once effortful control is assessed directly and less subjectively, as it was in this study, it is easy to see how associations between the variables can change. The problem with observational measures of effortful control is that they naturally risk tapping related constructs such as reactive control (as reflected in behavioural inhibition), rather than the more active control of effortful control. Hence, studies which rely on parents and teachers to assess levels of effortful control in children, could in fact be picking up a less pure measure of the construct, thereby contaminating the nature of the construct's relationship to internalising problems.

Another possible reason for the lack of evidence found in this study to support the hypothesis that anxiety is associated with difficulties with effortful

control may be because there was a lack of variation in anxiety in the normative sample used, with not enough children being anxious enough. Alternatively it may be that more significant associations were not found because children who are anxious tend to compensate by trying harder, which may mask underlying difficulties with attentional control. In that sense, it is in theory possible that attentional biases may be more apparent when testing takes place under conditions of high cognitive load, where the potential for using compensatory strategies may be more limited. The tasks used in the current study place minimal attentional load on children. This may be a useful avenue to explore in future work.

### **Anxiety, Effortful Control and Attentional Biases**

This study was not able to provide evidence to support the hypothesis linked to the work of Derryberry & Reed (1996) that executive control accounts for the link between anxiety and attentional bias. No measure of effortful or executive control was associated significantly with anxiety, and effortful control did not interact with anxiety when predicting attentional disengagement from angry faces in regression analyses. The most plausible reason for this is that the study relied on a sample of normative school children who displayed relatively low levels of anxiety symptomatology. It may well be that the interactive effect of anxiety and effortful control only appears when studying children with clinical levels of anxiety symptomatology, or with anxiety that reaches a certain threshold. Indeed, the results of Ehrenreich et al. (1998) and Vasey's investigations all appear to support the idea that a higher level of symptom severity is needed to achieve reliable childhood attentional biases to threat.

## **Methodological Limitations**

### *Measurement Issues*

The failure to detect associations between anxiety and formal tests of attentional control could in part be accounted for by measurement limitations. While the measures chosen were designed to pick up important aspects of attentional functioning, it is possible that other aspects of attention and cognitive function might have led to the detection of anxiety-related effects. The measures of effortful control used in the study were chosen carefully in relation to the preciseness with which they indexed specific cognitive processes (attentional orienting, attentional control, inhibition), but a more comprehensive behavioural battery such as that suggested by Murray and Kochanska (2002) might have provided greater predictive power. A more valid measure of effortful control might have been obtained by assessing a broader range of cognitive measures of executive function such as working memory, planning, and distractibility/sustained attention. If these had been carried out, it is conceivable that more support for the hypotheses might have been found.

One of the main problems faced in a study like this which attempts to directly assess effortful control, is that it tends to be referred to and discussed in the literature as a single construct. Typically studies of effortful control in the literature find a single dimension to their measure, but they rely on parent reports and behavioural batteries (eg using delay of gratification tasks). In the current study, measures of cognitive attentional control were not correlated at all. While it was expected that alerting, orienting and conflict would be uncorrelated, replicating previous research (Fan, McCandliss, Flombaum, Thomas & Posner, 2003; Posner & Petersen, 1990), it was surprising that no association was found between attentional conflict performance in the Attention Network Task and commission errors in the Go/No-Go

task, both of which are thought to involve inhibitory processes. This could mean that the measures are not valid and reliable enough, or that when you measure these skills in a more controlled way like as in this study, it is very multi-dimensional and that the tasks pick up slightly different things. Either way, problems are posed in terms of limiting the capacity to detect relationships between effortful control, attentional biases and anxiety.

### *Definition of anxiety*

The results of this study showed a lack of correspondence between reports of anxiety. After some consideration, it was felt that the problem posed by this would most reasonably be dealt with by combining the anxiety scores. Whilst there was some logic to this (eg avoids multiple testing) it could also have limited the validity of the measure as a measure of anxiety. An alternative approach might have been to solely use a child self-report questionnaire as a measure of anxiety, in recognition of the fact that it is harder for others to rate anxiety than the person themselves. However, it is risky assuming that self-ratings provide the best assessment as it is known that self-report measures are prone to biases.

Bogels & Van Mellick (2004) highlighted that a lack of correspondence between respondents on ratings of anxiety is not unusual in psychological research as child self-report and adult ratings often do not correlate well. To counter this, a more detailed picture of children's anxiety could perhaps have been gained through the use of an interview method, or through more direct methods such as taking physiological measurements.

*Sampling*

Another limitation to this study which may have had a negative impact on the results was the suggestion of under-power in the results. This can be seen in the fact that the results showed that there was a weak anger bias effect, only significant in an omnibus test at a trend level. In a larger sample size, a more significant result may have been seen. Similarly, in a much larger sample, the effortful control interaction might also have appeared. Also, had the study been carried out on a large sample with a better representation of very anxious children, sources of error and bias, such as social desirability bias, may have been less influential and allowed for the detection of systematic effects. For example, it may be that for children, perhaps boys especially, acknowledgment of feelings of fear does not tend to be encouraged socially and thus in a small sample the contaminating influences of such effects will more dramatically impact on study results.

In summary, the issue of how to appropriately measure the key constructs implicated in this study present dilemmas shared to a large extent by other studies in the field. While the measurement approach adopted in this study has some limitations, it also afforded a number of strengths. Compared to other studies in the literature to date, effortful control was measured here in much more rigorous way than has been attempted previously, and through the use of a task which employed both faces and words attentional biases were assessed in a more multi-modal fashion than has been the case before. Other studies like this, which take a more direct approach to the measurement of the cognitive control processes involved in anxiety, are surely much needed if our understanding of the mechanisms involved is to be advanced.

This study supports the interest which has increasingly developed in disengagement, and detecting the cognitive mechanisms implicated in children's anxiety is important to research further. Recasting attentional biases in terms of disengagement from threat may have clinical implications in terms of models of intervention. These will be touched upon in paper three, along with some of the wider theoretical implications arising from the current study.

