

**Effortful Control, Attentional Biases and Problem
Behaviours in Children**

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Overview

Effortful control (EC) is a temperamental concept that serves a self-regulatory function, allowing inhibition of dominant responses and emotion regulation through its effect on switching attention and self-soothing. The literature review focuses on EC and its links with emotional and behavioural problems in children. It also reviews research on attentional biases and considers how these two areas of study may be integrated. The empirical paper reports a study of children aged nine to 11 using a computer task and questionnaire measures of behaviour and EC. The main findings were that children with more emotional and behavioural problems showed attentional avoidance of angry faces. This effect was particularly strong in boys where it served to mediate the relationship between EC and problem behaviours. The critical appraisal focuses on issues of future development of this literature, specifically it addresses development of measures, a logical understanding of avoidance, integration of theoretical approaches and potential clinical implications.

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Paper 1: Literature Review

Effortful Control, Attentional Biases and Problem Behaviours in Children

Abstract

This review integrates findings from the research fields of temperament, cognitive processes and childhood psychopathology. It examines the role of temperamental effortful control (EC) in both internalising and externalising behaviours in children. The difficulties in operationalising the construct of EC and its developmental trajectory are also highlighted. The review then reviews evidence for attentional biases (hypervigilance to threat, disengagement difficulties and avoidance) in anxiety and aggression. Research is presented which considers the association between attentional biases and EC and discusses this association as a risk factor in the development of childhood anxiety; a similar process is presented as a potential risk in externalising behaviours.

Effortful Control, Attentional Biases and Problem Behaviours in Children

Definition of Effortful Control

Effortful control (EC) is an emerging concept in developmental psychopathology. It is an aspect of temperament that serves a self-regulatory function and defined as “the ability to suppress a dominant response in order to perform a subdominant response.” (Rothbart, Ellis, Rueda & Posner, 2003, p.1114). EC is an overarching construct of temperament that encompasses such concepts as delay in gratification, behavioural inhibition, impulse control, emotion regulation and attentional control. It includes the abilities to voluntarily focus and shift attention (for example, away from a distressing event) and inhibitory and activational control, the ability to begin or stop behaviour if it serves an adaptive purpose even if it is not what one would more automatically want to do (Valiente et al., 2003). An increasing understanding of EC and its role in childhood psychopathology will aid in our understanding of those conditions and hopefully lead to useful clinical interventions.

Outline of the review

This review will examine the literature demonstrating links between EC and both internalising and externalising problems and will review and consider a conceptual critique of the possible mechanism explaining these associations. The first section will address issues of terminology, seeking to define what exactly EC is and to provide an overview of how such a concept can be assessed. The possible developmental course of EC and its role in emotion regulation will be outlined. In section two concurrent and longitudinal research linking EC and both internalising problems (focusing on anxiety) and externalising behaviours will be presented while

section three will present the evidence linking attentional biases and anxiety. In the fourth section, mechanisms for explaining the links between EC, attentional biases and internalising problems will be presented. Next, consideration will be given to emerging evidence linking aggressive behaviour with specific attentional biases. In the light of the evidence presented, the review will culminate by discussing attentional biases as a possible mechanism for mediating the effects of EC across diagnostic categories.

Hypervigilance to threat has often been considered to be the mechanism by which attentional biases operate in anxiety. Evidence will be presented exploring the possibilities of disengagement and avoidance as further explanations of attentional bias.

Effortful Control

Terminology

Prior to reviewing the evidence relating to EC, it is important to put forward some cautionary notes. EC is a relatively recent area of research and therefore the evidence base, although growing, is limited in both quantity and in the development of its own language and terminology. This review was complicated by the use of varied terminology, which multiple authors appear to have interpreted with differences in nuance. Many different cognitive and neuropsychological factors have been drawn into the EC literature and some amount of confusion prevails in terms of a clear definition and operationalisation of the construct of EC. For example in some definitions, the construct of EC appears very similar to executive functioning and a lack of clarity remains on what exactly are the differences between the two.

Murray and Kochanska (2002) discuss the difficulties caused by varying conceptualisations of what exactly constitutes EC. They note that this has led to researchers using a wide range of measures and paradigms to assess EC. This inevitably means that comparison of different studies is somewhat complicated and therefore that theoretical developments are hampered as researchers struggle with linking together results that are gleaned from a variety of measures and methodologies. This lack of consistency or certainty as to which abilities or constructs are tapped by different measures means that different researchers may be looking at the same thing but labelling it differently, or perhaps more frustratingly measuring slightly different things but labelling them the same. One example of such confusion is the use of the term attentional control; Muris, de Jong and Engelen

(2004) use the term attentional control, referring to one part of the broader construct of EC, whilst not encompassing all the facets included in EC. Others however, seem to discuss the two as more fluid concepts (Derryberry & Reed, 2002).

Measurement

As a result of the varying conceptualisations of EC, a range of instruments have been utilised in its assessment. Most commonly, EC is assessed using self-report questionnaire measures (or parental report for children). Rothbart's laboratory has produced a range of measures to assess EC as a subscale of self-report temperamental measures for different age groups. The Child Behaviour Questionnaire (CBQ) is a widely used parental report questionnaire for the assessment of temperament in young children (Rothbart, Ahadi, Hershey, & Fisher, 2001). The same group have also revised the Early Adolescent Temperament Questionnaire (EATQ: Capaldi & Rothbart, 1992) to better assess aspects of temperament related to self-regulation in adolescents (EATQ-R: Ellis & Rothbart, 2001). Sub-scales used when specifically assessing EC include inhibitory control, attention and activation control.

Another commonly used measure in this field is the child version of the attentional control scale (ACS-C: Derryberry & Reed, 2002). It measures attentional focussing and attentional shifting and although these are assumed to be constituents of EC this measure is more specific than EC itself, including only items that relate to attention rather than the more behavioural forms of inhibition (Derryberry & Reed, 2002).

A particular difficulty with EC measurement relates to the independent development of literature and measurement in EC and that of childhood psychopathology. Such independence means that measures claiming to assess temperament and those assessing clinical symptoms or disorders often contain similar or overlapping items. Lemery, Essex and Smider (2002) discuss item overlap in questionnaire measures as being of particular relevance when considering correlations between temperament and behavioural problems in children. They rightly point out that although similar behaviours may stem from either temperament or behaviour problems, “they have distinct operational definitions that must be reflected in item content if the measures are to be used to test a hypothesis of association” (p.867). Lemery et al. (2002) suggest methods of overcoming this item overlap or measurement confounding by eliminating items that overlap either conceptually or empirically. They suggest that expert rating of temperament and problem behaviour items on questionnaire measures and empirically using factor analysis could achieve this.

Other paradigms that have been utilised to assess EC are listed in Murray and Kochanska (2002); they include cognitive tempo tasks, motor inhibition or slowdown tasks, delay of gratification tasks and resistance to temptation paradigms. To draw conclusions from this varied evidence base would require comparisons to be made between results from many different studies, Murray and Kochanska note that even when similar tasks are employed, the variation of exact procedures used often prevents meaningful comparison. Murray and Kochanska advocate the use of their comprehensive, theoretically driven behavioural battery, designed to assess multiple aspects of EC. This battery encompasses a number of related activities and age-appropriate tasks designed to assess the various functions of EC specifically, delay

tasks, slowing down motor activity, go-no-go tasks, modulating voice, cognitive reflectivity and effortful attention. A complete description of these tasks and their supporting data can be found in Kochanska, Murray, Jacques, Koenig and Vandergeest (1996) and Kochanska, Murray and Coy (1997).

Whilst such measures are more theoretically driven and therefore perhaps more likely to be providing an accurate measure of the construct of EC, they are not without problems. Such a battery would be both time-consuming and expensive to administer, both factors that are barriers to use in research particularly in these early days of research in the field of EC. Murray and Kochanska (2002) conclude by stating that the optimal method of reliably assessing EC may be best accomplished using multiple, developmentally relevant paradigms designed to capture the complexity of this construct, these will include self-report and multi-informant measures.

Effortful Control – a Temperamental Factor.

Rothbart (1989) describes temperament as relatively stable, primarily biologically based individual differences in reactivity (i.e. arousability of behavioural, endocrine, autonomic, and central nervous system responses) and self-regulation (i.e. attention, approach, avoidance and inhibition). EC is seen as one aspect of the more self-regulatory dimension of temperament.

EC is considered to be extremely important developmentally because, if a person were solely controlled by the reactive dimension of temperament, they would be at the mercy of their own disposition to approach or avoid a situation or stimulus, given

reward or punishment cues (Rothbart & Posner, 2001). Self-regulation skills, including EC, allow a person to suppress more automatic tendencies or drives and to train behaviour in conflict situations; this gives the individual some freedom from “affectively driven behaviour” (Rothbart et al., 2003, p.1115). EC therefore serves to regulate the more reactive side of temperament and may be essential for social success, which often requires behaviour that is opposite to reactive tendencies (Rothbart & Posner, 2001). In practical terms, a child who has good EC would be likely to show patience and restraint in situations which required such behaviour e.g. whilst queuing or turn-taking. Rothbart and Posner (2001) also state, “The ability to rise above prepotent emotional drives may underlie human conscientiousness and empathy” (p.361).

Development of Effortful Control

The development of EC is vital in the transition from being a child whose needs are met and whose inappropriate behaviours are excused, to being an adult who is expected to alter and inhibit behaviour and delay gratification when the situation demands. Denckla (1996) stated, “The difference between the child and adult resides in the unfolding of executive functions” (p.264).

EC is assumed to begin to emerge, to varying levels in different individuals, at the end of the first year of life (Murray and Kochanska, 2002). At this stage however, such a system is viewed as somewhat rudimentary. Rothbart et al. (2003) describe the development of EC as an outcome of the maturity of executive attention, which they see as developing rapidly during the toddler and pre-school years. Research in this field has focussed particularly on the biological maturation of regions of the

brain associated with executive attention. Rothbart et al. (2003) highlight studies that have examined brain activity and conclude that areas of a pre-frontal network (specifically the anterior cingulate and areas of the pre-frontal cortex) are most important in the executive task of resolving conflict (e.g. Botvinick, Braver, Barch, Carter & Cohen, 2001). Rothbart et al. (2003) believe that the development of this pre-frontal network in children is linked to the ability to “exercise voluntary control by choosing among competing cognitive and emotional computations, those that will be dominant at any given moment” (p.1115).

In their review of the development of attentional networks, Rothbart and Posner (2001) conclude that the neurological systems, which support EC, show important developments between the ages of two and four. However they believe that this development continues throughout childhood and into adolescence, allowing more sophisticated forms of self-regulation with increasing maturity. These more advanced self-regulatory abilities are more reliant upon verbal information, representations of the self and projections concerning the future.

Murray and Kochanska (2002) provide a more environmental description of EC development, saying that, as a child grows and begins to explore their environment more, parents begin to enforce rules and expect the child to modulate their own behaviour. In such a way, the ability to utilise EC, to override dominant responses and initiate the subdominant response, for example not eating the cake the child has been told to keep away from, is implicated in multiple developmental processes and allows the maturation of socialisation.

Emotion Regulation

Aside from a role in purely behavioural, motivational regulation, researchers have suggested that EC is critical in developing abilities to regulate one's own emotion. Modulation of emotional arousal is, at least in part, achieved through the shifting and focusing of attention, which regulates exposure to stimuli and cognitive processes related to emotional experiences (Lengua, 2002). Increasing evidence appears to support the idea that EC, in its capacity to allow flexible responses to environmental stimuli, can help to regulate emotion.

High EC has been shown to be associated with successful self-regulation of emotion and coping with one's own and others' distress (Eisenberg et al., 1997) and to faster and more effective self-soothing in children (Rothbart, Posner & Rosicky, 1994).

Wilson and Gottman (1996) state, "Attentional processes provide a shuttle between the cognitive and emotional realms, and...the abilities involved in being able to attend and shift attentional focus are fundamental to emotional regulatory processes" (p.189).

High EC children might also be assumed to be more likely to show the ability to direct attention away from upsetting or scary events. It may appear that a child with low EC is less able to self-soothe and seems more easily distressed by upsetting situations, such as meeting a stranger or feeling scared.

Following on from the theoretical assertions that EC will link with emotional regulation, increasing evidence (reviewed below) demonstrates a relationship

between EC and both internalising and externalising disorders. It makes sense to expect that EC would relate to children's adjustment problems as these are defined partly in terms of difficulties in controlling emotion such as displaying high levels of angry or anxious behaviour (Eisenberg et al., 2004). Children who are high in EC are "likely to be prosocial, socially competent and relatively low in problem behaviours, especially externalising problem behaviours." (Valiente et al., 2003, p.1173). Lengua (2002) found low EC (assessed using subscales of the CBQ and EATQ) was a risk for adjustment problems, a composite of both internalising and externalising problems. Wilson (2003) notes, "The ability to manage attention effectively...is related to low levels of negative affect in adults, children and infants" (p.315). Derryberry and Reed (2002) have proposed that children with high levels of EC "may be able to use attention to constrain the overly reactive aspects of positive emotionality and negative emotionality" (p. 226).

Effortful Control and Emotional and Behavioural Problems

Effortful Control and Anxiety

Several studies have examined the link between EC and children's anxiety problems. Conceptually, difficulties with EC could be expected to serve as a risk factor for anxiety problems given that attentional biases to threat have been found to be consistently associated with anxiety problems in adulthood and childhood (Vasey & Macleod, 2001).

Studies with Adults

In early studies with adults, Derryberry and Rothbart (1988) noted a negative correlation between attentional focussing and shifting, and scales of fear, frustration and sadness, consistent with the view that EC is linked with emotional regulation. However, the extent to which this association is causal is unclear and as both constructs were measured using self-report it may be that reporter bias or item overlap was partly responsible for the association reported.

Studies with Children - Community Samples

Muris et al. (2004) report a negative correlation between anxiety and attentional control (measured by the ACS-C) in a sample of non-clinical children aged between eight and 13. Lower levels of attentional control were associated with higher levels of symptoms of anxiety disorders and this was found to be independent of temperamental neuroticism.

Lemery et al. (2002) note that measurement confounding can be a major source of error and suggest using expert ratings and factor analyses to overcome these measurement difficulties in studies linking temperament and problem behaviours. Utilising these techniques, they removed confounding items and still found an association between mother's reports of children's temperament and reports of behaviour problem symptoms. This study examined non-referred children at ages three and a half and four and a half, using parental and caregiver questionnaire measures including the CBQ and separate measures of behaviour problems/symptoms. Of particular interest here, mother's reports of high anxiety and fearfulness correlated with their reports of children's low attention focusing and inhibitory control. Additionally, the longitudinal design of this study allowed the investigators to examine the predictive nature of early temperamental variables and later behaviour problems. It was noted that attentional focusing and inhibitory control were both significant predictors of later parental reported internalising problems. These effects remained when results were purified, that is confounding items (judged by expert rating and factor analysis) were removed.

Murray and Kochanska (2002) utilised a battery of theoretically driven behavioural tasks to assess EC and behavioural correlates in non-referred children. This study was longitudinal, assessing children on three occasions over a four-year period (mean age 33 months at first assessment). In contrast to the studies detailed above, they found higher levels of EC to be associated with internalising problems in this sample, whilst low levels were more linked to externalising behaviours. It appeared that adaptive functioning was related to having a moderate level of EC. Were this finding to be replicated, it might suggest that those children who are overcontrolled

may be more liable to experience anxiety or depression symptoms while undercontrol would relate to externalising psychopathology. Other researchers (Eisenberg et al., 2004) have suggested that Murray and Kochanska's results may have been due to the behavioural tasks tapping not only EC, but also reactive control.

A longitudinal study also linked the occurrence of internalising symptoms, measured in this case with the child behaviour checklist (CBCL: Achenbach, 1991), and low EC (Caspi, Henry, McGee, Moffitt & Silva, 1995). Caspi et al. completed a 12 year follow up of parent, teacher and expert ratings of child behaviour and temperamental constructs in a sample of over 800 children. The children were observed at the ages of three, five, seven and nine and temperamental dimensions of their behaviour were rated. The investigators used factor analysis to determine three important factors, the one of interest here is the temperamental factor they named lack of control. Lack of control was defined by emotional lability, restlessness, short attention span and negativism, although it cannot be assumed to entirely encapsulate the same features as does EC, it is possible to see many parallels. The researchers found, not only that the temperamental factors measured were stable over time, but also that early temperamental constructs could be used to predict occurrence of specific behavioural problems at later ages. Children with a lack of control (low EC) in early childhood were somewhat more likely to experience internalising problems a decade later. These results are more suggestive of EC as a causal factor in the later development of internalising problems, although the small effect sizes obtained do mean these results must be viewed with some caution.

Studies with Children with Anxiety Problems

Currently there is limited research in the area of EC with children diagnosed with anxiety disorders or other internalising problems. In one study, Eisenberg et al. (2001) examined responses of children (aged four and a half to eight years old) with internalising problems. Although the children were not referred, those in the internalising group had a CBCL score over 60 indicating moderate risk of development of internalising problems. These children were compared with non-disordered children using teacher and parental reports of attentional regulation and behavioural control alongside observations of children's ability to wait, to be persistent and their display of emotion in a disappointing situation. Eisenberg et al. (2001) found that the children with internalising problems were lower in attentional regulation from adult report, although did not differ in behavioural inhibition from non-disordered children. The authors suggest that their results are consistent with the view that children with internalising problems have particular difficulty regulating the internal experiences of emotions such as anxiety.

Eisenberg and colleagues (2001) hypothesised that children with internalising behaviour problems, such as anxiety, would be low in at least some types of EC, especially the abilities to manage emotion with effortful attentional processes.

In a two-year follow up of the data used in the above study, Eisenberg's team examined whether the relationship between EC and internalising symptoms persisted when taking into account early levels of internalising problems (Eisenberg et al. 2004). They also looked at the role of resiliency and other adjustment problems. Parents and teachers completed subscales of the CBQ on two occasions, two years

apart, to assess EC; measures of resiliency and children's problem behaviours were also employed. The authors reported that EC and impulsivity have unique relations to internalising problems and that these were mediated by resiliency. Children who were low in EC or impulsivity tended to be low in resiliency (regardless of their level of negative emotionality) and this, in turn, predicted low levels of internalising problems. Thus, EC and impulsivity indirectly predicted internalising problems (through resiliency). The authors suggest that those low in EC may have difficulties managing their negative emotional states (e.g. shifting attention to other thoughts or focussing on positive thoughts) and, as a consequence, find it difficult to adapt to or recover from negative experiences.

Possible Mechanism

Theoretically it is proposed that high EC would serve as a "buffer" from anxiety by allowing the child to utilise attention and other coping behaviours as self regulatory processes. However, if EC were low, "the individual may be unable to limit or control the negative effects of neurotic temperament" (Muris et al. 2004, p.791). Lonigan, Vasey, Phillips and Hazen (2004) suggest that anxiety is likely to be characterised by behaviours linked to reactive control (such as inhibition of behaviour and an automatic attentional bias to threat). However, a person with high EC would be able to overcome this to some extent by redirecting attention and using other coping behaviours to prevent or modulate the experience of distress.

Methodological Issues

The evidence base examining links between anxiety and EC is in its formative years. Aside from issues regarding measurement of temperamental constructs, which have

been discussed previously, other limitations of the research must also be recognised. Research in EC is commonly of concurrent correlational design and, whilst this allows relationships to be observed, its usefulness when considering causal direction is limited. Some studies have examined the relationships using longitudinal designs but this has appeared to be used mostly as evidence of the stability of relationships in temperamental constructs over time.

Research also spans adult and child, and clinically anxious and normally anxious participants. This means that comparison of data is not always easy or useful as it may be that very different processes operate, for example, between young children with an emerging sense of EC and those who are in adulthood. Studies have also examined children from different populations, including those with internalising problems (e.g. Eisenberg et al., 2001) and non-referred children with some symptoms of anxiety (e.g. Muris et al., 2004). Murray and Kochanska (2002) highlight that their sample, drawn from a normal range included very few children who would meet clinical diagnostic criteria for anxiety disorders and this is common among general population studies. Such a varied focus enhances our knowledge base, however it is important to be mindful of the possibility of quite varied influences of EC in these populations.

A further difficulty, specific to this literature, relates to parental measures of anxiety. These require parents or teachers to answer questions on the internal affective states of children, some of whom are quite young. Inevitably, especially when children are young and lack the language to label and convey these internal states, parents must judge these by making inferences from behaviours shown. Whilst some parents are

likely to prove good judges of the internal states of their children, such ratings are likely to vary considerably in their accuracy and this should serve as a caution in interpreting the results obtained in these studies.

It will be important in future research to develop and use measures or behavioural observations that can sensitively assess internalising problems, anxiety specifically, in young children.

Effortful Control and Externalising Problems.

Aside from the work in anxiety, research has also examined the relationships between the temperamental factor of EC and the occurrence of aggression and externalising behaviour problems.

The ability to effortfully control one's attention may be important in a wide range of social and internal processes. As Rothbart and Posner (2001) explain, "Systems of EC allow approach to situations in the face of immediate cues for punishment and avoidance of situations in the face of immediate cues for reward. In this sense, the programming of EC is critical to socialisation, which often demands that behaviour proceed in a manner that is counter to reactive tendencies" (p.361). It has been suggested that EC is likely to be less well developed in those who are aggressive and socially incompetent. Rothbart et al. (2003) state, "EC is (also) positively related to the development of conscience and appears as a protective factor in the development of behaviour disorders" (p.1113).

Evidence for such a negative relationship between EC and aggression has used both cross-sectional and longitudinal studies, examining young children's temperament and later measuring externalising behaviours in later childhood or adolescence.

Studies with Children - Community Samples

Murray and Kochanska (2002) investigated the hypothesis that low EC would relate to externalising problems. However, in their sample of around 100 normally developing four-year-old children the frequency of delinquent and aggressive behaviour was too low to properly test this hypothesis. They did report an association between specific externalising behaviours (attention problems) and low EC but given the importance of attention in the construct of EC, this result is perhaps unsurprising.

Zhou, Eisenberg, Wang and Reiser (2004), studied Chinese children, aged seven to ten, using a concurrent correlational design. The investigators used parental and teacher report on questionnaires of EC, externalising problems and socially appropriate behaviour, using a translated version of Rothbart's CBQ subscales to assess EC. Peer assessment of social behaviour was administered in groups, where the children had to judge which of their classmates they viewed as aggressive or disruptive. Zhou et al. (2004) found that an individual's vulnerability to poor social functioning, which is associated with high dispositional anger/frustration, can be limited if they have a more developed capacity to self regulate, or to utilise EC. Specifically, they noted an interaction, whereby those children who have a combination of both high anger/frustration and low EC were at most risk of maladjustment.

Gilliom, Shaw, Beck, Schonberg and Lukon (2002) examined anger regulation in disadvantaged preschool boys. They collected temperamental data at age one and a half using maternal report on the Infant Characteristic Questionnaire (ICQ: Bates, Freeland & Lounsbury, 1979) and observed mother and child characteristics at ages one and a half, three and a half and six. At age three and a half the boys were observed in a variety of stressful situations with their primary caregiver. At age six, teacher ratings of externalising behaviours were obtained using the teacher report form of the CBCL. Gilliom and his colleagues reported that a child's ability to regulate their own emotions had the expected effect on subsequent behaviour; a reliance on effective regulatory strategies, such as distraction and passive waiting, predicted greater self-control and lower levels of externalising behaviour problems. Whilst these authors do not discuss EC specifically, there is likely overlap between the concepts measured here and the construct of EC. To be able to use distraction and passive waiting the child can be assumed to have good EC, as these strategies would draw heavily on an ability to switch attention and to inhibit dominant responses.

Caspi et al.'s (1995) longitudinal study, as described above, reported that lack of control at ages three and five correlated with increased externalising behavioural problems at ages nine and 11 (as rated by parents and teachers) and at ages 13 and 15 (rated by parents). Lack of control was specifically linked to later reported hyperactivity and attention problems as well as antisocial behaviour in late childhood and conduct disorder in adolescence. The effect sizes suggested a stronger relationship between externalising problems and low EC than was found with internalising problems. Such research lends support both to the idea that early temperamental traits influence later personality development, and that factors related

to control are highly relevant when considering later externalising behaviour problems.

Valiente et al. (2003) completed a six-year follow up of earlier work (Eisenberg Fabes, Guthrie & Reiser, 2000.) Valiente's study examined the role of negative emotionality as a moderator of the relations of EC and overcontrol with children's externalising behaviour. At all assessments, (T1 when mean age was 90 months, T2 - 2 yrs later and T3 - 4 yrs later) higher EC was associated with low levels of externalising behaviours. T3 EC was also found to predict T3 externalising behaviour even when T1 externalising behaviour was controlled for. These results further support EC being viewed as an important, potentially causal, factor in the development of externalising problems. Valiente et al. (2003) used a regression analysis and reported that the relationship between children's low EC and high externalising behavioural problems was strongest in those children who were prone to negative emotions. This supports earlier assertions by Eisenberg et al. (2000) that children high in both temperamental negative emotionality and low in regulation are more likely to be susceptible to externalising behaviour problems. Those children who are not prone to frequent and intense negative emotions may have less of a need to effortfully manage their attention and behaviours resulting from arousal, as they are less likely to be over aroused.

Studies with Children with Externalising Problems

Eisenberg et al. (2004) found that low EC was directly related to children's externalising problems. They used structural equation modelling to assess the role of impulsivity over a two year follow up and found that EC and impulsivity uniquely

and directly predicted resiliency and externalising problems in a sample of around 200 children who displayed a range of externalising and internalising problems (signified by a *t* score of 60 or above on the CBCL).

In terms of clinical significance of such results, Eisenberg et al. (2004) reflect that “The pattern of findings suggests that efforts to reduce externalising problems should include procedures designed to refocus attention on internal or external stimuli that lower arousal or inhibit behaviour when one is frustrated or angered” (p. 42).

It is of note that, whilst considering a link between externalising problems and EC, few studies have focused on EC in children who have diagnoses of externalising disorders, such as oppositional defiant disorder, conduct disorder or attention deficit hyperactivity disorder (ADHD). The reader is directed to related literature where executive functioning and impulsivity, both possible components of EC, have been examined in relation to a wide variety of clinical diagnoses of externalising disorders. One example is the argument that deficits in behavioural inhibition may be the central impairment in ADHD (Barkley, 1997).

Nigg, Goldsmith and Sachek (2004) propose the integration of literature on child temperament and ADHD in order to more fully understand the condition. They review relevant literature and suggest a multiple pathway model to understanding the aetiology of ADHD that would encompass aspects of temperament. As the EC literature develops, it is likely that both concurrent and more predictive longitudinal studies will usefully be employed to examine the role of EC in diagnosable externalising disorders rather than just in externalising behavioural problems within

the general population and that this will result in a more complete understanding of the aetiological role of temperament in these disorders.

Methodological Issues

In considering the evidence linking temperament and later problems, both internalising and externalising, it is important to remember the possibility that the studies cited may in fact be measuring different aspects of the same phenomenon. Caspi et al. (1995) state that it could be possible that “at the extreme, individual differences in childhood behavioural styles are actually early, subclinical manifestations of later behavioural disorders” (p.66). They further discuss the possible conceptual similarity between temperamental factors and behaviour problems and note that questionnaire measures purporting to measure the two distinct constructs, may actually include items which overlap and therefore the distinction between temperament and behavioural problems is somewhat blurred. This may be especially true when parental ratings are used to assess both constructs (Lemery et al. 2002). The issues outlined above whilst reviewing the anxiety literature regarding implying causality from correlational research and the limitations of self-report outlined above are also of relevance here.

Attentional Biases and Psychopathology

Despite clear evidence linking EC with both internalising and externalising problems, at this stage very little is known about the mechanisms that give rise to this association. Few studies have directly set out to investigate what mechanisms might be at work although EC has been linked to underlying attentional problems, particularly attention to threat (Lonigan et al., 2004). Given the central role of attentional control in EC and the role of attentional biases in psychopathology, one plausible account is that the link is mediated by associated attentional biases. A problem in controlling attention might therefore manifest itself in maladaptive attentional biases.

In this next section, a brief case for the importance of attentional biases in psychological models of psychopathology will be made, and then studies examining attentional biases will be reviewed, followed by studies that explicitly investigate the link between EC and attentional biases.

Attention and Psychopathology

A cognitive understanding of psychological distress and disorders suggests that problematic distress is maintained partly by the selective processing of information pertinent to the problems that are the focus of the distress (Taghavi, Dalgleish, Moradi, Neshat-Doost and Yule 2003). Beck's (1976) cognitive behavioural model suggests that information-processing biases could conceivably become part of a vicious circle of cognition and emotion. For example, a person may show an

attentional bias such that they focus on their own bodily symptoms (self-focused attention). Perhaps they become aware of their own pulse, they then become distressed, fearing a heart attack. This cognition then leads to further distress and serves to increase the attentional bias, such that bodily symptoms will be more closely attended to. Such a process is assumed to both increase distress and to maintain an attentional bias (Clark & Wells, 1995).

Crick and Dodge (1994) propose a model of social information processing that has been influential in shaping research, particularly within the area of childhood aggressive behaviour. The model explains children's social behaviour as a function of sequential steps of processing and offers a framework in which we can understand possible roles of attention. The steps are: encoding of social cues, interpretation of social cues, clarification of goals, response access or construction, response decision and behavioural enactment. Processing activity within each stage is considered to be a function of the activity within the others and to be influenced by memory processes and the content and organisation of memory stores. Crick and Dodge (1994) note that a child will focus on particular cues in a situation. It seems likely then, that at the point of encoding, an attentional bias may be important in determining whether a stimulus or event is observed and the amount of attention directed to it. This will then influence the subsequent interpretation of the stimulus and the behavioural and emotional response.

Information Processing Biases in Anxiety

Vasey and MacLeod (2001) review the evidence of information processing biases in childhood anxiety. From this review it appears that anxious children show biases at

many of the steps outlined in Crick and Dodge's (1994) model. They disproportionately opt for the more threatening interpretation of an ambiguous scenario, show a preference for maladaptive coping strategies, overestimate the chance of experiencing future threatening events and may show superior memory for threatening information. Of particular interest to this review is the attentional bias to threat in anxiety, which will be detailed below.

Attentional Bias in Anxiety

Biases of attention have received considerable attention in the anxiety literature. Research in this area, much of which has been completed with anxious adults has reported an attentional bias to threat in anxiety and suggests the importance of cognitive factors in both the aetiology and maintenance of anxiety. (Mathews & MacLeod, 1994; Mogg & Bradley, 1998). With children, evidence relating cognitive processes and anxiety is less comprehensive. This literature has been comprehensively reviewed elsewhere (Vasey & MacLeod, 2001); a brief review will be presented below.

Vasey and MacLeod (2001) report evidence that supports an attentional bias towards threat cues in high-anxious children and an attentional bias away from threat cues in low anxious children. However, they also discuss a series of inconsistent findings within this evidence base. Vasey and MacLeod (2001) suggest that the contradictory findings reported can mostly be explained by methodological differences. For example, it appears that experimental work using a modified Stroop task produces less consistent results than those obtained using the dot probe detection paradigm.

The modified Stroop tasks compare average time taken to name the colour in which threat relevant and non-threatening stimuli are written. This is supposed to give a measure of the cognitive interference caused by the threatening word. It is assumed that a longer time taken to name threat words is a result of threat words having caught attention more than neutral words. Children with specific fears have been found to display increased colour naming latencies for feared stimuli only under very particular experimental conditions. (See Vasey & MacLeod, 2001)

In contrast to the Stroop evidence, studies utilising probe detection tasks have shown consistent evidence of an attentional bias towards threat stimuli in anxious children. In this paradigm, commonly, one threat word and one neutral word are presented one above the other on a computer screen. The words then disappear and a dot is presented in one of the locations. Latency to detect the probe provides a measure of how much the attention was directed towards the word that was previously displayed there. A faster latency to detect a probe when a threat word was present, as opposed to a neutral word, would indicate an attentional bias to the threat word (e.g. Vasey, Daleiden, Williams & Brown, 1995).

Avila and Parcet (2002) used a cueing paradigm where undergraduate participants had to detect a target that appeared on a computer screen either 100 or 500ms after the presentation of a cue - either a threatening or a neutral word. Cues were either valid, where the target appeared in the same location, or invalid, target in opposite location to cue. Avila and Parcet found that, for the non-clinical trait-anxious participants, there was a greater tendency to focus on locations where aversive cues had been presented.

Clinical Anxiety

An attentional bias to threatening stimuli has been observed using probe detection tasks in clinically anxious children (Vasey et al., 1995). This effect was reported to be more apparent when the threat word was presented in the bottom part of the screen, particularly in younger children. Non-anxious children showed no bias either toward or away from threat words.