## References

- Achenbach, T. M. (1991). Integrative guide for the 1991 CBCL/4-18, YSR and TRF profiles. Burlington: University of Vermont, Department of Psychiatry.
- Achenbach, T. M. & Edelbrock, C. (1986). *Manual for the Teacher's Report Form*. Burlington: University of Vermont, Department of Psychiatry.
- Allen, S. (2005) Effortful Control, Attentional Biases and Problem Behaviours in Children. *D.Clin.Psy. thesis*. UCL (unpublished)
- Anderson, J. C., Williams, S., McGee, R., & Silva, P. A. (1987). DSM-III disorders in preadolescent children: Prevalence in a large sample from the general population. *Archives of General Psychiatry*, 44, 69 – 76
- Barkley, R. A. (1997). Behavioral inhibition, sustained attention, and executive functions: Constructing a unifying theory of ADHD. *Psychological Bulletin*, 121, 65 – 94
- Beck, A. T. (1976). Cognitive therapy and the emotional disorders. New York: International Universities Press. In J. S. Beck (1995) *Cognitive Therapy: Basics and Beyond*. New York: Guilford Press.
- Bell-Dolan, D. J., Last, C. G., & Strauss, C. C. (1990). Symptoms of anxiety disorders in normal children. *Journal of the American Academy of Child and Adolescent Psychiatry*, 29, 759 – 765
- Bijttebier, P. (1998). Monitoring and blunting coping styles in children. Unpublished Doctoral Thesis. Catholic University of Leuven, Belgium.
- Birmaher, B., Khertarpal, S., Brent, D., Cully, M., Balach, L., Kaufman, J. & McKenzie Neer, S. (1997). The screen for child anxiety related emotional disorders (SCARED): scale construction and psychometric characteristics.

*Journal of the American Academy of Child and Adolescent Psychiatry*, 36,  
545 – 553

- Bogels, S. M. & van Mellick, M. (2004). The relationship between child-report, parent self-report, and partner report of perceived parental rearing behaviours and anxiety in children and parents. *Personality and Individual Differences*, 37, 1583 – 1596.
- Burke, C. B., Burke, J. D., Reiger, D. A., & Rae, D. S. (1990). Age at onset of selected mental disorders in five community populations. *Archives of General Psychiatry*, 47, 511 – 518
- Capaldi, D. M., & Rothbart M. K. (1992). Development and validation of an early adolescent temperament measure. *Journal of Early Adolescence*, 12, 153 - 173
- Caspi, A., Henry, B., McGee, R. O., Moffitt, T. E. & Silva, P. A. (1995). Temperamental origins of child and adolescent behaviour problems: From age three to age fifteen. *Child Development*, 66, 55 – 68
- Chen, Y. P., Ehlers, A., Clark, D. M. & Mansell, W. (2002). Patients with generalised social phobia direct their attention away from faces. *Behaviour Research and Therapy*, 24, 399 – 409.
- Crick, N. R. (1991). Subgroups of neglected and rejected children. Paper presented at the biennial meeting of the Society for Research in Child Development, Seattle.
- Crick, N. R., & Dodge, K. A. (1994). A review and reformulation of social information-processing mechanisms in children's social adjustment. *Psychological Bulletin*, 115, 74-101.



- Crick, N. R. & Grotpeter, J. K. (1995). Relational Aggression, Gender, and Social-Psychological Adjustment. *Child Development, 66*, 710 – 722
- Derryberry, D., & Reed, M. A. (1996). Regulatory processes and the development of cognitive representations. *Development and Psychopathology, 9*, 633 – 652
- Derryberry, D., & Rothbart, M. K. (1998). Affect, arousal, and attention as components of temperament. *Journal of Personality and Social Psychology, 55*, 958 – 966.
- Drotar, D., Stein, R. E. & Perrin, E. C. (1995). Methodological issues in using the Child Behaviour Checklist and its related instruments in clinical psychology research. *Journal of Clinical Child Psychology, 24*, 184 - 192
- Ehrenreich, J. T., Coyne, L. W., O'Neill, P. & Gross, A. M. (1998). Attentional bias to threat cues in childhood anxiety: A preliminary investigation of lexical and facial cues. Poster session presented at the annual convention of the Association for the Advancement of Behaviour Therapy, Washington, DC.
- Ehrenreich, J. T., & Gross, A. M. (2002). Biased attentional behaviour in childhood anxiety: A review of theory and current empirical investigation. *Clinical Psychology Review, 22*, 991 - 1008
- Eisenberg, N., Cumberland, A., Spinrad, T. L., Fabes, R. A., Shepard, S. A., Reiser, M., Murphy, B., Losoya, S. H. & Guthrie, I. K. (2001). The relations of regulation and emotion to children's externalising and internalising problem behaviour. *Child Development, 72*, 1112 – 1134
- Eisenberg, N., Fabes, R. A., Guthrie, I. K. & Reiser, M. (2000). Dispositional emotionality and regulation: Their role in predicting quality of social functioning. *Journal of Personality and Social Psychology, 78*, 136 – 157

- Eisenberg, N., Spinrad, T. L., Fabes, R. A., Reiser, M., Cumberland, A., Shepard, S. A., Valiente, C., Losoya, S. H., Guthrie, I. K. & Thompson, M. (2004). The relations of effortful control and impulsivity to children's resiliency and adjustment. *Child Development, 75*, 25 – 46
- Ellis, L. K. & Rothbart, M. K. (2001). Revision of the Early Adolescent Temperament Questionnaire. Poster presented at the 2001 Biennial Meeting of the Society for Research in Child Development, in Minneapolis, Minnesota. Available;  
<http://darkwing.uoregon.edu/~maryroth/LesaEllisSRCDDPosterReprint.rtf>
- Fan, J., McCandliss, B. D., Flombaum, J. I., Thomas, K. M., & Posner, M. I. (2003). Cognitive and brain consequences of conflict. *NeuroImage, 18*, 42 - 57
- Fan, J., McCandliss, B. D., Sommer, T., Raz, A., & Posner, M. I. (2002). Testing the efficiency and independence of attentional networks. *Journal of Cognitive Neuroscience, 14*, 340 - 347
- Fox, E., Russo, R., Bowles, R. & Dutton, K. (2001). Do threatening stimuli draw or hold visual attention in subclinical anxiety. *Journal of Experimental Psychology, 130*, 681 – 700
- Kaufman, A. S. (1990). *Assessing adolescent and adult intelligence*. Boston: Allyn & Bacon.
- Kochanska, G., Coy, K. C., Tjebkes, T. L. & Husarek, S. J. (1998). Individual differences in emotionality in infancy. *Child Development, 69*, 375 – 390
- Kochanska, G. & Knaack, A. (2003). Effortful Control as a Personality Characteristic of Young Children: Antecedents, Correlates, and Consequences. *Journal of Personality, 71:6*, 1087 – 1112