Dalgleish et al. (2003) reported a comparison study of processing biases across different clinical disorders: generalised anxiety disorder (GAD), posttraumatic stress disorder (PTSD) and depression in children and adolescents, age seven to 18. They utilised both the modified Stroop and the dot-probe paradigms. The anxious children showed an absolute bias to threat related material on the dot-probe task, although the same effect was not observed using the modified Stroop task. The study also demonstrated some specificity of processing whereby anxious children had a greater attentional bias for threat-related material compared to depression related material on the dot-probe task.

Taghavi et al. (2003) attempted to replicate with children and adolescents, the seminal findings of Mathews and Macleod (1985). The 1985 study had demonstrated the attentional bias to threat in adults with generalised anxiety disorder (GAD) using the modified Stroop test. Taghavi et al. (2003) found that children and adolescents with GAD did show selective interference for negative emotional material. However, Taghavi et al. concluded that this was an effect for general negative emotional material rather than being specific to threat-related material as interference was also

observed with depression related material in the GAD children. They stated that a stronger threat specific interference effect may emerge with methodological changes.

Yiend and Mathews (2001) used facial expressions as the threatening stimuli when investigating attentional biases with adult participants. They argued that, if the attentional bias is an underlying vulnerability factor for anxiety, attentional priority to more realistic threatening stimuli than threatening words, should be observed. Yiend and Mathews go on to suggest that some attentional bias to threat would be an adaptive response but that response to low threat cues would compromise a person's ability to function successfully at other tasks. Yiend and Mathews (2001) therefore used pictures of threatening situations to more easily vary intensity of threat. They found that high anxious adults did show an attentional bias to threatening stimuli in this situation.

However, using stimuli that have additional personal relevance has produced a different effect. Chen, Ehlers, Clark and Mansell (2002) observed an avoidance effect of faces in those with social phobia. Their study used a dot probe paradigm in which two photographs (one showing a facial emotion and one a neutral object) were displayed simultaneously on a computer screen for 500ms. Participants with social phobia selectively attended to the objects and away from the faces. Regarding a scanning effect, (Amir, Foa & Coles, 1998) have demonstrated selective attention to social threat at 100ms followed by avoidance at 850ms. It has therefore been suggested that people with social phobia may initially attend to threatening faces but avoid these faces when they have adequate time to move their eyes or where the social threat is more serious (Harvey, Watkins, Mansell & Shafran, 2004).

Non-clinical Anxiety

There is mixed evidence regarding high-trait anxiety in children without a clinical anxiety disorder. High-trait anxious children have been shown to demonstrate a bias to threat and low trait anxious children show an attentional bias away from such stimuli (Bijttebier, 1998, cited in Vasey and MacLeod, 2001). Bijttebier (1998) used a dot-probe task and compared responses of high and low-trait anxious children (mean age 10.8). High trait anxious children showed a speeding to detect probes close to the threat stimuli whilst low-trait anxious children showed a slowing in response time to detect the probes displayed near to the threat words. However, Ehrenreich, Coyne, O'Neill and Gross (1998, cited in Ehrenreich & Gross, 2002) used a probe detection task (presentation time 1250ms) with a non-clinical sample of children (nine to 11 years old). They reported that self-reported anxiety did not demonstrate a significant relationship to attentional bias in a normative sample. Interestingly, Ehrenreich et al. (1998) observed a gender effect such that boys were slightly more likely to bias attention away from threat and girls slightly more towards threat stimuli regardless of anxiety level.

There is little evidence that elevation in state anxiety in children results in an attentional bias to threat. Both Vasey, El-Hag & Daleiden (1996) and Vasey and Schippell, (2000, cited in Vasey & Macleod, 2001) have in fact shown a surprising negative association between state anxiety and attention to threat. It appeared that elevated state anxiety did not serve to increase attentional bias to threat and in fact in both studies, there was a tendency for elevated state anxiety to be associated with reduced attention to threatening information, i.e. avoidance. Ehrenreich and Gross (2002) suggest, "A higher level of symptom severity, perhaps a diagnosable anxiety

disorder, is needed to achieve reliable childhood attentional biases towards threat cues” (p.1005).

Attentional Bias as the Link Between Anxiety and Temperamental Effortful Control

It has been demonstrated that there is an attentional bias to threat-related information in anxious children. However, there is some contradictory evidence and other attentional processes such as disengagement and avoidance may also prove important in understanding the exact nature of any bias (discussed below). Links between EC and anxious psychopathology have also been established. This next section will review evidence relating to the question of whether low EC is related to an increased attentional bias to threat and how this relationship is mediated.

Lonigan and Phillips’ Model (2001)

Lonigan and colleagues (Lonigan & Phillips, 2001; Lonigan, Vasey, Phillips & Hazen, 2004) have produced a model proposing one possible mechanism for EC to play a crucial part in how attentional biases arise and how they maintain anxiety. Lonigan and Phillips (2001) propose that anxiety and temperament may be inextricably linked and that a child would require a dynamic combination of low EC and high temperamental neuroticism/negative affectivity to develop an anxiety disorder.

An introduction to Lonigan & Phillips' (2001) theory requires an understanding of the role of reactive aspects of temperament in anxiety. Lonigan and Phillips (2001) highlight the overlap between aspects of childhood temperament and adult personality. Various factor analytic studies have found that there are three stable factors of temperament – positive affectivity/surgency, negative affectivity/neuroticism and EC, the first two of which are consistent with Rothbart's (1989) ideas of reactive dimensions of temperament, whilst EC is viewed as self-regulatory in function. Although research in this area, particularly with children, is somewhat limited in quantity, there is evidence for a role of temperament in anxiety. Both concurrent and longitudinal studies have shown that those with high negative affectivity/neuroticism are more at risk of psychopathology, particularly anxiety in later life. For example, Eisenberg (2001) reported that children with internalising psychopathology and not externalising problems were significantly higher than controls on negative affectivity/neuroticism and lower on EC. Caspi et al. (1995) reported that temperament factors that equate to high negative affectivity/neuroticism were consistent across age and were associated with occurrence of anxiety symptoms through a 12-year longitudinal study. For a full review of this literature see Lonigan and Phillips (2001).

Lonigan et al. (2004) propose that anxiety is characterised by behaviours consistent with reactive control (e.g. inhibition of behaviour) and is therefore triggered by high temperamental negative affectivity/neuroticism. However, an individual's level of EC is proposed to moderate the behavioural expression of negative affectivity/neuroticism temperament dimensions. Studies have shown that a high EC individual can employ self-regulative processes in the form of attention and other

coping behaviours, and prevent or modulate the experience of distress in the presence of aversive stimulation (Derryberry & Reed, 1996, Rothbart et al. 1994) Lonigan suggests that a failure of effective EC (because of low temperamental ability, high situational demand, or both) leads to reactive control (and therefore anxiety) in highly aversive situations or in individuals with low threshold for distress.

Lonigan and Phillips (2001) therefore suggest that to achieve the same level of emotional stability, high negative affectivity/neuroticism individuals need a higher level of EC as they see more stimuli as aversive, or because these individuals react more strongly to aversive stimuli. They go on to suggest that, whilst high levels of negative affectivity/neuroticism are required to develop clinical anxiety, this alone does not provide an adequate causal explanation. Instead a “dynamic contribution” (p. 70) of both low EC and high negative affectivity/neuroticism is necessary.

Lonigan et al. (2004) describe links with attentional bias, claiming that those with high negative affectivity/neuroticism have an automatic attentional bias to threat which leads to emotional dysregulation and elevated anxiety. This risk is moderated by EC which, in high levels, inhibits the attentional bias to threat. Low EC is thought to prevent overriding of automatic processing bias and, through a biased attention to threat, to promote the risk of dysregulation of emotions and anxiety.

Evaluation of the Model

Derryberry and Reed (2002) found that high trait anxious adults showed an attentional bias towards punishment at short presentation times (250ms). However, when stimuli were presented for a longer time (500ms), the bias was only seen in

high trait anxious individuals who were also low in EC. Derryberry and Reed thought that EC was being utilised by those with skilled control of voluntary attention at longer presentation times and that this ability might allow those with anxiety to limit the impact of threatening information. This finding supports Lonigan and Phillips (2001) idea that the interaction between attentional bias and anxiety may be mediated by EC. Derryberry and Reed (2002) suggest that, “These findings warn against viewing processing biases as common to all anxious persons: Their magnitude and time course depends on another personality dimension involving the capacity to voluntarily control attention” (p. 233). It seems that skilled voluntary control of attention may allow the anxious person to limit the impact of threatening information – further support for Lonigan’s interactional model.

Derryberry and Reed (2002) go on to suggest that those anxious individuals with good EC may be more able to disengage attention from the threat, this would therefore allow them to remain in the situation and possibly learn from it. This may be relevant in considering the success of CBT in anxiety (Dadds & Barrett, 2001) it may be that those with high EC are able to learn that anxiety can be tolerated. Those with low EC might be overwhelmed and have to avoid or escape, thus presumably entering a vicious circle of fear and escape, reinforcing anxious/avoidant behaviour.

Related to the phenomenon of disengagement from threat, Derryberry and Reed’s (2002) experimental design allowed them to assess not only bias towards threat, but ability to disengage attention. They used an orienting paradigm to assess attentional biases. This involved presentation of relevant threatening stimuli in a game where peripheral cues are used to orient participants to either a positive location, where

points are gained if the response is swift enough, or to a negative location, where points will be deducted if the response is too slow. Using this task the researchers found that anxiety seemed to cause a delay in disengaging attention from threat rather than enhancing the attention to threat, this argues against a highly automatic bias related to anxiety. Derryberry and Reed's (2002) paper suggests that EC may have the majority of its influence, moderating the effect of anxiety, at the disengagement stage. Whilst anxiety slows a person's ability to disengage from threat, EC may serve to allow anxious individuals to overcome this tendency to get attention "stuck" on the threatening stimuli. This could serve as alternative explanation for EC as a protective factor against the occurrence of anxiety disorders.

Further support for the role of EC as a moderator of the attentional threat bias is offered by unpublished data of Vasey (2003) cited in Lonigan et al. (2004). Vasey reported that EC significantly moderated the relation between anxiety and attentional bias in children. Lonigan et al. (2004) also cited a paper presented by Vasey et al. (2002) which assessed 200 adolescents and found that both negative affectivity and attentional control significantly predicted scores on a self report anxiety measure. Those individuals who had high negative affectivity were only likely to show anxiety symptoms when they also had low EC; those with high EC had significantly fewer anxiety symptoms.

In contrast, Muris et al. (2004) attempted to evaluate the model in a non-clinical population. They reported that, although neuroticism was negatively associated with attentional control and positively correlated with anxiety symptoms, and attentional control was negatively associated with anxiety symptoms, they did not find that the

interactive combination of high neuroticism and low attentional control is required for the development of anxiety problems. Muris et al. (2004) raise the possibility that the interactive effect of neuroticism and attentional control may only be seen in children with clinical levels of anxiety or when the child is in a threatening situation. Although neuroticism and attentional control each make an independent contribution to anxiety symptoms, they may interact only in stressful conditions.

Interim Summary

We have seen that poor EC is associated with an attentional threat bias and that an attentional threat bias is associated with increased anxiety. It appears that EC serves to moderate this link. This has been demonstrated in non-clinical adults (Derryberry & Reed, 2002) and in children with anxiety (Vasey, 2003).

These are promising studies and reflect a movement towards considering EC as an important control mechanism and possibly as the fundamental risk factor in occurrence of clinical anxiety.

Links Between Effortful Control, Attentional Bias and Aggression

EC is clearly important in anxiety and linked to the most prominent cognitive mechanism in anxiety research, the attentional bias. As this link is so important in anxiety, and EC has been linked with aggressive behaviour, it may be possible that cognitive attentional biases may yet be shown to play a similarly important role in the mediation of the relationship between EC and aggression.

Attentional Biases in Aggression

Crick and Dodge's social information processing model (1994) allowed a framework for understanding and studying the cognitive mechanisms involved in aggressive behaviour in children. Their work suggested it would be possible that a bias operating at the earliest stages of encoding and representing of social cues could greatly influence subsequent stages of information processing and resultant behaviours. It was hypothesised that children who display aggressive behaviour may attend selectively to cues that are relevant to social conflict and aggression more often than their peers. Following on from this attentional bias, children may then fail to attend to non-aggressive/conflictual cues and therefore become increasingly likely to interpret ambiguous social situations negatively and to respond aggressively. Crick and Dodge suggested in 1994 that future research should integrate cognitive psychology techniques measuring response times and priming effects to assess automatic processing in aggression. An interesting question remains over whether people are biased to aggressive behaviour because their attention has been caught on the negative information in the environment? It may be possible that automatic effects, in the form of attentional biases to aggressive stimuli serve to increase the

likelihood of subsequent aggressive behaviour in much the same way as the bias to threat is assumed to have a causal role in anxiety.

Emerging evidence has examined the possibility of an attentional bias in aggressive individuals. The research literature is currently limited in quantity and uses mostly adult participants. Within laboratory situations, such a bias has been demonstrated. Van Honk, Tuiten, de Haan, van den Hout and Stam (2001) report a study with university students which found that a high self reported trait anger score was associated with an attentional bias for angry faces in a pictorial emotional Stroop task.

Distinguishing between the attentional biases seen in trait and state anger, Cohen, Eckhardt and Schagat (1998) administered a visual search task to young adults with varying levels of trait anger, having administered an anger inducing insult to half the participants. They reported that, within individuals who were angered, a positive relationship was seen between the level of trait anger and the difference in reaction times to anger related distracter words. This indicates that in angry people, a mood congruent attentional bias is seen; high-trait anger participants, when insulted, allocate more attentional resources to anger-related stimuli than to neutral or positive stimuli. Cohen et al. suggest that this provides preliminary evidence of biases in preattentive information processing during anger arousal in high trait angry individuals. Interestingly this tendency was found to diminish with greater number of trials and the authors propose that individuals with anger problems may benefit from exposure programmes to target these involuntary cognitive processes and may benefit in a similar way to those with anxiety from exposure and habituation to their

involuntary automatic tendency to allocate attentional resources towards threatening stimuli.

Gouze (1987) aimed to assess attentional processes in aggressive children. This experiment utilised aggressive and non-aggressive puppet shows and cartoons and compared children's difficulty in shifting attention away from these stimuli and their selective attention towards them when involved in other activities. Gouze found some evidence that aggressive children selectively attend to hostile cues in social situations and have difficulty shifting attention away from such cues. This may again be evidence of difficulty disengaging attention from salient stimuli. It is of note that this experiment did not control for inattention or hyperactivity/impulsivity and therefore it is not clear that the effect found is related entirely to aggression.

Schippell, Vasey, Cravens-Brown and Bretveld (2003) examined attentional biases in children and adolescents, they utilised a reaction time measure to investigate online attention allocation processes as they relate specifically to reactive and proactive aggression, they also measured children's intent attributions to ambiguous social situations and various personality and behavioural characteristics using parent, teacher and child questionnaire ratings. The study found that reactive aggression but not proactive aggression was related to biased attention for rejection, ridicule and failure cues. Heightened reactive aggression was associated with a suppression of attention to these cues. The authors were surprised by the direction of this effect; that high levels of reactive aggression were associated with suppressed rather than heightened attention to such stimuli. They suggest several possible interpretations for this finding, including methodological factors, such as a lack of the use of physical

threat words related specifically to aggression and they question how automatic the processing was given the length of presentation of stimuli. It could be that it was too long a presentation time to detect an automatic attentional bias towards threat, which may operate earlier in the sequence. Schippell et al. (2003) also discuss ideas about how such attentional suppression could still contribute to inappropriate aggressive responses. It appeared that suppressing threat-related information, in some way, caused a hostile attribution to be made based on this biased initial information processing. This may be due to some form of avoidance of threatening information.

In a similar way as was discussed in the disengagement literature in relation to anxiety, Wilson (2003) found that children who were aggressive or rejected by peers had significant difficulty shifting attention away from angry facial expressions during a computerised task (than did non-aggressive/popular children). No group differences were found in shifting attention away from happy or neutral facial expressions. These aggressive children were showing an apparent difficulty with disengaging from threatening stimuli. Wilson's experiment also engineered some social failure that was presumed to have aroused negative affect and reported that aggressive/rejected children then demonstrated a prolonged lack of socialised behaviour with the children who had previously been involved in their social failure. Finally aggressive/rejected children showed more difficulty regulating their emotions than did the non-aggressive/popular children. Wilson suggests, "Exposure to negative affect may lead aggressive/rejected children to allocate more attentional resources to anger-related themes. This may leave fewer attentional resources available for processing positive information such as happy facial expressions and opportunities to play with others" (Wilson, 2003, p.324).

Evidence is emerging which suggests that aggressive or angry individuals show an attentional bias to anger related stimuli, it is not clear from the reviewed studies whether this bias can be attributed wholly to either a hypervigilance for this information or a problem disengaging from these stimuli.

The Mechanism of Attentional Bias

As noted in several of the studies reported here, hypervigilance is not the only possible bias of attention observed. Studies have also demonstrated apparent avoidance of threatening stimuli and difficulties with disengagement.

Disengagement

Recent studies from several independent researchers are suggesting that the attentional bias in anxiety may not be based on hypervigilance to threat but more a problem disengaging attention from threatening stimuli. This is more than an interesting theoretical distinction as it has considerable implications for both our understanding of mechanisms underpinning anxiety, and the treatments employed in treating these disorders. It also has repercussions on how we view EC. Conceptually, if disengagement were thought to be most important, the role of EC, as an ability that permits switching of attention, may also be viewed as increasingly important.

Fox, Russo, Bowles and Dutton (2001) studied disengagement of attention in undergraduate students using an attentional cueing paradigm. They completed a

series of experiments using threatening words and faces. In one example, schematic faces (angry, neutral and happy) were presented on a computer screen for either 100 or 250ms and then, after an interval of 200ms or 500ms, participants had to respond to a neutral target, either in the same location, or opposite to where the face had been. Fox et al. did not find an attentional bias to threat, with words or faces, even when participants were highly state-anxious. This finding is consistent with studies of state anxiety discussed above. However, Fox et al. did report that threatening cues, both words and pictures of faces, strongly impacted upon the disengagement of attention, such that locating the target in the opposite location after presentation of the angry face resulted in a slowed response. Those individuals with higher state anxiety found it more difficult to disengage from threat related stimuli. This study demonstrates that those with high state anxiety are likely to dwell for longer on threat-relevant stimuli and that this may be important in considering the maintenance of anxiety states. Fox et al. (2001) summarise, "The interesting point about our results is that the interface between the attentional and affective systems appears to be in the disengage component of visual attention rather than a shift component" (p. 697).

Yiend and Mathews (2001) also examined disengagement and reported that high trait anxious adults were slower to disengage attention from threat relevant stimuli than were less anxious controls (at short cue exposure time). At longer cue exposure, both high and low anxious participants were slower to disengage from threatening rather than non-threatening stimuli. At both exposure lengths, there was a more pronounced slowing effect for the severe threat stimuli in the anxious group only. The methodology in this study allowed Yiend and Mathews (2001) to conclude that displaying threatening pictures served to delay attentional disengagement and that

there was no evidence to suggest that greater engagement with threatening pictures led to speeding (hypervigilance).

More recently, Amir, Elias, Klumpp and Przeworski (2003) have found that adults with social phobia also show a specific deficit in disengaging attention from emotionally valenced (socially threatening) words that is not seen in controls. No evidence was found for differences between those with social phobia and the non-anxious controls in their facilitated attention to social threat, thus Amir et al. conclude that, "Disengagement difficulties may be the primary mechanism of attentional bias in these [socially phobic] populations" (p.1333).

Koster, Crombez, Verschuere and De Houwer (2004) designed research to distinguish whether vigilance or disengagement is fundamental in the anxiety related attentional bias. They discuss how previous research, such as that presented above, has interpreted dot probe task results as evidence for a facilitated vigilance to threat in anxious subjects. Koster et al. argue that this is ambiguous evidence and in fact the same results are at least partially due to the disengagement effect. This distinction is important in our understanding of anxiety, as vigilance to threat has been credited with responsibility for certain features of anxiety disorders. Koster et al. (2004) suggest that if anxiety were characterised instead by the difficulty in disengaging from anxiety, "this would lead to a different set of problems, specifically at breaking away from negative material and engaging in appropriate coping behaviour" (p.1184). The difficulty disengaging from threatening information is expected to relate to prolonged anxious states as well as limiting attention to, and therefore the efficacy of, fear-disconfirming information and active coping strategies.

Koster et al. also suggest that repeated experience of lack of ability to disengage will leave the person with feelings of uncontrollability.

Avoidance

When considering the mechanism of attentional biases and subsequent emotional and behavioural problems, the issue of avoidance must also be of importance. Much of the attentional bias literature reported above suggests that people with anxiety are hypervigilant to threat and notice it more than others or have difficulty disengaging from threatening stimuli. Whilst that makes some sense in terms of the development of an anxious or aggressive response, there appears to be some form of paradox here, in that we imagine anxious people avoid threat, for example a spider phobic avoids any contact with the threatening stimuli of spiders. It may in fact be a case of anxious people scanning for and being hypervigilant to, but then subsequently voluntarily and deliberately avoiding threatening stimuli. This can be linked with that which is known about cognitive behaviour therapy where an anxious person is thought to become stuck on their anxious cognitions and unable to shift their attention onto more healthy thoughts.

For avoidance to play a part in any attentional bias, it must be assumed that some mechanism of scanning is in operation. In order to systematically avoid a certain category of stimuli, in both attentional cueing tasks as described above, and in the real world in relation to threat stimuli, the person must first have scanned the information, possibly extremely rapidly and picked up on the threatening nature of the stimuli, to be able to subsequently avoid it. This avoidance would then presumably be picked up at longer latencies. Avoidance has been observed in

attention tasks using faces as stimuli (Chen et al., 2002, Mansell, Clark, Ehlers, & Chen, 1999). Avoidance may also have been the most important factor in the findings of Schippell et al. (2003) and the two studies reported by Vasey and MacLeod (2001) that showed that elevated state anxiety was associated with reduced attention to threatening information. Amir et al. (1998) have demonstrated selective attention to social threat at 100ms followed by avoidance at 850ms. This is suggestive of the scanning effect that would be necessary for avoidance of a specific class of stimuli to be achieved. It has therefore been suggested that people may initially attend to threatening faces but avoid these faces when they have adequate time to move their eyes or where the social threat is more serious (Harvey et al., 2004). This effect has been demonstrated in social phobia (Chen et al. 2002).

It should be noted that no studies investigating this hypervigilance versus disengagement effect have been reported with child participants. Further research will elucidate if this effect is found in either a clinical population or in non-clinical children.

Automatic or Controlled Attentional Biases?

Some researchers have queried whether attentional processes vary according to the length of presentation of threat stimuli. This literature is reviewed below.

Macleod and Rutherford (1992) reported that high trait anxious individuals who were high state anxious showed decreased attentional orientation to threat when controlled processing was permitted by longer latency of presentation of stimuli but when shorter presentation was used, attentional orientation to threat increased.

Derryberry (1998) in a paper presented at conference, cited by Vasey and Macleod (2001) found that high trait anxious adults showed attentional bias to threat when stimuli were presented for 250ms. However, under a longer presentation condition (500ms), the attentional bias to threat in high anxious adults remained only in those who were low in attentional control (low EC). High trait anxious adults with high EC shifted attention away from the negative stimuli as much as low trait anxious participants. It was concluded therefore that shorter latency of presentation prevented attentional control operating and that, only at longer latencies, could the beneficial effect of EC be employed.

In adult studies, clinically anxious people (as opposed to non-clinical participants with high self-reported trait anxiety) have been found to fail to display controlled attentional avoidance of threatening information (Mathews & MacLeod, 1994). It is not clear why anxious individuals would not show avoidance of threat stimuli at slower presentations, however Mathews and Macleod suggest that the absence of controlled attentional avoidance (that shown at longer presentation of threatening stimuli) of threat may represent a hallmark of clinical status of anxiety. Vasey and MacLeod (2001) point out that whether or not a child can “succeed in developing the ability to effortfully direct attention away from threatening information may be the most important determinant of their future clinical status” (p273). Lonigan et al. also argue that an inability to acquire a strategically mediated pattern of attentional avoidance may reflect a pre-existing deficit in attentional control and may heighten risk of future anxiety pathology.

Lonigan et al. (2004) suggest that there are qualitative differences between the pre-attentional bias and the attentional bias. They propose that high levels of negative affectivity/neuroticism increase the risk of anxiety, and that this is partly through the associated pre-attentional bias. EC, they suggest, can moderate the persistence of this bias when controlled attentional processes are permitted, i.e. longer latencies. This research led to speculation that the temperamental factor of EC is vital in anxiety (Lonigan & Phillips, 2001; Lonigan, et al., 2004).

The studies reviewed in the adult literature demonstrate clearer attentional biases to threat in anxious individuals when threat related stimuli are presented for brief intervals than when the stimuli are displayed for longer periods. There is a suggestion that any bias towards threatening information may be a consequence of the type of processing in operation, some researchers have interpreted this as a difference between automatic processing at rapid latencies and more controlled processing at slower presentations. In children, this pattern is less clear-cut, possibly because of the smaller quantity of research.

Conclusion

In conclusion this review has examined literature linking EC with both internalising and externalising problems. It has demonstrated that anxiety and aggression are associated with attentional processes through biases of attention and has discussed the mechanism of this attentional bias. It is not yet clear whether attentional biases result from hypervigilance to threat, difficulty disengaging or some form of avoidance effect.

The review has also presented literature on the cognitive factor of attentional bias and how such biases may serve to mediate the link between the temperamental measure of EC and development of behavioural problems, both internalising and externalising in nature. It has described two studies where EC is linked with attentional biases and anxiety (Derryberry & Reed, 2002; Lonigan, 2004) and shown that EC has been directly linked with ability to disengage from threatening stimuli (Derryberry & Reed, 2002). This provided early evidence that EC may have its effect on behaviour via attentional biases such that skilled use of EC in those who have the ability to utilise it, can limit the impact of threatening information. There is suggestive evidence of a similar pattern operating in aggression. It was demonstrated that those with low EC are more at risk of externalising behaviour problems and it is proposed that this link may again be mediated by attentional bias to aggressive related information.

Although research in this area is at an early stage it may be possible to speculate that low EC could serve as a generic risk factor for psychopathology. Currently much

more research is required. Of particular interest will be research attempting to replicate Derryberry and Reed's (2002) findings with children. Further work will also be of relevance in discerning the exact nature of the attentional biases operating in anxiety and aggression be they related to avoidance, hypervigilance or disengagement. Finally, more work is required in assessing the link between disengagement and EC where the evidence base is currently limited.

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Paper 2: Empirical Paper

Effortful Control, Attentional Biases and Problem Behaviours in Children

Abstract

This study examined the role of attentional biases as a mediating factor in the relationship between effortful control (EC) and both internalising and externalising behavioural problems in children. The sample consisted of 110 children between the ages of nine and 11 recruited from a community school. Parental, teacher and self-report ratings of behaviour and EC, demonstrated that children with lower EC had increased internalising and externalising problems. A modified cueing task was used to investigate attentional biases using threatening faces as aversive stimuli. Attentional avoidance of aversive stimuli was associated with increased emotional and behavioural problems; this effect was particularly strong in boys. This avoidance partially mediated the relationship between EC and emotional and behavioural problems in boys. Theoretical and clinical implications of the results are discussed.

Effortful Control, Attentional Biases and Problem Behaviours in Children

Introduction

Recent innovations in psychological thinking and research have begun to examine common cognitive processes across psychological disorders (Harvey, Watkins, Mansell & Shafran, 2004). Attentional biases have received considerable attention in research into the aetiology and maintenance of anxiety and more recently of aggressive behaviour. However, little is yet understood about the mechanisms that link attentional bias with emotional and behavioural disorders. There is emerging evidence that temperamental individual differences may play a major role in the relationship between these cognitive processes and behavioural manifestations.

Effortful Control

Of the range of temperamental differences that have been reported in the literature, the construct of effortful control (EC) is receiving increasing attention. EC is an aspect of temperament that serves a self-regulatory function and is defined as “the ability to suppress a dominant response in order to perform a subdominant response.” (Rothbart, Ellis, Rueda & Posner, 2003, p.1114). There has been limited integration of the research on temperament and childhood psychopathology (Frick, 2004), however EC has been implicated both in behavioural/motivational control and emotion regulation (Lengua, 2002; Valiente et al., 2003).

Within community samples of children, high anxiety has been found to correlate with low attentional and inhibitory control, both factors of EC. (Lemery, Essex & Smider,

2002; Muris, de Jong & Engelen, 2004). A similar effect has been reported in those with internalising problems (Eisenberg et al., 2001). Two longitudinal studies have described low levels of attentional and inhibitory control predicting later childhood or adolescent internalising problems (Caspi, Henry, McGee, Moffitt & Silva, 1995; Lemery, Essex & Smider, 2002). Contrary to these results, Murray and Kochanska (2002) reported higher levels of EC to be associated with internalising problems, whilst low levels were more linked to externalising behaviours. They suggested that adaptive functioning was related to having a moderate level of EC, and that those children who are overcontrolled may be more liable to experience anxiety or depression symptoms while undercontrol would relate to externalising psychopathology. Other researchers (e.g. Eisenberg et al., 2004) have suggested that Murray and Kochanska's (2002) results may have been due to the behavioural tasks tapping not only EC, but also reactive control.

Eisenberg et al. (2004) demonstrated a correlation between low EC and increased externalising behavioural problems. A child's vulnerability to poor social functioning has been shown to be limited if they have a more developed capacity to self regulate, or to utilise EC (Zhou, Eisenberg, Wang & Reiser, 2004). Gilliom, Shaw, Beck, Schonberg and Lukon (2002) report that a reliance on effective regulatory strategies, such as distraction and passive waiting, predicted greater self-control and lower levels of externalising behaviour problems. In longitudinal research, Caspi et al. (1995) reported that lack of control in early childhood was specifically linked to later reported hyperactivity and attention problems as well as antisocial behaviour in late childhood and conduct disorder in adolescence. The effect sizes suggested a stronger relationship between externalising problems and low EC than was found with

internalising problems. Valiente et al. (2003) completed a six-year follow up study, at three assessments, each separated by two years, with higher EC being associated with low levels of externalising behaviours. There is therefore a growing body of evidence that poor EC is linked with both internalising and externalising behaviour problems in children.

Attentional Biases

Despite clear evidence linking EC with both internalising and externalising problems, very little is known about the mechanisms that give rise to this association. Few studies have directly set out to test possible mechanisms although in some work, EC has been linked to underlying attentional problems, particularly attention to threat.

Attentional Biases in Internalising Behaviours

Attentional bias has received considerable attention in the anxiety literature. Research in this area, mostly completed with adults, has found consistent evidence of attentional biases to threat in anxiety and suggests the importance of cognitive factors in both the aetiology and maintenance of anxiety (Mathews & MacLeod, 1994; Mogg & Bradley, 1998).

A bias to threatening stimuli in attentional tasks using dot probe paradigms has been demonstrated in high trait anxious children (Bijttebier, 1998; cited in Vasey & MacLeod, 2001), in clinically anxious children (Vasey, Daleiden, Williams & Brown, 1995), and in those with generalised anxiety disorder (GAD) and posttraumatic stress disorder (PTSD) (Dalgleish et al., 2003). Taghavi, Dalgleish,

Moradi, Neshat-Doost and Yule (2003) found that children and adolescents with GAD showed selective interference for negative emotional material using an emotional Stroop paradigm. Both Vasey, El-Hag and Daleiden (1996) and Vasey and Schippell, (2000, cited in Vasey & Macleod, 2001) have in fact shown a surprising negative association between state anxiety and attention to threat in a non-clinical population. It appeared that there was a tendency for elevated state anxiety to be associated with reduced attention to threatening information - an apparent avoidance effect. For a comprehensive review of anxiety and attentional biases in children see Vasey and Macleod (2001).

Nature of Attentional Bias

The nature of attentional biases in anxiety is not fully understood. Traditionally these results have been viewed as a hypervigilance to threat whereby the anxious person is assumed to notice threat signals more quickly, which in turn is believed to play a role in maintaining maladaptive schemas regarding threat (Harvey et al., 2004). Recently researchers using paradigms that discriminate different attentional processes, have proposed that the important attentional bias may be a difficulty in disengaging from threat stimuli (e.g. Fox, Russo, Bowles & Dutton, 2001). Such effects have been shown in high trait anxious adults (Yiend & Mathews, 2001) and in adults with social phobia (Amir, Elias, Klumpp & Przeworski, 2003). Amir et al. (2003) used a Posner cueing paradigm (Posner, 1980) in which social threat, neutral or positive words cued one of two locations on a computer screen. The cue word was presented for 600ms, after which participants had to respond to a probe which appeared either in the same place as the word (valid trial) or in the opposite location (invalid trial). Those participants with social phobia showed longer latencies to detect invalid cued

targets than controls but only when the cue was a social threat word. No differences were observed in responses to validly cued targets. This indicated that those with social phobia had difficulty disengaging their attention from socially threatening material and suggested that differences in orienting to threat stimuli were less important than had previously been assumed. Koster, Crombez, Verschuere and De Houwer (2004) note that previous research has interpreted dot probe task results as evidence for a facilitated vigilance to threat in anxious subjects. However, they suggest this evidence is ambiguous and in fact the same results are at least partially due to the disengagement effect.