- Last, C. G., Hanson, C., & Franco, N. (1997). Anxious children in adulthood: A prospective study of adjustment. *Journal of the American Academy of Child and Adolescent Psychiatry*, 35, 645 – 652
- Lemery, K. S., Essex, M., & Smider, N. (2002). Revealing the relationship between temperament and behaviour problem symptoms by eliminating measurement confounding: Expert ratings and factor analyses. *Child Development*, 73, 867 – 882.
- Lezak, M. D. (1995). *Neuropsychological assessment*. (3<sup>rd</sup> edition). New York: Oxford University Press.
- Lezak, M. D., Howieson, D. B., & Loring, D. W. (2004). *Neuropsychological Assessment* (4<sup>th</sup> ed.). Oxford: Oxford University Press
- Lonigan, C. J. & Phillips, B. M. (2001). Temperamental influences on the development of anxiety disorders. In M. W. Vasey & M. R. Dadds (Eds.), *The Developmental Psychopathology of Anxiety*. New York: Oxford University Press.
- MacLeod, C., Mathews, A., & Tata, P. (1986). Attentional bias in emotional disorders. *Journal of Abnormal Psychology*, 95, 15 – 20
- Mathews, A., & MacLeod, C. (1985). Selective processing of threat cues in anxiety states. *Behaviour Research and Therapy*, 21, 233 – 239
- Matsumoto, D., & Ekman, P. (1988). The Japanese and Caucasian facial expressions of emotion (JACFEE) and Neutrals (JACNeuF) [Slides]: Intercultural and Emotion Research Laboratory, Department of Psychology, San Francisco State University, 1600 Holloway Avenue, San Francisco, CA 94132, USA.

- Muris, P., de Jong P. J., & Engelen, S. (2004) Relationships between neuroticism, attention control, and anxiety disorders symptoms in non-clinical children, *Personality and Individual Differences* 37, 789 – 797
- Muris, P., Merckelbach, H., Mayer, B., Van Brakel, A., Thissen, S., Moulaert, V., & Gadet, B. (1998). The Screen for Child Anxiety Related Emotional Disorders and its relationship to traditional childhood anxiety measures. *Journal of Behavior Therapy and Experimental Psychiatry*, 29, 327 - 329
- Muris, P., Merckelbach, H., Schmidt, H., & Mayer B. (1999). The revised version of the Screen for Child Anxiety Related Emotional Disorders (SCARED-R): Factor structure in normal children. *Personality and Individual Differences*, 26, 99 – 112
- Muris, P., Merckelbach, H., Wessel, I., & van de Ven, M. (1999). Psychopathological correlates of self-reported behavioural inhibition in normal children. *Behaviour Research and Therapy*, 37, 575 – 584.
- Murray, K. T. & Kochanska, G. (2002). Effortful Control: Factor Structure and relation to Externalizing and Internalizing Behaviors. *Journal of Abnormal child Psychology*, 30, 503 – 514
- Olson, S. L., Schilling, E. M., & Bates, J. E. (1999). Measurement of impulsivity: Construct coherence, longitudinal stability, and relationship with externalizing problems in middle childhood and adolescence. *Journal of Abnormal Child Psychology*, 27, 151 – 165
- Pennington, B. F., & Ozonoff, S. (1996). Executive function and developmental psychopathology. *Journal of Child Psychology and Psychiatry*, 1, 51 – 87
- Posner, M. I., & Petersen, S. E. (1990). The attention system of the human brain. *Annual Review of Neuroscience*, 13, 25 - 42

- Rothbart, M. K., Ahadi, S., & Hershey, K. L., & Fisher, P. (2001). Investigations of temperament at three to seven years: The Children's Behavior Questionnaire. *Child Development, 72*, 1394 - 1408
- Rothbart, M. K., & Bates, J. E. (1998). Temperament. In N. Eisenberg, & W. Damon (Eds.), *Handbook of Child Psychology: Volume 3. Social, emotional, and personality development*, 105 – 176. New York: Wiley.
- Rothbart, M. K., Posner, M. I. & Hershey, K. L. (1995). Temperament, attention, and developmental psychopathology. In D. Cicchetti & D. J. Cohen (Eds.), *Developmental psychopathology: Vol 1. Theory and methods* (pp. 315 – 340). New York: Wiley.
- Rubia, K., Taylor, E., Smith, A. B., Oksannen, H., & Newman, S. (2001). Neuropsychological analyses of impulsiveness in childhood hyperactivity. *British Journal of Psychiatry, 179*, 138 – 143
- Rueda, M. R., Fan, J., Halparin, J., Gruber, D., Lercari, L. P., McCandliss, B. D., et al. (2004). *Development of attention during childhood. Neuropsychologia, 42*, 1029 – 1040
- Spence, S. H. (1998). A measure of anxiety symptoms among children. *Behaviour Research and Therapy, 36*, 545 - 566
- Spence, S. H. (1999). The Spence Children's Anxiety Scale (SCAS). University of Queensland, Brisbane.
- Toren, P., Sadeh, M., Wolmer, L., Eldar, S., Koren, S., Wiezman, R. & Laor, N. (2000). Neurocognitive Correlates of Anxiety Disorders in Children: A Preliminary Report. *Journal of Anxiety Disorders, 14*, 239 – 247
- Vasey, M. W., Daleiden, E. L., Williams, L. L., & Brown, L. M. (1995). Biased

- attention in childhood anxiety disorders: A preliminary study, *Journal of Abnormal Child Psychology*, 23, 267 – 279
- Vasey, M. W., El-Hag, N., & Daleiden, E. L. (1996). Anxiety and the processing of emotionally threatening stimuli: Distinctive patterns of selective attention among high- and low-test-anxious children. *Child Development*, 67, 1173 – 1185
- Vasey, M. W., & MacLeod, C. (2001). Information-processing factors in childhood anxiety. In M. W. Vasey & M. R. Dadds (Eds.), *The developmental psychopathology of anxiety*, 253 – 257. New York: Oxford University Press
- Vasey, M. W., & Schippell, P. (2000). Beyond anxiety: Coping preferences and depression as correlates of threat-relevant attentional bias in adolescence. Manuscript in preparation.
- Vasey, M. W., & Schippell, P., Cravens-Brown, L., & Bretveld R. (1998). Patterns of threat-relevant attentional bias in childhood: distinctive patterns related to anxiety versus externalizing behaviour problems. Poster session presented at the annual convention of the Association for the Advancement of Behavior Therapy, Washington, DC.
- Wechsler, D. (1999). Wechsler Abbreviated Scale of Intelligence (WASI). The Psychological Corporation.
- Wechsler, D. (1991). Wechsler Intelligence Scale for Children (WISC-III) – Third Edition. The Psychological Corporation.
- Wechsler, D. (1997). Wechsler Adult Intelligence Scale (WAIS-III) – Third Edition. The Psychological Corporation.

Yiend, J., & Mathews, A. (2001). Anxiety and attention to threatening pictures.  
*Quarterly Journal of Experimental Psychology: Human Experimental  
Psychology, 54*, 665 - 681

## **Paper 3: Critical Appraisal**

**Attentional Biases in Children's Anxiety:**

**The Role of Executive Control**



This paper is divided into three sections. The first, theory and research, will begin by outlining why the particular topic was chosen for study. It will go on to highlight some of the methodological dilemmas that arose in carrying out the research related to issues of sampling, design and measurement. Following this, there will be some discussion on how further research might have added to the results, and how alternative theoretical conceptualisations might explain discrepancies between the findings of this study and the other main ones in the field. The second section of this paper will focus on some of the clinical implications which stem from this study, and how the findings could be used to inform treatment interventions. The third and final part will consist of some brief personal reflections on the research process.

## **Theory and Research**

### *Decision of topic for study*

It became clear to me as a psychologist with experience of working clinically in both paediatrics and more general child settings, that anxiety disorders seem to consistently represent a significant proportion of the caseload of most clinicians in these settings. It is common for children to have suffered from clinical anxiety for several years before reaching the attention of these services, and for some of these children to have received psychological treatment unsuccessfully several times previously. An interest in why this might be the case led to the decision to study some aspect of the developmental psychopathology of anxiety.

The evidence base soon revealed that relatively little research has been carried out on internalising disorders to date compared to externalising disorders, despite the fact that figures have shown that anxiety disorders represent some of the most prevalent forms of psychopathology affecting children today (Anderson,

Williams, McGee & Silva, 1987). Prevalence rates are estimated to be running at up to 17%, with a significant proportion of anxiety disorders being resistant to treatment and running a chronic course (Last et al., 1997). It has also been shown that around 50% of children who show symptoms of anxiety, but do not yet meet diagnostic criteria, are then diagnosed as meeting the criteria for an anxiety disorder 6 months later if they are left untreated (Dadds, Spence, Holland, Barrett, & Laurens, 1997). Thus, early symptoms of anxiety are clearly a factor in predicting the onset of full-blown anxiety disorders. When these disorders do develop, the wide range of social, emotional, and academic consequences associated with them, can be extremely debilitating for children.

All this seemed to point to a need to contribute in some way to research on the processes involved in the development and maintenance of anxiety. This study was carried out in the hope that it could in some small way improve our understanding of some of the factors involved in this, as it is new understandings that ultimately lead to modifications in treatment.

### **Methodological dilemmas**

#### *Participant population*

A number of dilemmas presented themselves in designing this study. The first, and one of the most central, was whether or not to use a clinical population of children. After consideration, the decision to use a 'normal' sample was taken in recognition of the fact that most research on developmental psychopathology tends to focus on children with clinically significant behaviour. Whilst this is understandable, it does mean that the potential continuity with normal behaviour can get overlooked. Added to this, working within the limits of a study like this meant that recruiting a

clinical sample of children would have been extremely difficult to do within the limited time available.

In hindsight, the decision not to use a clinical population may have been responsible for the lack of support found for the hypotheses. Reliance on a normative population meant that the vast majority of children ended up with levels of anxiety within the normal range and did not meet the diagnostic criteria for anxiety disorders. This can often be the case among general population studies (Murry & Kochanska, 2002).

In future research, it would be interesting to study a clinical sample of children, or to study a community sample where the design of the study was altered to allow for a better range of anxiety. Selective screening could ensure the inclusion of a substantial number of children with at least borderline clinical levels of anxiety, as a few other studies have done (eg Eisenberg et al., 2004). Several hundred questionnaires could be sent out, for instance, and the fifty most anxious children selected. If the study was to use a sample with a higher base rate of psychopathology, some of the interactive effects absent in this study might appear.

#### *Multi-informant methodology*

The decision was made to use a multi-informant methodology in order to try and maximise the reliability of measurement. Parent and teacher reports were included in the hope of avoiding some of the potential problems that occur with the exclusive use of self-report measures. It was hoped that designing the study to include useful cross-validated information would build on the limitations of other studies which have investigated links between attentional control and anxiety, without using such a comprehensive approach (eg Muris et al 2004). Had the

hypotheses been better supported, the findings of the current study would have been compelling because of the advantage of using multiple reporters to assess the constructs.

Although on balance this strategy was certainly felt to be the most reasonable, it was not completely problem-free. The main problem was that anxiety is a uniquely an internal state that may be reported most reliably by the individual themselves (Stallings & March, 1995). Indeed, parents have been shown to be unreliable informants of children's internalising problems (Kolko & Kazdin, 1993), partly because inferring internal affective states such as anxiety and fearfulness can be more difficult to determine than less obvious externalising behaviours. Thus, it is possible that third party reports may have had a negative impact on the results by not providing an accurate enough picture of levels of anxiety.

#### *Measurement issues*

Many dilemmas arose in designing this study which related to which measures to use to assess the constructs under investigation. As highlighted in paper two, it is not easy to obtain a comprehensive assessment of effortful control, given all the difficulties there are with operationalising the construct. The revised Early Adolescent Temperament Questionnaire (EATQ-R: Ellis & Rothbart, 2001) was chosen to provide a parental assessment of the construct. This measure was updated by the designers of the much used and well validated Child Behaviour Questionnaire (CBQ: Rothbart, Ahadi, Hershey, & Fisher, 2001) and has been outlined as being suitable for 9-11 year olds. However, it is not a tool that has been as well validated or as widely used as the CBQ and it did not correlate well with other measures of

effortful control. Therefore, it is difficult to know how reliable an assessment of effortful control it provided.

The issue of how many measures to use in the assessment battery certainly presented dilemmas, and it is possible that the validity of the effortful control measure in this study might have been compromised by not assessing a broad enough range of measures of cognitive function. Wider measures of executive function such as working memory and sustained attention might have been valuable, or alternatively, the inclusion of more behavioural tests to assess attentional control such as the Test of Everyday Attention for Children (Manly et al., 2001) or the behavioural battery suggested by Murray and Kockanska (2002).

In terms of the IQ assessment, it has been suggested that verbal intelligence is related to performance on a Continuous Performance Task, such as was employed in this study (Swanson and Cooney, 1989). However, only a non-verbal measure was used in the current study as it was felt the briefest means of achieving a rough estimate of a child's IQ. Although the use of a verbal intelligence task was considered at the design stage, it was rejected on the basis that it would have added another 20 minutes or so to testing time. Children of this age can take their time to form and express their ideas, and this is often particularly evident in a vocabulary task. It might have been interesting though to assess verbal intelligence in order to see what it could contribute to the results.

Whilst inclusion of tasks such as these might have improved the study, their potential use raised a whole host of methodological dilemmas. The most obvious of these was the difficulty of being able to incorporate them into the battery with limited time and financial resources. Another was that including extra measures in the assessment battery would have made an already lengthy test procedure, even

longer. It was not easy to find two schools to participate in the research. Many of those approached declined to take part due to a reluctance to let children out of lessons for so long. Hence, making the assessment procedure even longer did not seem an attractive option. Added to this, each child was already being subjected to an assessment battery involving attentional tasks that lasted over an hour and there was concern that adding to this might affect the results. Children of this age have limited attention spans, tiring and losing interest easily, and so caution was taken in making too many demands on them. In hindsight, this attitude may have been a little over-cautious. In time, perhaps a school would have consented to a longer battery, and with regular breaks the children may have been able to manage some additional tasks. Perhaps this would have afforded benefits to the study.