The evidence regarding attentional biases towards threats and more recent findings regarding slower disengagement from threatening stimuli in anxious individuals is in apparent contrast to the well-established tendency for anxious individuals to avoid anxiety-provoking stimuli. Indeed, some studies have found evidence of attentional avoidance of threat. For example, Chen, Ehlers, Clark and Mansell (2002) observed an avoidance effect in those with social phobia. Their study used a dot probe paradigm in which two photographs (one showing a facial emotion and one a neutral object) were displayed simultaneously on a computer screen for 500ms. Participants with social phobia selectively attended to the objects and away from the faces. Amir, Foa and Coles (1998) have demonstrated selective attention to social threat at 100ms followed by avoidance at 850ms, suggesting early automatic detection of threat, followed by a perhaps controlled, deliberate avoidance at longer latencies. It has therefore been suggested that people with social phobia may initially attend to threatening faces but avoid these faces when they have adequate time to move their eyes or where the social threat is more serious (Harvey et al., 2004). Avoidance

may also have been important in the two studies reported by Vasey and MacLeod (2001), which showed that elevated state anxiety was associated with reduced attention to threatening information.

Attentional Biases in Externalising Behaviours

There is also evidence that attentional biases are found in those with externalising behaviours. An attentional bias to negative information for angry faces in a pictorial emotional Stroop task has been demonstrated in high self reported trait anger students (Van Honk, Tuiten, de Haan, van den Hout & Stam, 2001). Cohen, Eckhardt and Schagat (1998) demonstrated a mood congruent attentional bias: high-trait anger participants, when insulted, allocated increased attentional resources to anger-related stimuli than to neutral or positive stimuli.

There is a small quantity of research on similar effects in children. Gouze (1987) found some evidence that aggressive children selectively attend to hostile cues in social situations and had difficulty shifting attention away from such cues using aggressive and non-aggressive puppet shows. Wilson (2003) assessed attentional shifting in young children (kindergarten and first grade age) using a computerised task. In this task, two faces were presented simultaneously (for 2.5 sec) and the child was asked to respond if a happy or angry face was displayed. Wilson found that children who were aggressive or rejected by peers had significantly more difficulty shifting attention away from angry facial expressions (than did non-aggressive/popular children). No group differences were found in shifting attention away from happy or neutral facial expressions. Both these studies indicate difficulty disengaging attention from salient stimuli. Schippell, Vasey, Cravens-Brown and

Bretveld (2003) found that heightened reactive aggression but not proactive aggression was associated with a suppression of attention (an avoidance effect) to rejection, ridicule and failure cues in children. Schippell et al. suggest attentional suppression may contribute to inappropriate aggressive responses by interfering with the processing of relevant social cues and by preventing disconfirmation of fears of threat or by not permitting the child to see that the situation might demand a response other than aggression.

The research literature thus shows evidence of at least three ways in which attentional processes are modulated in a manner that may serve to maintain anxious symptoms in those in the normal range and anxiety in clinical populations. Specifically attention may be rapidly deployed to threat stimuli (hypervigilance), it may be preferentially maintained on threat stimuli (and hence poorly disengaged from it; a disengagement effect) or attention may be directed away from threatening stimuli (avoidance). The extent to which these processes work together and how they operate with variations in task characteristics and in different internalising and externalising disorders is not fully understood. Currently there is evidence for an increased avoidance when faces are used as stimuli (Chen et al., 2002, Mansell, Clark, Ehlers, & Chen, 1999).

Linking Effortful Control, Attention and Behaviour

Lonigan and colleagues (Lonigan & Phillips, 2001; Lonigan, Vasey, Phillips & Hazen, 2004) have produced a model suggesting that EC is a crucial part of how attentional biases arise and how they maintain anxiety. Lonigan and Phillips (2001) propose that anxiety and temperament may be inextricably linked and that a child

would require a dynamic combination of low EC and high temperamental neuroticism/negative affectivity to develop an anxiety disorder. An individual's level of EC is proposed to moderate the behavioural expression of negative affectivity/neuroticism temperament dimensions by allowing them to orient away from distressing stimuli. A failure of effective EC (because of low temperamental ability, high situational demand, or both) leads to reactive control (and therefore anxiety) in highly aversive situations or in individuals with low threshold for distress.

Lonigan et al. (2004) describe links with attentional bias, claiming that those with high negative affectivity/neuroticism have an automatic preattentional bias to threat which leads to emotional dysregulation and elevated anxiety. They suggest this risk is moderated by EC (which can be used when strategically mediated or controlled processing is possible). EC in high levels inhibits the attentional bias to threat whereas low EC prevents overriding of automatic processing bias and therefore promotes the risk of dysregulation of emotions and anxiety.

This model has not yet been thoroughly evaluated, but has gained some support. Derryberry and Reed (2002) found that high trait anxious adults showed a threat related delay in disengaging attention at short presentation times (200 ms). However, at longer latencies (500ms), this delayed disengagement effect was only seen in high trait anxious individuals who were also low in EC. Derryberry and Reed concluded that skilled control of voluntary attention might allow those with anxiety to limit the impact of threatening information by allowing them to overcome the tendency to get attention "stuck" on the threatening stimuli. Unpublished data of Vasey (2003) cited in Lonigan et al., (2004) offers further support. Vasey reported that EC significantly

moderated the relation between anxiety and attentional bias in children. Lonigan et al. also cite a paper presented at conference by Vasey et al. (2002) which assessed 200 adolescents and found that both negative affectivity and attentional control predicted scores on a self report anxiety measure. Those individuals who had high negative affectivity were only likely to show anxiety symptoms when they also had low EC; those with high EC had significantly fewer anxiety symptoms.

Predictions of Current Study

Literature has clearly linked EC with both internalising and externalising behaviours. Threat related attentional biases have also been linked to problem behaviours. However it is not yet clear whether these two findings are linked. Given the central role of attentional control in EC, one plausible account is that the link between EC and emotional and behavioural problems is mediated by the associated attentional biases. Such that attentional biases may serve as a mechanism by which EC is related to problem behaviours. The extent to which this is true can be examined by a mediational analysis. This will show what proportion of the variance in the relationship between EC and problem behaviours is carried by the attentional bias. A problem in controlling attention might therefore manifest itself in maladaptive attentional processes. The current study will examine the role of these attentional processes as a mediator of the relationship between EC and problem behaviours, both internalising and externalising in nature.

It is predicted that:

1. Children with low EC will show more behavioural and social problems.
2. Children with low levels of temperamental EC will demonstrate higher levels of attentional biases.

3. Threat related biases of attention (hypervigilance, avoidance and disengagement) will be associated with children's emotional and behavioural problems.
4. As shown diagrammatically in Figure 1, attentional biases will mediate, in a statistical sense, the relationship between EC and emotional and behavioural problems.

Fig. 1: Diagrammatic representation of predicted relationships investigated in the current study

Established link

Hypothesised mediating link

Method

Participants

Children were recruited from a middle school in Southern England. All pupils in years five and six (aged nine to 11) were given information, consent forms and questionnaires by their teachers to take home for completion by parents. 119 parents completed and returned questionnaires, 110 before the cut off date – this was a response rate of 35.7%. Of this sample 56 were boys (50.9%) and 54 were girls (49.1%). The mean age was 9.83 (SD 0.73). Most children were white British with a small number (4) being of ethnic minorities. Due to absences, a total of 100 children completed all measures.

The children were drawn from a middle school (ages 9-13, roll = 702). The area it serves has some deprivation and is below average in socio-economical background. The standards of attainment of pupils as they enter the school are below national averages. The number of pupils who take free school meals is average. Less than one in 20 pupils is from ethnic minority backgrounds and very few speak English as an additional language. Fourteen percent of the pupils on roll have special educational needs. Both authorised and unauthorised attendance is well below the national average.

Ethics

Ethical approval was obtained for this study from UCL Committee for the Ethics of Non-NHS Human Research (See Appendix A for approval letter).

All parents of children involved in the study received an information sheet (Appendix B) and gave written informed consent (Appendix C). The children involved were read details of the research by the principal researcher and they also signed consent forms (see Appendices D and E respectively).

Procedure

All those children whose parents had returned the consent form and questionnaires were asked to participate. All agreed and during school time on two occasions over the next month, children completed the questionnaire measures and the computer task. Each child was involved for a total of approximately one hour. Both parents and children were told that participating children would be entered into a draw, with seven prizes of vouchers for a high-street shop, ranging in value from £5 to £15.

Children were seen for two sessions, during which they completed three questionnaires, detailed below, and the computer task. Questionnaires were completed in a classroom in groups of around 10 children. The researcher read the questions aloud and the children were given time to answer each one. During the computer task, children were seen in groups of five. They were seated in such a way that they could not see others completing the task. All children were asked to remain silent and to concentrate on the task; they were told they would get a brief break in the middle of the procedure. Children were randomly allocated to one of two conditions, informed or uniformed (see measures section below).

Form tutors were asked to complete ratings of the children from their class who had completed the study. The response rate from teachers was 64%.

Measures

This study utilised parental, teacher and self-report questionnaires and a computer task of threat related modulations of attention.

Psychological Difficulties

Strengths and Difficulties Questionnaire, (SDQ: Goodman, Meltzer, & Bailey, 2003). Parents completed the SDQ, a 25 item scale assessing child behavioural problems on four subscales: emotional problems, peer problems, hyperactivity, conduct problems; it also provides a measure of prosocial behaviour. Parents were asked to indicate whether each item was never, somewhat or always true when describing their child's behaviour over the last six months. Example items include; "Often has temper tantrums or hot tempers" and "Many fears, easily scared". The SDQ is a highly standardised measure, used frequently in research (<http://www.sdqinfo.com>) and in clinical work. Alpha coefficients obtained for the subscales in this study ranged from .62 to .89 (median = .77).

Revised Child Manifest Anxiety Scale (RCMAS: Reynolds & Richmond, 1978). Children rated their anxiety symptoms on the RCMAS, a 37-item questionnaire. It incorporates subscales of physiological anxiety, worry/oversensitivity, social concerns/concentration and also contains a nine-item lie scale. Children indicated the extent to which each item was true or untrue (rated on a five point scale) when describing themselves. Items include; "I worry a lot of the time" and "I get nervous when things do not go the right way for me". The RCMAS has consistently shown an alpha coefficient between 0.82 and 0.85 and its validity for assessing chronic manifest childhood anxiety is well established; it is often used in research to validate

other instruments and to measure treatment effects (Centre for Neuropsychology, Swinburne University, n.d.).

Child Behaviour Checklist (CBCL: Achenbach, 1991). The CBCL is a well validated and frequently used rating tool for assessing self-report and third party report of behavioural problems in children between the ages of six and 18. The measure is designed to assess diverse aspects of adaptive and maladaptive functioning. It allows the researcher to assess eight different syndrome scales (including such things as anxious/depressed, thought problems and attention problems) and to build up competence and adaptive functioning profiles. Children completed the five items of the youth self-report form that make up the aggressive behaviour subscale. They were asked to choose if each item was not true, somewhat true or very true for them. The alpha coefficient for this subscale was .79. Items included, "I am mean to others" and "I destroy things belonging to others". Teachers answered a total of 36 items that make up the anxious/depressed and aggression subscales of the teacher report form of the CBCL. Alpha coefficients obtained were .93 for both subscales. An example of an anxiety item is: "Nervous, highly strung or tense", and of the aggression items "Explosive and unpredictable behaviour". The CBCL was added in as the measure for teachers in order to attempt to get a separate measure of internalising and externalising disorder than was provided by the SDQ.

Effortful Control

Revised Early Adolescent Temperament Questionnaire (EATQ-R: Ellis & Rothbart, 2001). Both parents and children completed effortful control subscales of the EATQ-

R. The EATQ-R has been designed to assess temperament by specifically tapping experiences common to adolescents. It has been developed by the same team of researchers as the Child Behaviour Questionnaire (CBQ; Rothbart, Ahadi, Hershey, & Fisher, 2001) which has been extensively used in research of temperament in younger children. The EATQ-R contains a number of subscales of temperament, three of which are pertinent to EC and were used in the current study (attention, inhibitory control and activational control). Example items include; “Is good at keeping track of several different things that are happening around her/him” and “Is able to stop him/herself from laughing at inappropriate times.”

The parental questionnaire had 18 items and published alpha coefficients of 0.66 to 0.86. Scaled scores for the effortful control subscales were computed for parent completed questionnaires by dividing the summed total of items by the number of completed items on that scale. The child version had 16 items with published alphas of 0.69 to 0.80. The parental responses in this study produced alpha coefficients between .67 and .91. However, the alphas of the original child effortful control subscales were low (.34 to .56). A factor analysis on the child responses to the EATQ-R items revealed three factors, these appeared to be one relating to behavioural self control (e.g. “I do something fun for a while before I start my homework, even if I am not supposed to”), one where the items reflect conscientiousness (“I finish my homework before the due date”) and one that seemed to reflect the more cognitive effortful control construct. On subsequent reliability checks, only the last of these was reliable, with an alpha coefficient of .78. The items making up this new factor (Child EC) are, “I can stick with my plans and goals”, “I pay close attention when someone tells me how to do something”, “I am good at

keeping track of several different things that are happening around me” and “it’s easy for me to keep a secret”. The face validity of these items and their internal reliability allow us to use this factor in further analysis.

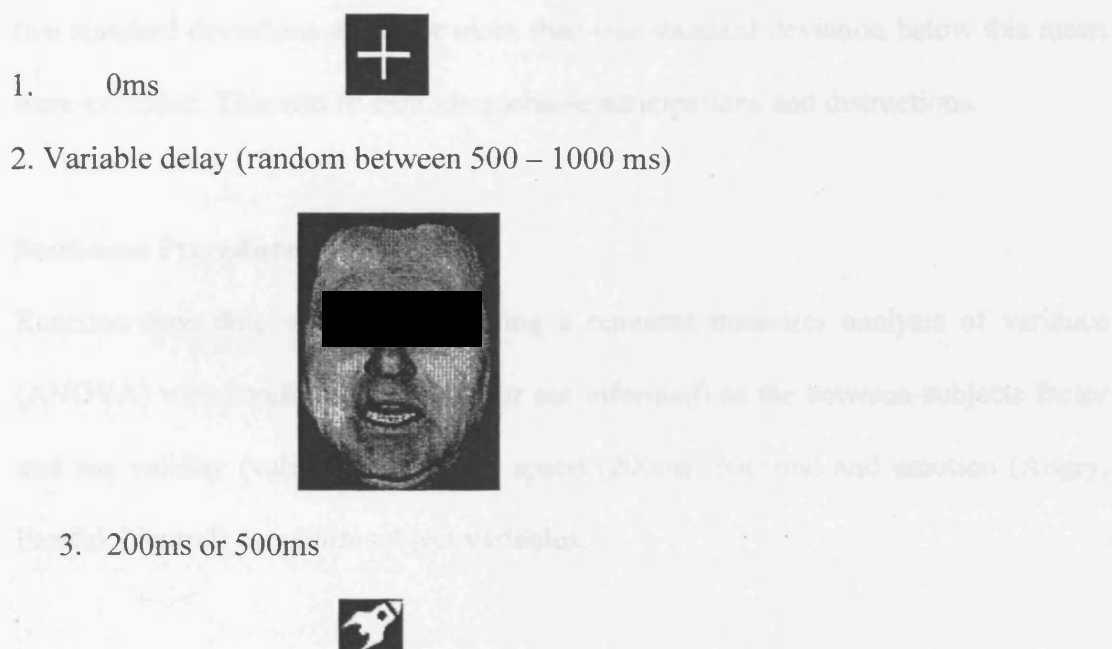
Attentional Bias

A computer based emotional cueing task was designed to assess attentional bias to emotionally valenced stimuli, based upon the task used by Fox et al. (2001). The task was adapted to use faces as the cue stimuli rather than words, as it is difficult to be sure of the capability of young children to process quickly the content of a briefly presented word. Initially a cue, a picture of a face demonstrating different facial expressions was presented, after which the child responded to a neutral target stimulus.

Participants were located approximately 50 centimetres from the screen. At the beginning of a trial the screen was black, followed by the presentation of a white ‘+’. In order to reduce possible anticipatory responses, the facial cue was then presented after a random variable delay between 500ms and 1000ms following the presentation of the ‘+’. After a period of either 200ms or 500 ms the facial cue was removed and a target (a picture of a spaceship) was presented, either in the same location as the cue (75% of trials, referred to as valid trials) or in an alternative location (above or below the facial cue, 20% of trials, referred to as invalid). A total of 240 trials were presented in a random order. In 5% of trials a cue was presented but no target followed (known as ‘catch trials’), in order to further reduce anticipatory responding. All trials consisted of either an angry, fearful or neutral facial expression developed by Matsumoto and Ekman (1988; JACFEE and JACNeuF). A measure of reaction

time was recorded automatically for each presentation. The task procedure is schematised in Figure 2.

Fig. 2: Sequence of events and exposure durations of stimuli in the task



The amount of time it took the child to disengage their attention from the different type of facial expression and to locate the target stimulus in each possible presentation scenario was measured over numerous trials and averages obtained for each possible scenario.

During the procedure, children were told to keep their eyes focussed on a cross in the centre of the screen and to respond by hitting a clearly labelled button when the neutral target stimulus was seen on the screen. They were told that the aim of the game was to get the target stimulus to disappear as quickly as possible. In the uninformed condition, children were told that other pictures would appear at times but they were to ignore these, in the informed condition, children were advised that

the target stimulus would mostly appear behind these other pictures (Avila & Parcet, 2002).

Each child's own mean reaction time was computed and trials that were higher than two standard deviations above or more than one standard deviation below this mean were excluded. This was to exclude probable anticipations and distractions.

Statistical Procedures

Reaction time data was analysed using a repeated measures analysis of variance (ANOVA) with condition (informed or not informed) as the between-subjects factor and cue validity (valid, invalid), cue speed (200ms, 500 ms) and emotion (Angry, Fearful, Neutral) as within-subject variables.

The relationship between the child's reaction times and their emotions and behaviour were analysed separately for each outcome measure, therefore there were three within- and between subjects analysis of variance with cue validity, speed and emotion and within-subjects factors and the dimensions of emotional and behavioural problems as between subjects variables.

The relationships of effortful control, attentional bias and emotional and behavioural problems were analysed using bivariate correlations and regression analyses. Mediating effects were analysed using the Sobel test.

Results

This study aimed to investigate the role of modulations of attention namely; hypervigilance, avoidance and disengagement, in the relationship between EC and children's emotional and behavioural problems.

The results section will initially present means and standard deviations from the parent and child completed questionnaire measures, and will locate the scores obtained in relation to published normative data. Secondly a description of inter-informant agreement between parents, teachers and children across measures and the correlations between subscales on the different measures will be presented. Thirdly, the data from the emotional cueing attention task will be presented. Next, the relationships between the attentional task and children's emotional and behavioural problems will be examined. Finally, the association between EC and behavioural problems will be tested and the mediating role of attention in this relationship will be examined.

Means, Standard Deviations and Normative Data

Means and standard deviations from the parent and child questionnaire measures are given in Tables 1 and 2 respectively. They are presented separately by age and by gender.

As can be seen in Table 1, the SDQ scores for hyperactivity were higher in boys across the age range, whilst girls were rated as higher on the prosocial scale. The difference in hyperactivity between boys and girls was significant ($t(108) = 2.37, p =$

.02). Prosocial scores for girls were not significantly higher than for boys ($t(108) = -1.5, p = .13$). Tables 1 and 2 show that both parental and self-report revealed that the girls have higher levels of EC than boys across the age range. The gender difference was significant in parental report ($t(106) = -3.35, p = .001$) but not for child report ($t(103) = -.805, p = .423$). There was no significant gender difference on the RCMAS ($t(99) = -.22, p = .830$).

Table 1: Means and standard deviations of scores on the parental questionnaires (totals and subscales)

Parental Ratings	Age		9				10				11			
	Gender		Male		Female		Male		Female		Male		Female	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
SDQ emotional problems	1.79	(2.32)	3.30	(3.20)	2.92	(2.84)	2.09	(2.39)	2.55	(3.17)	1.70	(1.57)		
SDQ conduct problem	1.74	(1.28)	1.80	(1.47)	1.35	(1.62)	1.39	(1.88)	2.45	(1.92)	.80	(1.23)		
SDQ hyperactivity problems	3.74	(3.02)	3.60	(2.30)	4.08	(3.07)	2.95	(3.15)	6.64	(3.70)	2.60	(2.72)		
SDQ peer problems	1.79	(1.93)	2.00	(1.89)	2.28	(2.54)	1.48	(1.62)	2.45	(2.25)	2.10	(1.73)		
SDQ prosocial	7.89	(1.76)	8.05	(1.99)	8.42	(1.81)	8.87	(1.94)	7.73	(2.28)	9.20	(1.32)		
SDQ Total difficulties score	9.05	(7.08)	10.79	(7.53)	10.68	(8.77)	8.00	(7.78)	14.09	(8.32)	7.20	(4.71)		
EATQ-R activation control	23.32	(5.47)	24.90	(5.11)	23.00	(5.79)	24.35	(5.44)	20.64	(7.26)	25.90	(5.40)		
EATQ-R inhibitory control	17.58	(3.34)	18.53	(2.84)	18.50	(4.08)	20.39	(3.54)	15.91	(4.06)	19.30	(3.43)		
EATQ-R attentional control	20.37	(5.94)	21.00	(3.54)	19.20	(5.82)	21.57	(5.44)	15.55	(4.87)	21.10	(5.20)		
EATQ-R total - sum of means	7.26	(0.96)	7.81	(0.94)	7.51	(1.18)	7.94	(1.02)	6.78	(1.38)	7.84	(1.27)		

Table 2: Means and standard deviations of scores on the child questionnaires (totals and subscales)

Age		9				10				11			
Gender		Male		Female		Male		Female		Male		Female	
Child Ratings		M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
CBCL total score		2.78	(2.92)	.82	(.73)	1.88	(1.75)	1.00	(1.09)	2.60	(3.06)	1.88	(2.03)
RCMAS physiological anxiety		4.00	(2.72)	5.29	(2.76)	4.42	(1.95)	3.91	(2.67)	4.60	(3.44)	3.25	(1.67)
RCMAS worry/oversensitivity		3.67	(2.14)	6.88	(3.20)	5.17	(3.14)	5.23	(3.28)	4.10	(2.73)	5.63	(2.56)
RCMAS social concerns/concentration		3.59	(2.37)	3.47	(2.03)	3.78	(2.15)	2.75	(1.86)	4.20	(2.49)	3.25	(1.58)
RCMAS lie scale		1.61	(2.06)	4.82	(2.86)	3.50	(2.92)	4.73	(2.80)	3.00	(1.94)	2.14	(2.27)
RCMAS total for overall anxiety		11.53	(6.16)	15.65	(7.13)	13.57	(6.23)	12.20	(7.10)	12.90	(7.78)	12.13	(4.64)
Child EC		13.67	(3.22)	14.71	(2.57)	13.81	(4.85)	13.57	(3.38)	13.10	(4.84)	15.40	(2.12)

To situate the data within a population context, the published norms for the RCMAS total score and SDQ scales are shown below in Table 3.

Table 3: Normative scores (Means and SDs) for the SDQ (British sample of 5-15 year olds) and the RCMAS (6-19 year olds) compared with overall means from current sample

	Males	Females	Current sample
RCMAS	n = 173	n = 156	
Total	12.58 (5.75)	14.97 (5.60)	13.06 (6.6)
SDQ scale	n = 5153	n = 5145	
Emotional Problems	1.8 (2.0)	2.0 (2.0)	2.45 (2.7)
Conduct Problems	1.7 (1.8)	1.5 (1.6)	1.55 (1.6)
Hyperactivity	4.0 (2.7)	2.9 (2.4)	3.82 (3.1)
Peer Problems	1.5 (1.7)	1.4 (1.6)	1.9 (2.0)
Prosocial	8.4 (1.7)	8.9 (1.4)	8.37 (1.9)
SDQ Total	9.1 (6.0)	7.8 (5.5)	9.82 (7.7)

(SDQ - Meltzer, Gatward, Goodman, & Ford, 2000) (RCMAS - Reynolds & Richmond, 1978)

As can be seen the data obtained in the current study is largely comparable with published community sample norms. Of particular note however, are the high SDQ scores on all subscales (except prosocial), found with the 11-year-old boys in this sample. Both the mean hyperactivity score and the mean total SDQ problems score for this group are almost a standard deviation above the norm.

Inter Informant Agreement

Outcome Measures -To determine whether parents, teachers and children agreed on the extent to which children showed emotional and behavioural problems, correlations between the different raters' responses were computed (see Table 4). For purposes of inter-informant agreement, only totals from the questionnaire measures were used. The table is organised by grouping measures according to whether they represent internalising or externalising symptoms. Parental ratings of internalising problems consisted of the emotion scale of the SDQ, whilst parental ratings of externalising problems consisted of the SDQ sum of scales for peer problems, hyperactivity and conduct problems. Teacher internalising and externalising ratings were taken from the anxiety and aggression totals of the CBCL teacher form respectively. Child internalising ratings were obtained from the RCMAS total and externalising ratings from the CBCL self rated aggression items.

Table 4: Inter-rater agreement on internalising and externalising measures

		Parental Report		Teacher Report		Child Report	
		Int.	Ext.	Int.	Ext.	Int.	Ext.
Parental Report	Internalising						
	Externalising	.606**					
Teacher Report	Internalising	.470**	.110				
	Externalising	.285*	.494**	.392**			
Child Report	Internalising	.305**	.274**	.050	.076		
	Externalising	.121	.264**	.155	.288*	.217*	

*Correlation is significant at the 0.05 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed).

As can be seen in Table 4, teacher and parent measures correlated well on both internalising and externalising dimensions. Given the smaller response rate from teachers, parental ratings will be used in further analyses. The children's self-ratings showed some correlation with parental and teacher ratings, however, these were lower than the teacher to parent agreement; child reports of internalising problems did not correlate with the teacher ratings. It was therefore not suitable to create a total composite score and for that reason child ratings were analysed separately.

Effortful Control

The child EC score did not correlate with the parental total, ($r = .103$, $p = .303$). Child and parent ratings of EC were therefore analysed separately.

Subscale Agreement

Multiple measures of outcome had been used (E.g. SDQ subscales) therefore, correlations were checked amongst these in order to form composites that were highly correlated and would allow reduction of the number of subsequent analyses required.

Outcome Measures

Parental Measures - As can be seen in Table 5, there were significant positive correlations across the SDQ subscales indicating a high degree of overlap in judgement by parents of child behaviour. It appears that those children rated as having high levels of emotional problems also experience more difficulties with peer relationships, hyperactivity and conduct problems. Such a finding is not uncommon; particularly in community samples where internalising and externalising behaviour problems tend to be highly correlated. It therefore makes sense to combine these

SDQ scores and further analyse a single composite parental rating of problem behaviour. However, such an approach has its limitations and these will be considered in the discussion.

Table 5: Correlations between the SDQ subscales and total

		SDQ Subscale				
		Emotional	Peer	Hyperactivity	Conduct	Total
SDQ	Emotional					
Sub-	Peer	.550**				
scale	Hyperactivity	.487**	.511**			
	Conduct	.536**	.550**	.674**		
	SDQ Total	.804**	.777**	.850**	.815**	

** Correlation is significant at the 0.01 level (2-tailed).

Child Measures - Correlations between subscales of the RCMAS were high (see Table 6), suggesting that the different dimensions of anxiety assessed by the RCMAS tapped a single dimension. The total score was therefore used in later analyses.

Table 6: Correlations between RCMAS subscales

	1	2	3	4
1. Physiological anxiety				
2. Worry/oversensitivity	.571**			
3. Social concerns /concentration	.600**	.616**		
4. Total	.834**	.853**	.876**	

** Correlation is significant at the 0.01 level (2-tailed).

The correlation between child self-report of internalising and externalising behaviours was quite low at $r = .217$, $p = .030$, suggesting that the two questionnaires assessed relatively separate constructs. Further analyses will therefore be completed on these two as separate entities.

Effortful Control

The subscales on the parental measure correlated well together as can be seen in Table 7. This suggests that those children who have low EC are likely to demonstrate this across the domains assessed by the different subscales and that the EC total is a useful composite score for use in further analyses.

Table 7: Correlations between scaled scores of effortful control subscales

	1	2	3	4
1. Attentional Control				
2. Inhibitory Control	.715**			
3. Activation Control	.742**	.534**		
4. Sum of scaled scores - Effortful control total	.936**	.840**	.867**	

** Correlation is significant at the 0.01 level (2-tailed).

Attention Task

In this section the underlying effects characterising performance on the task is considered. This is followed by an examination of the task's associations with emotional and behavioural problems. All reaction times (RTs) were positively skewed and therefore square root transformations were computed and these were used in subsequent analyses.

The reaction times were analysed through a repeated measures analysis of variance (ANOVA) that included condition (informed or not informed) as the between-subjects factor and cue validity (valid versus invalid), cue speed (200ms versus 500 ms) and emotion (Angry, Fearful, Neutral) as within-subject variables. Square roots of mean RTs for the different presentations on the emotional cueing task are shown in Table 8.

Main effects of speed and validity were observed (Validity: $F(1,99) = 17.66$, $p < .001$, Speed: $F(1,99) = 63.59$, $p < .001$); examination of means revealed that, as has commonly been found in past research using emotional cueing tasks (e.g. Amir et al., 2003), slower RTs were seen when the trial was invalid, that is when the target stimulus appeared in a different location to the cue. RTs were also slower when the cue presentation was short in duration (200ms). There was no main effect of emotion ($F(2,98) = .626$, $p = .537$).

There was a significant Validity x Speed interaction, $F(1,99) = 4.58$, $p = .035$. As can be seen in Table 8, a stronger effect of validity was seen in longer presentation trials (500ms), such that there was a bigger delay in responding to invalid rather than

valid trials. A further interaction demonstrated that this effect was more prevalent in those who were uninformed (Validity x Speed x Condition, $F(1,99) = 5.08$, $p = .026$). The uninformed group (who had not been forewarned that the target stimulus would most commonly be seen behind the picture) showed a bigger delay in responding to valid rather than invalid trials at short presentation times than did those in the informed group.

The Validity x Emotion x Condition interaction was also significant ($F(2,198) = 3.12$, $p = .049$). The informed group showed the biggest validity effect for faces representing fear whilst in the uninformed group the biggest validity effect was for angry faces. Given the marginal nature of significance and the difficulty in interpreting this result, it may be possible that this finding is a result of sampling error.

Table 8: Mean square root of reaction times (in ms) on stimulus detection trials for different presentation conditions

Validity	Speed	Emotion	Mean	95% Confidence Interval
Invalid Trials	200ms	Anger	21.763	21.28 - 22.24
		Fear	21.770	21.30 - 22.23
		Neutral	21.759	21.32 - 22.19
	500ms	Anger	21.452	20.95 - 21.95
		Fear	21.227	20.69 - 21.75
		Neutral	21.221	20.72 - 21.71
Valid Trials	200ms	Anger	21.415	21.06 - 21.77
		Fear	21.408	21.05 - 21.75
		Neutral	21.457	21.08 - 21.82
	500ms	Anger	20.703	20.32 - 21.07
		Fear	20.763	20.40 - 21.12
		Neutral	20.684	20.32 - 21.04

Attentional Task and Emotional and Behavioural Problems

In this next section, the relationship between attentional performance in the emotional cueing task and children's emotional and behavioural problems is examined. In an initial analysis, the condition variable (informed or uninformed) was not found to interact with children's emotion or behavioural problems (or any related higher-order interactions) and, given its relatively weak effect in previous analyses, it was excluded from further analysis. Thus, the analysis consisted of three within- and between subjects analyses of variance (one for each outcome measure of emotional or behavioural problems) with cue validity, speed and emotion as within-subjects factors and the dimensions of emotional and behavioural problems as between subjects variables. Rather than splitting the outcome variables into arbitrary high and low groups, they were instead treated as continuous covariates. Where significant interactions were found, predicted values from the underlying regression equations were used to evaluate the nature of these interactions (Aiken & West, 1991). The results of the ANOVAs are presented in Table 9; only the terms involving the outcome measures are shown.