#### *Further research*

One of the interesting things that came out of this study was that the results showed that finding attentional biases in children is much harder than one might think. They seem to be less robust and less easily found in children than they are in adults, as the empirical paper and the review of existing studies showed. This may be a methodological issue linked to the somewhat arbitrary decisions that had to be made in designing this study (and others), given the absence of much existing research on children in this area.

Having the opportunity to experiment with different variations of target identification, probe detection, and other tasks would probably have ensured a better appreciation of which method in fact offers the most reliable means of identifying attentional biases consistently in children. For example, one of the computerised identification tasks used in this study involved individual threat words appearing on

the screen. However, the likelihood of encountering single threat words in the real world perhaps made them rather a narrow stimulus to generate a realistic response. Experimenting with alternative designs would have made it more likely that a clear threat message was conveyed as accurately as possible, thereby ensuring the most accurate conclusions could be drawn about children's information processing abilities. Repeating this study with faster presentation times of threat cues would clarify whether the presentation time for words in the task used was too long and allowed for too much movement of attention. One possible reason that the current study did not support Lonigan and Phillip's (2001) model more strongly might have been because levels of anxious arousal were not high enough in the children during the experimental procedure. In theory, if a study could be designed with more challenging tasks, greater effects of attentional control might have appeared.

Modifications such as these, based on the findings of additional research, might in future result in stronger disengagement effects being seen in anxious children. These type of tasks need to be developed because the attentional processes of children do not seem to map directly from those found in adults. It may well be that more sensitive methods need to be developed to tap biases in children reliably.

#### *Alternative theoretical conceptualisations*

Disengagement difficulties have been conceptualised as being about problems with executive control. In theoretical terms, it could be hypothesised that this control comes from some central attentional resource in the brain responsible for general attentional ability. In this conceptualisation, following Lonigan and Phillips (2001) and others, it could be imagined that the brain automatically evaluates the significance of information and then creates its own pattern of priorities based upon

this evaluation. Stimuli are then responded to according to the particular level of significance it holds, which has been determined by the brain's sorting and prioritising process. Attention moves to the most salient stimuli first, making them most likely to be processed by the higher order thinking processes. This ability of the brain to scan information and automatically regulate and reorganise priorities effectively is thought to be modified by an executive system sometimes referred to as the 'Supervisory Attentional System' (SAS; Shallice, 1988). It is a system which takes control of action when dealing with novelty or conflict. This might, for example, occur when a highly salient stimulus (e.g. a threat cue) captures attention and interferes with goal-directed behaviour (e.g. responding to a target stimulus, or encoding non-threat information). The role of a central executive system would be to adjust cognitive processing when reactive, automatic priority-driven processing produces behaviour that conflicts with adaptive functioning. Consequently, a model such as this might suggest that attentional disengagement effects in emotional cueing tasks reflect differences in automatic evaluation processes and the influence (or relative lack of influence) of a central supervisory attention system. This, in effect is how Derryberry and Reed interpreted their findings. In the current study, an attempt was made to measure these processes, but unexpectedly it did not appear to relate to the ability to disengage.

There could be a number of possible reasons for this. Some explanations of course would involve methodological considerations. However, it may also be that the conceptualization is wrong. One alternative account is that disengagement effects seen in attentional cueing tasks may be more about competition between stimuli than they are about attentional control. It is possible that rather than disengagement difficulties being related to difficulties with cognitive control, they are instead more



to do with differences in the perceived salience of cues and targets. Perhaps differences in the salience of faces and targets determine how quickly children disengage their attention. It could be that anxious children are not able to disengage their attention easily if an angry face is perceived as much more salient than other stimuli and that the difference in time taken to disengage attention reflects a passive process of competition between stimuli differing in salience. This could explain why, in the current study, attentional disengagement effects were found to be associated with children's anxiety but this could not be related in any way to measures that ought to tap into relatively central executive capacities. The difficulty with this argument however, is that Derryberry & Reed (1996) did in fact find direct evidence that slowed attentional disengagement from threat may occur in adults with high trait anxiety who also rated themselves as having poor attentional control abilities. Nevertheless, this finding has not been replicated in adults, and has not been tested in children at all. Furthermore, the reliance on a self-report of attentional control leaves open the possibility that attentional control was not measured properly.

In attempting to explain the discrepancy between Derryberry and Reed's findings and those of the current study, one has to consider the possibility that their finding represented something of a chance result. More studies are needed in order to assess whether their findings can be replicated in wider research with adults. Alternatively, it could be that effortful control plays differing roles in children's development at different stages. It may be that attentional control processes play a greater role in children's cognitive biases as they get older and are less important when they are younger. Further research would clarify the developmental processes involved and could be studied by investigating different age cohorts of children, such as a group of 10, 12, and 14 year olds. Longitudinal research is also much needed.

This could be done through the early assessment of temperament using multiple methods and follow-up over time, to allow for greater insight into the temperamental risk factors which lead to the development of attentional biases and anxiety. This would provide researchers with useful information about whether children first develop anxiety and then attentional biases, or whether the biases themselves are a cause of the anxiety developing. This data is currently lacking and so the role of effortful control in children's development at different stages is still poorly understood.

Additional research would also be helpful on the contributions of wider factors such as parenting and peer influence on individual differences in effortful control and anxiety, and how social influences interact with personality characteristics of children in predicting pathology. This is because as well as an interaction between low effortful control and high negative affectivity, Lonigan & Phillips (2001) themselves have pointed out that there may be a number of other factors like this which are likely to have a large influence on the expression of anxiety, even in children prone to anxiety.

### **Clinical Implications**

The main clinical implication of the results of this study is that attentional disengagement may be an important factor in anxious children's processing of emotionally salient stimuli. It is possible that a greater understanding of the role of attentional biases in anxiety may be able to contribute towards improvements in traditional CBT interventions. Improvements are certainly needed because the evidence-base indicates that although CBT is recommended as the model of choice for anxiety disorders, current treatments are ineffective for a significant proportion of

anxious children, with around 30-40% still meeting diagnostic criteria for a clinically significant anxiety disorder at the end of treatment (Barrett, Dadds et al., 1996; Kendall, 1994).