Table 9: F and p values for main effects and interactions of emotional cueing task variables and outcome variables

	SDQ		RCMAS		CBCL	
	(Parent)		(Child Anxiety)		(Child Aggression)	
	F	p	F	p	F	P
	(1,99)		(1,99)		(1,99)	
Outcome	.469	.495	5.43	.022*	2.62	.109
Validity x Outcome	.733	.394	1.67	.199	.637	.427
Speed x Outcome	.162	.689	1.39	.242	.002	.964
Emotion x Outcome	3.631	.030*	.865	.424	1.026	.362
Validity x Speed x Outcome	2.720	.102	1.156	.285	2.285	.134
Validity x Emotion x Outcome	9.555	<.001**	1.504	.227	.777	.463
Emotion X Speed X Outcome	1.269	.286	.938	.395	1.410	.249
Validity X Emotion X Speed X Outcome	.987	.376	1.313	.274	.032	.968

*ANOVA is significant at the 0.05 level

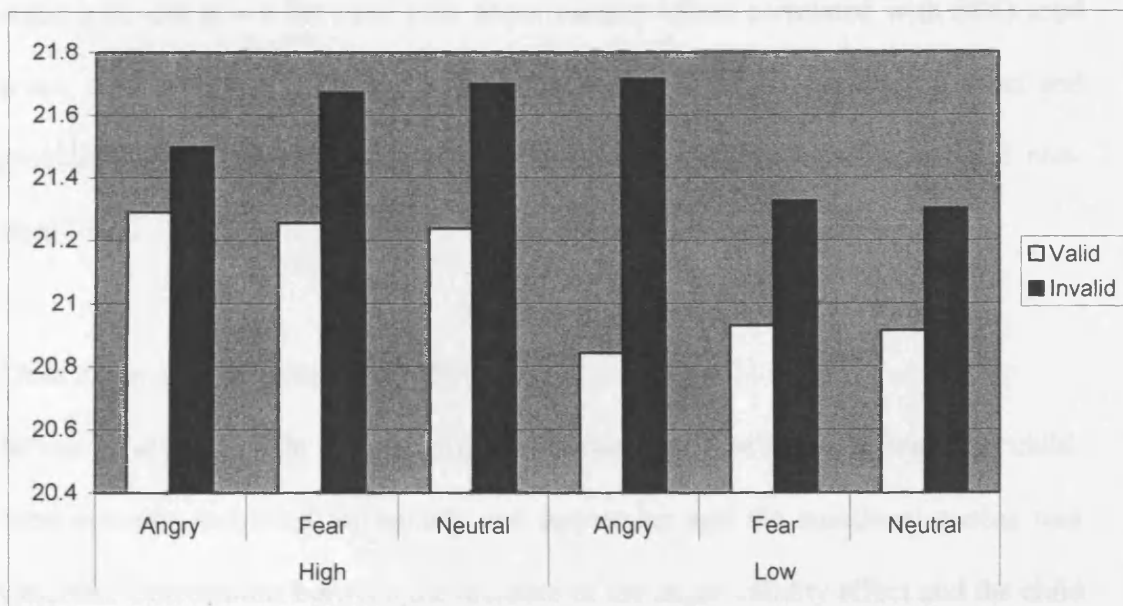
**ANOVA is significant at the 0.01 level

Parental Reports of Behavioural Problems

As can be seen in Table 9, there was no main effect of outcome when using the SDQ ($F(1,99) = .469$, $p = .49$) or the CBCL ($F(1,99) = 2.62$, $p = .109$). There was a main effect of outcome when using the RCMAS ($F(1,99) = 5.426$, $p = .022$) analysis of means revealed that children with higher self-rated anxiety were slower to respond to targets overall.

Also shown in Table 9, there was an interaction between Cue Emotion and SDQ score, $F(2, 198) = 3.632$, $p = .030$. However, as predicted, there was also a higher order, three-way interaction between Cue Validity, Cue Emotion and Total SDQ score, $F(2, 198) = 9.555$, $p = <.001$ suggesting that those children with more emotional and behavioural problems had different validity latencies depending on the emotion displayed. Figure 3 shows the estimated mean RTs for each condition for high and low SDQ problem scores (± 1 SD). As can be seen in Figure 3, on valid trials, high SDQ scoring children were slower (longer RT) than low SDQ scorers on all emotions. However, on invalid trials, with an angry cue, the children with high SDQ scores are quicker to locate the target, but in the fear and neutral conditions they take longer than those with low SDQ scores. No other interactions were significant, although all results can be seen in Table 9.

Fig. 3: Graph to show the (square root of) mean RTs for different trial conditions (emotion and validity) for high and low scores on emotional and behavioural problems



The validity effect in children with a higher SDQ problem score suggests that they were demonstrating attentional avoidance to angry faces. Children with a low SDQ score are substantially slower to detect the target when it was not behind the angry face (i.e. when the angry face was displayed on an invalid trial). This suggests that their attention is still deployed towards the face while the children with a higher SDQ problem score may be avoiding it. In order to develop a simple index that represented this effect, a difference score was computed to represent the size of the validity effect for angry faces compared to neutral faces (as a baseline comparison) – i.e. (Angry Invalid – Angry Valid) – (Neutral Invalid – Neutral Valid). This measure of the anger validity effect correlated with the SDQ total score at $r = -.363$, $p = <.001$. This measure will be used in later analyses testing the association between effortful control and attentional bias (and the mediating role of attentional bias).

In order to check that gender was not significantly affecting these results, correlations were performed between the anger validity effect and SDQ total for boys and girls separately. For boys the anger validity effect correlated with SDQ total score, $r = -.58$, $p = <.001$. For girls anger validity effect correlated with SDQ total score, $r = -.104$, $p = .477$. The relationship between the anger validity effect and problem behaviour was very strong in boys whilst in girls it was small and non-significant.

Child Reports of Behavioural Problems

As can be seen in Table 9, no significant interactions were found between the child-rated outcome measures for anxiety and aggression and the emotional cueing task variables. Correlations between the measure of the anger validity effect and the child

behavioural outcome measures were not significant. CBCL (aggression) $r = -.125$, $p = .213$. RCMAS (anxiety) $r = -.119$, $p = .234$.

Effortful Control and Behaviour Problems

Table 10 shows the correlations of effortful control (from both child and parent report) with the behavioural outcome measures. As can be seen in Table 10, EC correlates negatively with the behavioural outcome measures. The parent total EC score correlated particularly highly with the parent-rated SDQ total score ($r = .676$, $p < .001$).

Table 10: Effortful control scores from child and parent report correlated with behavioural outcome measures

	RCMAS Total	CBCL Total	SDQ Total
Child-rated EC	-.361**	-.249*	-.232*
Parent-rated EC	-.277**	-.215*	-.676**

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

These negative correlations indicate that higher levels of EC are associated with lower behavioural and emotional problems, as self rated and rated by parents.

The sample was split by gender and analysed separately to determine whether this association was different for boys and for girls. The resultant correlations can be seen in Table 11.

Table 11: Effortful control scores from child and parent report correlated with behavioural outcome measures for boys and for girls

GIRLS	RCMAS Total	CBCL Total	SDQ Total
Child-rated EC	-.322*	-.079	-.205
Parent-rated EC	-.225	-.014	-.568**
BOYS	RCMAS Total	CBCL Total	SDQ Total
Child-rated EC	-.393**	-.345*	-.247
Parent-rated EC	-.353*	-.198	-.737**

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Table 11 demonstrates that, when significant associations were found, all the correlations between effortful control measures and behavioural, and emotional outcome measures were stronger for boys than they were for girls.

Mediation Analysis

Baron and Kenny (1986) detail four steps or conditions required for analysis of a mediational model. These four steps were completed to test the hypothesis that the relation between EC and a child's emotional and behavioural problems was mediated by modulators of attention (in this case the anger avoidance effect). This process is outlined below. The steps were tested using regressions, and the final mediation analysis was tested using the Sobel test (Preacher & Leonardelli, 2001). Results are presented separately for child and parent-rated EC. The four conditions that need to be met for mediation to be present are:

Condition One

EC must be significantly correlated with the anger validity effect. Bivariate regressions with EC as the independent variable (IV) and the anger validity effect (attentional bias) as the dependent variable (DV) were used to check that this condition was met.

Parent-Rated EC - Overall, the bivariate regression was significant ($F(1, 98) = 6.84$, $p = .010$). EC (as rated by parents) accounted for 5.6% of the variance in the anger validity effect. Standardised $\beta = .26$, $t(92) = 2.62$, $p = .010$. Therefore condition one was met.

Child-Rated EC - Overall, the bivariate regression was not significant ($F(1, 94) = .490$, $p = .486$). EC (as rated by children) did not predict the anger validity effect. Condition one was not met for child-rated EC, it therefore required no further analysis.

Condition Two

EC must significantly affect emotional and behavioural problems (EBP) in the absence of the anger validity effect. This condition was met and has been demonstrated in the correlations presented above. High EC was shown to relate to lower levels of EBP.

Condition Three

After controlling for EC, the anger validity effect must be significantly associated with EBP, that is, it must have a significant unique effect on EBP. Condition three was tested through multiple regression analyses with EC (both parent and child-rated) and the anger validity effect as IVs and SDQ total as the DV.

Parent-Rated EC - The multiple regression was significant overall ($F(2, 98) = 43.26$, $p = <.001$). EC and the anger validity effect together accounted for 46.3% of the variance in SDQ score. The independent effects of both IVs were significant. EC (Standardised $\beta = -.601$, $t(96) = -7.851$, $p = <.001$). Anger validity effect (Standardised $\beta = -.215$, $t(96) = -2.806$, $p = .006$). Both parent-rated EC and the anger validity effect could independently predict the SDQ score, thus conditions two and three were met.

Condition Four

The relation between EC and EBP must be rendered nonsignificant (in the case of full mediation) or considerably decreased (in the case of partial mediation) by the addition of the anger validity effect to the model. This is demonstrated in the case of parent EC by the beta coefficient from the regression analysis of EC and EBP being smaller ($-.601$) than the correlation between EC and EBP ($-.676$). This suggests that some of the effect has been taken by the mediating role of the anger validity effect.

The Sobel test was then performed, to assess the significance of this mediating effect. In the complete sample (girls and boys) the Sobel test was approaching significance ($Z = -1.92$, $p = .055$).

Gender Differences

Because the earlier correlations between both EC and behavioural problems and between the anger validity effect and behavioural problems had been found to be much stronger for boys, this mediation analysis was repeated for boys alone.

The conditions were all met; the beta coefficient from the regression analysis of EC and EBP was smaller (-.58) than the correlation between EC and EBP (-.737). This demonstrates that some of the effect has been taken by the mediating role of the anger validity effect. The Sobel test of mediation for boys alone showed a significant effect ($Z = -2.38$, $p = .017$). In boys, the anger validity effect of attentional avoidance partially mediated the relationship between EC and emotional and behavioural problems.

Discussion

This study aimed to investigate the role of attentional biases in children's emotional and behavioural problems. It further intended to replicate earlier findings that have shown associations between EC and problem behaviours and between attentional biases and internalising and externalising problems in children (Caspi et al., 1995; Eisenberg et al., 2001, 2004). It was hypothesised that attentional biases of one form or another would serve to mediate the previously demonstrated links between EC and problem behaviour. The logic behind this proposition was that in the absence of adequate EC, fear-related automatic attentional biases operate. These are thought to increase emotional vigilance or avoidance, either of which could prevent better coping strategies and the modulation of distress, which in turn lead to emotional and behavioural problems. Before examining the results of the main hypotheses, some consideration is given to measurement issues that affect the interpretation of the study's findings. The results of the study are then considered in detail and discussed in the context of previous research in this area. The discussion ends by considering the limitations of the study and possible clinical implications.

Inter Informant Agreement

Outcome Measures

There was good agreement between teachers and parents when rating both internalising and externalising behaviour problems. However, as has commonly been found in psychological research (e.g. Bogels & van Mellick, 2004) children's self-ratings did not correlate well with the adult's measures. Such a finding is not surprising although it inevitably leads to some complications in the interpretation of

the results. Although this is a common finding it makes it possible to find evidence consistent with hypotheses when one informant's responses are used but not the other (as occurred in the current study). In hindsight it may have been of more use to utilise the same measure for both parents and teachers as this would have allowed the teacher data to be combined in some form of composite score.

Effortful Control

Questions about the reliability and validity of the EC questionnaires are also pertinent, as they not only failed to correlate between parents and children but the child measure also lacked internal consistency. In studies of temperament using the EATQ, it has been more common to rely on parental ratings (e.g. Oldehinkel, Hartman, De-Winter, Veenstra & Ormel, 2004) and few studies have been published that utilise both the parent and child versions of the EATQ-R. Ellis (2005) also reported significant differences between parent and child report on all EC subscales in a study of 165 adolescents (mean age =12.31). It is possible that parents and children are reporting on different constructs or that children of this age are not able to accurately report EC when assessed by self-report. However, in the current study there was one factor that emerged through factor analysis, which appeared to have face validity when assessing the constructs of EC. It may be that the child EC measure used has not established sufficient reliability in its current form to allow it to be dependably used for the purpose of self-rated EC. One possible way of addressing issues of validity directly would be to use behavioural assessments of EC as suggested by Murray and Kochanska (2002).

Attentional Task

The task revealed a clear validity effect, whereby valid cues were responded to more quickly than invalid cues. Such an effect has been noted previously (Amir et al., 2003). Although previous research has used a similar cueing paradigm in children, this is the first study with children to demonstrate the cueing effect with emotional stimuli.

Critically, it was found that children with more emotional and behavioural problems had different responses to cueing depending on the emotion of the cue displayed. On valid trials, children with higher self-reported anxiety were slower to respond to the target than children with a lower problem score on all emotions. More importantly, when the trial was invalid (the target was not displayed behind the cue) and the cue displayed was angry, the children with more problems as reported by their parent responded to the target quicker than low SDQ scoring children (the anger validity effect). Such an effect was not seen for fear or neutral stimuli suggesting a specific avoidance of angry facial stimuli in those children with more emotional and behavioural problems.

This finding is particularly significant as it provides evidence of a link between an apparent avoidance of angry cues and problem behaviour. This finding is consistent with adult studies of social anxiety using facial emotion expressions (e.g. Chen et al., 2002; Mansell et al., 1999; Vasey & Schippell, 2000). Automatic processes that modulate attention and have been linked to both internalising and externalising problems, operate in one of three ways; hypervigilance to threat, difficulty disengaging from threat or avoidance of threat stimuli. However, the nature of the

attentional bias in the current study appeared to be one of avoidance. There are several ways of conceptualising this apparent avoidance effect. If the speeding effect on the invalid trials was found across all emotion faces, an explanation may be that children with more problems are less responsive to emotional cueing. However, the effect found clearly related to angry faces, so it is apparent that there is something specific about the angry stimulus that creates this. The most plausible account is that the reduced validity effect is due to avoidance of emotionally salient stimuli in the children with more problems. One plausible account of this avoidance would be that it is motivated because children evaluate angry faces as threatening or aversive. Interestingly, a study with adults has demonstrated a similar avoidance of conditioned aversive stimuli (Stormark, Hugdahl & Posner, 1999). Here a neutral cue (shape) was conditioned as aversive by pairing with white noise. Attention was then found to be directed away from this stimulus in the cueing task, which resulted in a reduced validity effect. It is possible, given the social salience of an angry face, that the children in the current study viewed the angry face as aversive, perceive social interactions as threatening and are driven to avoid angry faces by an expectation that people will be hostile towards them. The children with a lower problem score appeared to spend more time looking at the cue (angry face), which could in theory indicate that the children without problem behaviours are showing a difficulty with disengaging attention. However, this seems implausible and there is no theoretical explanation for such a process. A more parsimonious explanation is that the angry face contains socially important information and so, unless you are a person who has reason to avoid such stimuli, it is worth attending to in detail.

Although this study failed to support a hypervigilance effect, it also did not detect any disengagement difficulties in children with emotional or behavioural problems. One interpretation of this is simply that disengagement is not a problem in children with emotional and behavioural problems as has been shown in adults (Derryberry & Reed, 2002; Fox et al., 2001). It should also be noted that, because we found an avoidance effect, it would not be possible to simultaneously observe disengagement effects; the two are mutually exclusive at least within the same condition. The significance of the avoidance process in this experimental context may therefore have overridden any possible disengagement effects. Of course, it should be noted that for stimulus-specific avoidance to occur, the stimulus must have been processed, which means that some early detection of the threat must have occurred. It may be that this process happened more rapidly than anticipated and hence was not detected at the faster presentation speed of 200 ms. In future studies it would be valuable to reduce this presentation time in order to detect this initial orientation process.