In future, a number of lines of enquiry could be pursued to move this research on attentional disengagement forward. One possibility would be to see how difficulty disengaging attention impacts on other aspects of processing. We know that the attentional bias process is responsible for determining the nature of information observed at the point of encoding, having an impact on the interpretation of the stimulus and the subsequent emotional and behavioural response which follows it (Crick and Dodge, 1994); a 'selective focus' of attention on sources of threat or particularly salient information determines how anxious children perceive, interpret and remember information (Hertel, 2002). If therefore, anxious children have problems disengaging attention from a stimulus, they risk not being able to re-focus their attention on less threatening information. It would be interesting to investigate whether anxious children with disengagement problems find themselves particularly prone to anxious rumination as a result of this, or find it hard to use distraction as a means of regulating their anxiety, and whether certain factors affect how they can disengage their attention from emotional stimuli.

Belief modification is at the core of cognitive therapy treatment, and typically this is achieved through thought-challenging in various ways. This process, to some extent, focuses on threat information and uses relatively direct means to challenge belief content. However, it may be that interventions for anxious children should be more focused on helping children learn how to better control their attention, and particularly on how clinicians might most effectively help children disengagement their thinking from threatening information in order to encode non-threatening

information and therefore bring about cognitive change. This might help them to focus more effectively on challenging thoughts, entertain alternative beliefs and engage in novel behaviours (e.g. dropping safety behaviours). Children would need help from clinicians in learning when and how to do this; the acquisition of new attentional skills would likely require modelling, reinforcing and mirroring rather than an expectation that children will be able to do it themselves through trial and error. Parental involvement in treatment would be important in order to help children practice at home the attention control strategies learned in sessions.

Getting a child to shift to less threatening information may be partly about making the information salient or significant enough for the child. Knowing that an anxious child finds it hard to control their attention in the presence of threatening stimuli would alert a clinician to ensuring that the safety information presented is made especially salient for them. This could be done by working hard to present it in a particularly interesting or evocative way, such as by using striking examples, or through the use of examples provided by significant figures (e.g. parents, peers, story characters). Cognitive assessments may also be valuable in this context given the finding from this study that children with a lower IQ show generally slower disengagement from angry faces than children with a higher IQ.

Psycho-education work with family members could act to highlight the role of attentional biases to threat in maintaining anxiety for a child. Explanations to teachers about the difficulty for an anxious child of processing and remembering information in the face of threat, approaches to minimise these, and exposure to encourage the child to reduce their emotional reaction to the threat may all be helpful. A positive reinforcement system could also be included to reward a child

when they override a dominant response. This would encourage the behaviour to happen more frequently.

Essentially, consideration of attentional bias effects could be very useful in the routine assessment and formulation of psychological distress. Having a greater appreciation of a child's skills could help a psychologist better understand the nature of their anxiety and the fact that that may find it difficult to disengage their attention from information perceived as threatening. Appropriate training could then be developed around this. Having an understanding of attention bias effects may be particularly helpful with anxious children who have peer difficulties, given the finding of a specific bias in disengaging attention from angry faces. Those that have difficulties with disengagement might need help learning how to manage conflict situations and improve relations with classmates. It may be that disengagement difficulties result from cognitions about social interactions being threatening, which would lead to anxious behaviour. If anxious children overestimate the danger associated with an angry face, as evidenced by difficulty disengaging their attention from it, then their reactions prevent chances to disconfirm their misinterpretations. In all these examples, modifications to treatment are essentially about a clinician finding an effective means of supporting disengagement and inflexibility in cognitive processes during therapy, so that a child is better able to control their thought processes, and challenge their beliefs.

The tendency for anxious children to find it hard to disengage from threatening stimuli means that they may find it hard to mobilise effective coping strategies. Within the CBT model of anxiety, children could be helped to practice these coping strategies in increasingly stressful situations. Children differ markedly in their ability to use a range of coping skills that influence the degree of anxiety they

experience in response to unpleasant experiences. Diversion of attention is one method that has been demonstrated as being successfully associated with lower levels of anxiety (Brown, O'Keefe, Sanders, & Baker, 1986).

The evidence base provides encouraging early signs that attention processes can be mitigated through practice in adults (Amir, McNally, Riemann et al., 1996), and there are a few specific attentional training interventions with children in the process of being developed which look promising (Rothbart, 2004). One study has shown that attentional biases on Stroop tasks can be removed in children with GAD through carefully designed CBT interventions (Mathews, Mogg, Kentish and Eysenk, 1995). The indication from this is that attentional biases are triggered when children are under stress or feeling anxious, and their role may be related to the maintenance rather than the cause of anxiety. Much more research is needed on this though in order to find out how exactly how attentional bias interventions could be developed for children with anxiety disorders. One possibility might be to develop an exposure programme to angry faces or other socially threatening stimuli for children with attentional disengagement difficulties. It would also be interesting to see whether anxious children with more disengagement problems change less rapidly during treatment, and hence whether this variable can be used to predict treatment length. If this were the case, this might lead the way to more discriminated treatment packages that take account of children's capacities for cognitive change.

If however, clinicians working with anxious children are to have confidence in including these aspects in treatments, it is vital that the research base is enlarged and similar findings about disengagement of attention more consistency demonstrated.

## **Personal Reflections**

Carrying out this study highlighted a number of things for me. One of these was the difficulty that exists in wanting to carry out comprehensive and meaningful piece research to a high standard, but having to work with limited time and financial resources. Given the emphasis placed on the importance of research for clinical psychologists professionally, this difficulty and the methodological dilemmas that necessarily result from it, came as something of a surprise to me. Designing the study, collecting the data and writing up the research proved very challenging to do whilst simultaneously having to manage a heavy caseload on a busy placement.

The challenging research process highlighted for me the reality of the life of a psychologist working within the NHS, where the difficulty of balancing the demands of research and clinical work are a normal part of the job. In many ways it seems a shame that the NHS is not able to value the contribution of effective research as highly as the profession itself. This study showed me that the desire to carry out a piece of research to a high standard will always be balanced against what is practical to manage within the available resources. In an ideal world, there would be ample time and resources available to design the best study possible in a given area of clinical need. Unfortunately, working within the NHS means that this will rarely be possible.

Had more time and other resources been available for the current study, they would probably have been devoted to recruiting a larger (possibly clinical) sample to give more power to the study, and to including a wider range of measures in the assessment battery. It can be hard to achieve a balance between gaining as valid and reliable measure as possible of the constructs under investigation whilst ensuring that this does not come at a cost to the viability of a study. The decisions taken in this

study were certainly not the only ones that could have been taken. However, they were felt to be the most reasonable working within the resources available, and compared to other studies in the literature to date, they clearly offered this study a number of advantages. The decisions taken enabled effortful control to be measured more rigorously, and attentional biases to be assessed more comprehensively, than has been the case in previous research. This meant that the study offered an ambitious, but much needed, more direct approach to the measurement of the cognitive control processes involved in anxiety than has been seen before.



## References

- Amir, N., McNally, R., J., Riemann, B.C., Burns, J., Lorenz, M., & Mullen, J.T. (1996). Suppression of the emotional Stroop effect by increased anxiety in patients with social phobia. *Behaviour Research and Therapy*, *34*, 945-948.
- Anderson, J. C., Williams, S., McGee, R., & Silva, P. A. (1987). DSM-III disorders in preadolescent children: Prevalence in a large sample from the general population. *Archives of General Psychiatry*, *44*, 69 – 76
- Barrett, P. M., Dadds, M. R. & Rapee, R. M. (1996). Family treatment of childhood anxiety: A controlled trial. *Journal of Consulting and Clinical Psychology*, *64*, 333 - 342
- Brown, J.M., O'Keefe, J., Sanders, S.H., & Baker, B. (1986). Developmental changes in children's cognition to stressful and painful situations. *Journal of Pediatric Psychology*, *11*, 343-357.
- Crick, N. R., & Dodge, K. A. (1994). A review and reformulation of social information-processing mechanisms in children's social adjustment. *Psychological Bulletin*, *115*, 74-101.
- Dadds, M.R., Spence, S.H., Holland, D.E., Barrett, P.M., & Laurens, K.R. (1997). Prevention and early intervention for anxiety disorders: A controlled trial. *Journal of Consulting and Clinical Psychology*, *67*, 627-635.
- Derryberry, D., & Reed, M. A. (1996). Regulatory processes and the development of cognitive representations. *Development and Psychopathology*, *9*, 633 – 652
- Eisenberg, N., Spinrad, T. L., Fabes, R. A., Reiser, M., Cumberland, A., Shepard, S. A., Valiente, C., Losoya, S. H., Guthrie, I. K. & Thompson, M. (2004). The relations of effortful control and impulsivity to children's resiliency and adjustment. *Child Development*, *75*, 25 – 46

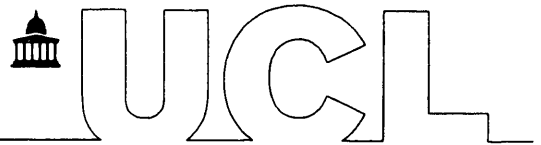
- Ellis, L. K. & Rothbart, M. K. (2001). Revision of the Early Adolescent Temperament Questionnaire. Poster presented at the 2001 Biennial Meeting of the Society for Research in Child Development, in Minneapolis, Minnesota. Available;  
<http://darkwing.uoregon.edu/~maryroth/LesaEllisSRCDPosterReprint.rtf>
- Hertel, P. (2002). Cognitive biases in anxiety and depression: Introduction to the Special Issue. *Cognition and Emotion*, 16, 321 – 330
- Kendall, P. C. (1994). Treating anxiety disorders in children: Results of randomized clinical trial. *Journal of Consulting and Clinical Psychology*, 62, 100-110.
- Kolko, D. J. & Kazdin, A. E. (1993). Emotional/behavioural problems in clinic and non-clinic children: Correspondence among child, parent and teacher reports. *Journal of Child Psychology and Psychiatry*, 34, 991 – 1006.
- Last, C. G., Hanson, C., & Franco, N. (1997). Anxious children in adulthood: A prospective study of adjustment. *Journal of the American Academy of Child and Adolescent Psychiatry*, 35, 645 – 652
- Lonigan, C. J. & Phillips, B. M. (2001). Temperamental influences on the development of anxiety disorders. In M. W. Vasey & M. R. Dadds (Eds.), *The Developmental Psychopathology of Anxiety*. New York: Oxford University Press.
- Manly, T., Anderson, V., Nimmo-Smith, I., Turner, A., Watson, P., & Robertson, I. H. (2001). The differential assessment of children's attention: The Test of Everyday Attention for Children (TEA-Ch), normative sample, and ADHD performance. *Journal of Child Psychology and Psychiatry*, 42, 1065 – 1081

- Mathews, A., Mogg, K., Kentish, J. & Eysenk, M. (1995). Effect on psychological treatment on cognitive bias in generalised anxiety disorder. *Behaviour Research and Therapy*, 33, 293-303.
- Muris, P., de Jong P. J., & Engelen, S. (2004) Relationships between neuroticism, attention control, and anxiety disorders symptoms in non-clinical children, *Personality and Individual Differences* 37, 789 – 797
- Murray, K. T. & Kochanska, G. (2002). Effortful Control: Factor Structure and relation to Externalizing and Internalizing Behaviors. *Journal of Abnormal child Psychology*, 30, 503 – 514
- Rothbart, M. K. (2004). Commentary: Differentiated Measures of Temperament and Multiple Pathways to Childhood Disorders. *Journal of Clinical Child and Adolescent Psychology*, 33, 82 – 87
- Rothbart, M. K. (1999). Temperament and development. In G. A. Kohnstamm, J. E. Bates, & M. K. Rothbart (Eds.), *Temperament in childhood* (pp 187 – 247). New York: Wiley.
- Rothbart, M. K., Ahadi, S., & Hershey, K. L., & Fisher, P. (2001). Investigations of temperament at three to seven years: The Children's Behavior Questionnaire. *Child Development*, 72, 1394 – 1408
- Shallice, T. (1988). *From Neuropsychology to mental structure*. Cambridge U.K.: Cambridge University Press.
- Stallings, P., & March, J. S., (1995). Assessment In: March, J. S. (Ed.) *Anxiety disorders in children and adolescents*, 125 – 147. Guilford Press, New York.

Swanson, H. L. & Cooney, J. B. (1989). The relationship between intelligence and vigilance in children. *Journal of Child Psychology and Psychiatry*, 27, 141 - 153

## **Appendices**

**Appendix A**  
**Notification of Ethical Approval**



Dr Pasco Fearon  
Sub-Department of Clinical Health Psychology  
University College London  
1-19 Torrington Place

29 November 2005

Dear Dr Fearon

**Re: Notification of Ethical Approval**

**Re: Ethics Application: 0564/001: Effortful control and anxiety in children**

The above research has been given ethical approval following review by the UCL Research Ethics Committee for a period of 12 months from the commencement of the project (1 December 2005) subject to the following conditions:

1. It is a requirement of the Committee that research projects which have received ethical approval are monitored annually. Therefore, you must complete and return our 'Annual Continuing Review Approval Form' PRIOR to the 1 December 2006. If your project has ceased or was never initiated, it is still important that you complete the form so that we can ensure that our records are updated accordingly.
2. You must seek Chair's approval for proposed amendments to the research for which this approval has been given. Ethical approval is specific to this project and must not be treated as applicable to research of a similar nature. Each research project is reviewed separately and if there are significant changes to the research protocol you should seek confirmation of continued ethical approval by completing the 'Amendment Approval Request Form'.

The form identified above can be accessed by logging on to the ethics website homepage:  
<http://www.grad.ucl.ac.uk/ethics/> and clicking on the button marked 'Key Responsibilities of the Researcher Following Approval'.

3. It is your responsibility to report to the Committee any unanticipated problems or adverse events involving risks to participants or others. Both non-serious and serious adverse events must be reported.

**Reporting Non-Serious Adverse Events**

For non-serious adverse events you will need to inform Ms Helen Dougal, Ethics Committee Administrator ([h.dougal@ucl.ac.uk](mailto:h.dougal@ucl.ac.uk)), within ten days of an adverse incident occurring and provide a full written report that should include any amendments to the participant information sheet and study protocol. The Chair or Vice-Chair of the Ethics Committee will confirm that the incident is non-serious and report to the Committee at the next meeting. The final view of the Committee will be communicated to you.

**Reporting Serious Adverse Events**

The Ethics Committee should be notified of all serious adverse events via the Ethics Committee Administrator immediately the incident occurs. Where the adverse incident is unexpected and serious, the Chair or Vice-Chair will decide whether the study should be terminated pending the opinion of an

independent expert. The adverse event will be considered at the next Committee meeting and a decision will be made on the need to change the information leaflet and/or study protocol.

On completion of the research you must submit a brief report (a maximum of two sides of A4) of your findings/concluding comments to the Committee, which includes in particular issues relating to the ethical implications of the research.

Yours sincerely

**Sir John Birch**  
**Chair of the UCL Research Ethics Committee**

Cc: Juliet Reynolds, Sub-Department of Clinical Health Psychology, UCL



**Appendix B**  
**Parent Information and Consent Form**



Sub-Department of Clinical Health Psychology

**UNIVERSITY COLLEGE LONDON**

GOWER STREET LONDON WC1E 6BT

General Enquiries:

## ***Information and Consent Form for Parents***

### **Re: Clinical Psychology Investigation of Factors Affecting Behaviour in Children**

Dear Parent/Guardian,

I am writing to invite you and your child to take part in a research project being conducted by University College London and your child's school. The research is looking at factors involved in the development of behavioural and emotional difficulties in children and aims to help professionals to help children with these difficulties.

This information sheet tells you about why the research is being done and what you will be asked to do. Please take a few minutes to read it.

#### **What is the purpose of the study?**

Many things affect a child's chance of developing behavioural and emotional problems, and one important factor is related to attention. We are hoping to find out more about the link between attention and the difficulties children have. It is hoped that this may provide really useful information for professionals, to help them when working with children with these types of difficulties.

#### **Why are we being asked to take part?**

We are approaching all parents/guardians of children who are aged between nine and eleven at your child's school. This school has been chosen because your Head Teacher values the importance of research to better understand some of the problems children have. We hope to collect information from around fifty families who will have a wide range of opinions, all of which will be useful to the research.

#### **What does the research involve?**

Parents or guardians will be asked to sign the attached consent form and return it with the attached questionnaires completed. This should take about 10-15 minutes. Children would then be seen in school time and asked to fill in two brief questionnaires which are designed for their age and have been used before in other studies. This questionnaires will ask about your child's feelings. Completing the questionnaires will take no longer than about 15 minutes.

Children will also be asked to complete a series of short tasks with me, some of which are short computerised task which involve them tapping a button in response to changing pictures and positions. There will also be a task the children complete individually with me afterwards, which is not carried out on the computer. Most children really enjoy all these types of tasks. Finally your child's teacher will also be asked about the children's behaviour.

**Is the research confidential?**

Yes. All information collected will be used for research purposes only and an ID number will be used to keep answers confidential. *Teachers will not see the forms the children or parents complete.*

**Are there any risks from taking part?**

There is no reason to believe that taking part in this study would be harmful in any way and taking part in the study will not affect your child’s schooling.

All proposals for research with people are reviewed by an ethics committee before they can begin. This proposal has been approved by the UCL Committee on the Ethics of Non-NHS Human Research. If you do have any concerns, please feel free to contact us at the address given below.

**Who should I contact if I have any questions?**

Please contact Juliet Geddes if there is anything that is not clear or if you would like more information.

**Do we have to take part?**

You and your child do not have to take place in this study if you do not wish to. You, or your child, may withdraw at any time without having to give a reason. Your child’s decision to take part or not, will not affect their schooling or teaching in any way.

**If you do choose to take part....**

Thank you very much, for your help. Please sign and return the slip at the bottom of this information sheet and the attached questionnaires.

**We understand how busy parents are, so thank you very much for taking the time to read this information sheet.**

Yours sincerely

Juliet Geddes  
Sub-Department of Clinical Health Psychology  
University College London  
Gower Street  
WC1 6BT  
Email: |

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**Clinical Psychology Investigation of Factors Affecting Behaviour in Children**

Please complete this slip and return it, with the completed questionnaires to your child’s class teacher or to the box in school.

I have read the information sheet and agree to my child taking part in this study.

Childs Name.....ID number.....

Signed ..... Date .....

Name in capital letters .....

**Appendix C**  
**Child Information Sheet**

# **Information to be read to the children participating in the study**

(to be read by researcher prior to questionnaire administration)

Hello, my name is Juliet Geddes. I am interested in how different children pay attention, what they think and how that makes them behave and feel.

I want to find out what helps children to feel good. I am trying to meet as many children as I can in your year.

Your parents have been very kind and answered some questions for me and I am hoping you can help me today by answering some more questions, and later by coming out of class and doing a few tasks with me – some of which are short tasks on the computer. There will also be another task to do at the end.

If you decide that you would like to take part, I will ask you to fill out a questionnaire that has been designed for children your age. It asks about how you feel about things.

*The things you tell me will not be given to your teachers or parents.*

But you don't have to do this. If you don't want to you can tell me when I've finished talking. It's also ok if you feel that you want to stop after you have started. All you have to do is say so.

If you find any of the words or questions hard to understand, just put your hand up or you can ask me at the end.

Please remember that this is not a test, and there are no right answers.

Does anyone have any questions that I can help with?

**Appendix D**  
**Child Consent Form**

# ***Consent form for the children participating in the study***

## **Factors affecting behaviour in children Paying attention and how you feel**

**Please put a circle round your answers**

I have been told about this study and had the chance to ask questions.

**YES**

**NO**

I agree to take part and know that I can stop at any time.

**YES**

**NO**

Please write your name here

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**Thank you for your help.**

**ID number** \_\_\_\_\_