The ecological validity of facial stimuli may help to explain the avoidance effect. In the adult literature, avoidance has been shown when the stimuli are faces and not words (Chen et al., 2002; Mansell et al., 1999). Facial stimuli may increase the immediacy or intensity of the threat resulting in children with problems becoming increasingly motivated to avoid such salient cues and therefore avoiding rather than failing to disengage attention. An avoidant response may also be understood in an evolutionary context, in terms of avoiding threat. Mansell et al. (1999) suggest that avoidance could also be interpreted as an escape mechanism. If a socially anxious person looks away from a face, they perform a psychological escape in that they reduce some of the more threatening aspects of the situation without having to leave.

For example, by breaking eye contact, they decrease the chance of the other person to engage them in social interaction. Chen et al. (2002) note that avoidance specifically of faces may maintain social anxiety in two ways, firstly, the avoidant person may fail to notice responses that would help them to see they are being viewed more positively than they imagine. Secondly, the tendency to look away may interfere with their own social interaction, making them appear bored and therefore reducing the chance of positive social interaction. It would be interesting to further investigate whether a disengagement effect is more likely than avoidance if using less ecologically salient stimuli, such as threat words as cues.

Schippell et al. (2003) found an avoidance effect in aggressive children and this may also be of relevance here. The children in the current study with high emotional and behavioural problems displayed a constellation of behaviours associated with both aggression and anxiety, and certainly in aggression, such avoidance has been noted before. Ehrenreich & Gross (2002) suggest that findings previously attributed to anxiety symptomatology may in fact be better explained by focusing on wider ideas of negative affect and aggression. Whether the current findings hold up in more narrowly defined clinical populations remains to be seen.

In order to clarify the exact nature of attentional biases using emotionally valenced stimuli in children, more research will be required using different presentation times and varying the qualities of the cue stimuli. However, this study suggests that avoidance processes, particularly of angry facial stimuli may prove important. Furthermore, literature has pointed to the possibility of different cognitive processes operating in different diagnoses of anxiety problems (Ehrenreich & Gross, 2002;

Harvey et al., 2004), it will therefore be important to assess children with specific anxiety and aggression disorders, as well as separating these problems within community samples, in order to understand which groups are most affected by these attentional processes.

As expected (and repeatedly found in the research literature), effortful control was strongly associated with children's emotional and behavioural problems (Eisenberg, 2001 & 2004). This was so for both parent and child reports. In all cases parent and child-rated EC correlated negatively with the parental behavioural outcome measure (SDQ) and the total scores and some subscales also correlated negatively with the child-rated outcome measures (RCMAS and CBCL). These negative correlations support previous work that has linked low EC with high occurrence of problem behaviours, both internalising and externalising in nature (e.g. Eisenberg et al., 2004). Regressions and mediational analyses were also able to demonstrate that parent-rated EC predicted the anger validity effect in the emotional cueing task, and that EC and the anger validity effect could predict SDQ score. The strength of the predictive value of these measures was increased in boys; indeed it was non-significant in girls.

The study found partial support for the major hypothesis – that maladaptive attention biases (avoidance) would mediate the link between EC and children's emotional and behavioural problems. However, the finding was essentially restricted to parental reports of both outcome and EC and was only apparent for boys. Such a finding would benefit from replication and from a larger sample size but this result, obtained from a strong design and producing such significant results, suggests the worth of

further research aimed at understanding if EC may operate as a cross diagnostic risk factor for psychopathology via its effect on attentional biases. Further research would also be valuable to explore the reasons for the restriction of the effect to boys. It might be imagined that this result could reflect a gender difference in the incidence of problem behaviour in boys in this sample. However, analysis revealed that only the hyperactivity scale was significantly different between boys and girls, therefore it seems increasingly likely that there is a specific gender effect in operation. Ehrenreich, Coyne, O'Neill and Gross (1998, cited in Ehrenreich & Gross, 2002) reported that boys in their sample of nine to 11 year-olds, irrespective of level of anxiety, showed a small bias away from threat cues. Vasey et al. (1996) reported that an attentional bias away from threat cues was found only in males whereas females attended equally to threatening and neutral words. It may be possible that directing attention away is more of an attentional pattern in boys and one which is exaggerated in those with emotional and behavioural problems. The gender effect may reflect the generally better EC skills of girls (Ahadi, Rothbart & Ye, 1993; Kochanska, Murray & Coy, 1997). Further research may be able to discriminate if girls who have more problems with EC would show the same avoidance effect.

These results suggest that for whatever reason, avoidance of angry faces is a coping strategy used more by boys than girls and subsequently more strongly linked with behavioural problems in boys. It appears that reactive attention or the ability to control reactive thinking (demonstrated by the very high correlation between the SDQ and the anger validity effect) is very important in the emotional and behavioural problems of boys. However, differences extend also to EC, both EC and the attention task failed to correlate with the behavioural measures in girls. This

suggests that different coping strategies and a different aetiology of problems may be operating in girls and boys. Replication and further research will be required to begin to understand the nature and reasons behind these differences.

Methodological Limitations

When considering the limitations of this research, the potential overlap of measures should be considered of importance. That parents were rating EC and problem behaviours and there was such a large correlation between these is a cause for concern. It may be that the parental questionnaires, or the parents' responses did not adequately separate the two constructs. Although the use of teacher measures validated the parental measures of behaviour, teachers did not rate EC. Even with multi-informant checks, it may be the content of the questionnaire measures involves overlap of constructs such that a high correlation becomes inevitable. Replication of this study is recommended, using a validated behavioural task to assess EC, in order to validate the strength of the reported relationships. Alternatively, procedures to analyse and remove any overlapping items, such as that used by Lemery, et al. (2002) may prove useful in enhancing the quality of data from questionnaire studies.

Retrospectively, the children's abilities to rate EC and emotional and behavioural problems was questioned, largely because of the lower correlations with the other raters and the relatively poor internal consistency of the instrument. It would also be useful in the future to gain a specific anxiety rating from parents, to further allow the differentiation between effects specific to internalising and externalising difficulties to be clarified.

The decision to combine the internal and external behavioural ratings into one problem behaviour score should also be considered as a possible limitation. As noted above, this decision was made with some statistical justification; the high correlations between the two scales meant that firm conclusions about the amount of variance that might be accounted for separately by either internalising or externalising behaviours was difficult to judge. However, this has implications when relating the findings back to the research literature. Previous work, and therefore the literature on which this study was based, has mostly examined internalising and externalising behaviours separately. The model proposed in the hypothesis (figure one) also noted established associations between EC and problem behaviours and between attentional biases and problem behaviours. These associations are mostly based on separating the dimensions of internalising and externalising behaviours. The results obtained in the current study broadly agree with the previous literature. It is therefore likely that the associations shown in figure one operate, not only for the separate constructs of internalising and externalising behaviours but also for the broader category of problem behaviours. The results of the current study cannot be said with certainty to represent the mechanisms at work in those with internalising or externalising disorders but only in a broader composite of higher levels of problem behaviours. By merging the internalising and externalising scores this study provided an interesting initial investigation into attentional biases as a mechanism through which EC links to problem behaviours. The merging also prevented a false conclusion that effects were due to either internalising or externalising behaviours as the two appeared highly co-morbid in the current sample. However, there are also disadvantages of this composite of problem behaviours. It is difficult to extend these findings into those with only internalising or only externalising behaviours or to those

with clinical diagnoses. Further research which assesses the constructs separately would allow researchers to make more explicit links and to use them to guide protective or clinical interventions. This suggests the need for future work to look separately at internalising and externalising behaviours, both within the normal population and in clinical samples before firm conclusions can be drawn.

Clinical Implications

The clinical implications of this research will depend to some extent on replication of this effect and its generalisability across clinical disorders of anxiety and/or externalising behaviours. The current results may suggest that attentional training may be a useful avenue to explore with boys. The correlation between the avoidance of angry faces and higher scores on the problem outcome measures was so substantial that it seems logical to test causality by experimentally decreasing this avoidance to examine any impact on emotional and behavioural disturbance. Furthermore clinicians may benefit from considering attentional processes more when formulating the aetiology and maintenance of these problems particularly in boys. Derryberry and Reed (2002) note that over-reliance on safety and inappropriate avoidance may limit the opportunity to learn new coping skills. Treatments such as increasing tolerance to emotionally valenced stimuli through habituation or exposure might allow boys to become more adept at recognising and reacting appropriately to, rather than avoiding, such important social cues. During their study, Cohen, et al. (1998) demonstrated that a mood congruent attentional bias to anger-related stimuli was found to diminish with greater number of trials suggesting that individuals with anger problems may benefit from exposure programmes to target these involuntary cognitive processes and may benefit from exposure and habituation to their

involuntary automatic tendency to allocate attentional resources towards threatening stimuli.

Mathews, Mogg, Kentish and Eysenk (1995) observed that adult patients with GAD who were successfully treated with CBT then showed a virtual elimination of previous attentional biases on Stroop tasks. This suggests that the attentional biases in adults are state dependent and operate when triggered by stress or anxiety and therefore that they may be of importance as a maintenance factor rather than necessarily being a causal factor in clinical anxiety. Such research suggests the importance of incorporating work on attentional biases in clinical interventions.

Given that EC serves such a potentially important role, and that high levels of EC serve a protective function, training to enhance EC may also prove of benefit. Consideration of EC skills in the formulation of psychological distress may help clinicians to focus treatment on attention when required. Those clients who present with good EC could be helped with understanding the current deployment of their attention and motivations behind this. The growth within cognitive therapy of mindfulness techniques, based on the premise that some individuals will benefit initially from strengthening attentional control (Teasdale, Segal & Williams, 1995), may provide evidence of efficacy for the idea of specific attentional training. In time this may be of benefit in enhancing attentional control in those individuals with low levels of EC. Attentional training interventions in childhood are currently in development and there are indications that these may lead to improvements in both IQ and performance on conflict tasks (Rothbart, 2004). The current study provides an

impetus and further direction for research and development of appropriate clinical tools to help overcome difficulties in childhood attention.

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Paper 3: Critical Appraisal

Effortful Control, Attentional Biases and Problem Behaviours in Children

This paper will expand upon the possible limitations and improvements to the empirical study presented in part two of the thesis. It will also consider the broader theoretical and clinical implications of this research. Specifically, consideration will be given to measurement issues, the theoretical underpinnings of these findings and finally to the potential benefits and the difficulties of extending these results beyond research and into clinical practice.

Measurement Issues

The study was specifically designed to try to maximise the reliability of measurement by collecting multiple informant ratings on all measures. However, I am also aware that perhaps the biggest area for improvement in replication of this study relates to the measures used. My three primary concerns were as follows; the validity of the child effortful control (EC) measure, overlap of measures and separation of the different constructs and the use of separate measures for internalising and externalising behaviours. These concerns will be discussed with a focus on improvements in future research.

I have learnt that the early design process and choice of measures should be prioritised thus maximising the chances of using the best available resources to assess the constructs of interest. To place this issue in some context within the current study, I was in the situation where my design process was somewhat rushed in order to meet the deadline of the ethics committee. This was because, due to circumstances beyond my control, this was the second piece of thesis research I had undertaken (the first study, in a different area, had fallen through). Inevitably that

process in itself taught me much about ensuring that a study was practical and viable in terms of recruiting participants, a lesson I think I used well in designing the current study. This study generally benefited from using well-validated research measures, and the multiple raters were one of its particular strengths. However, some possible improvements remain.

Measuring Effortful Control

As discussed in papers one and two, operationalising EC is a complex process, hampered by complicated terminology and definition of the construct of EC and its possible overlap with other temperamental and more behavioural concepts.

In EC research the most widely used and validated measure is the parental version of the child behaviour questionnaire (CBQ: Rothbart, Ahadi, Hershey, & Fisher, 2001). The developers of this instrument had updated the early adolescent temperament questionnaire (EATQ-R: Ellis & Rothbart, 2001) with both parent and self-report versions and had suggested that it was suitable for the age group I was investigating. However, it seems that this measure has not been widely used or validated, particularly in its revised form with children as young as the current sample. As it happened, the child version of the EATQ-R did not demonstrate good internal reliability and the factor I generated correlated poorly with parental ratings of EC. It seems then that, at least in the current sample, the child version of the EATQ-R may not have reliably assessed children's EC. It may be that children of this age are unable to rate such a construct on a questionnaire measure validly, or that the questionnaire itself is inadequate.

In replication, a revised self-report questionnaire of EC would be a useful additional measure, however there are significant complications with assessing such a construct. A measure that demonstrates good internal and external validity and reliability and can more accurately access this construct from child self-report would be valuable in furthering this area of research. Alternatively, other methods of measuring EC could be incorporated. Behavioural batteries, such as that designed by Murray and Kochanska (2002) may be of great use.

Measurement Confounding?

A behavioural measure of EC would help to overcome the other possible confounding measurement issue in this study, that of rater overlap. As the parents are rating both EC and problem behaviour on questionnaire measures, and the two scores showed a strong negative correlation, we must wonder if they are truly assessing separate constructs (Lemery, Essex & Smider, 2002). It may be that the parents make a more general rating of difficulty and that is shown on both the SDQ and on the EATQ-R. The use of behavioural assessments of EC (e.g. Murray & Kochanska, 2002) would help to eliminate this potential source of error. Workload and time constraints would need to be considered if a behavioural battery were to be used for assessment of EC. The need to restrict disruption to teaching in a school-based study does require limitations on the amount of time for which each child can be seen. A volunteer study where children were seen through a research facility and signed up to a certain amount of time may serve to decrease this pressure but would bring up its own problems of how representative the sample was and generalisability of the results. If questionnaire measures were to be used, a process of removing overlapping items through expert judgement and factor analysis, such as that used by

Lemery et al. (2002) would be valuable in demonstrating the separation of the constructs.

Choice of Measures

The third measurement issue relates to the use of specific internalising and externalising measures. Achieving a balance between the need for multi-informant ratings, the use of the best possible measures and receiving a sufficient sample size to achieve adequate power was something of a struggle. Ideally, I would have liked parent, teacher and child ratings of EC, anxiety and aggression. However, at the design stage, in conjunction with the school, there was a worry that increasing the demands would reduce participation and make the study untenable. I was concerned about parental return rate being low if the questionnaires appeared intrusive or overly burdensome. Secondly, as I was relying on the goodwill of the school, I was understandably keen to minimise disruption and workload for the staff and pupils. I was also keen that the children were engaged in, and enjoyed the research process, and that they were not discouraged by large amounts of paperwork, partly as I was aware of the importance of gaining an accurate measure of attention on the computer task.

In hindsight, I believe I probably overestimated these concerns in this population. The initial parental response rate was relatively high (36%) and I could have achieved statistical power with a lower sample size, so perhaps could have sacrificed numbers for a greater quantity and quality of information from each participant. The study would have been improved, particularly in terms of its clinical implications by obtaining a reliable measure of child anxiety across the sample. The child's report of

anxiety (RCMAS), although well validated in previous research, did not correlate with the teacher measure of anxiety from the CBCL, and the reliance on the emotional problems subscale of the SDQ for parental ratings of anxiety was far from ideal. Were I to repeat the study, I would use separate measures of parental rated anxiety and aggression in addition to the SDQ. However, ideally a child measure of anxiety would also be retained as the nature of internalising disorders such as anxiety means that they are not always apparent to a third party. Indeed, some have argued that parent's are not reliable informants of children's internalising problems (Kolko & Kazdin, 1993).

Do These Correlations and Associations Reflect Reality?

The associations in this study were very strong when using parent ratings derived from well-validated and highly reliable instruments. Furthermore, although there were some concerns about item-overlap and rater bias inflating associations between EC and emotional-behavioural problems, no such criticism could be levelled at the associations between children's reaction time performance in the computer task and parental ratings of emotional and behavioural problems. Thus, it seems unlikely that rater bias alone can explain the main findings of the study. What is harder to discern, given the methodological limitations of this study, is the symptom specificity of the associations that were found. However, in community samples, comorbidity is the rule rather than the exception (e.g. Eisenberg et al., 2004, note significant correlations between internalising and externalising behaviours) and, anecdotally, the children presenting to services often seem to cross diagnostic boundaries, showing both internalising and externalising behaviours. It may be that the sub-group of children to whom this research is most relevant are boys who demonstrate difficulties

across the board. Indeed, given the ubiquitous significance of social stimuli, the fact that children who avoid such stimuli have relatively widespread emotional and behavioural difficulties may not be surprising.

Theoretical Considerations

Integration of Theories

This study involved integration of research literature from temperamental, cognitive and childhood psychopathology domains. As Frick (2004) has discussed, such an integration is complicated by the varying terminologies and approaches used. Whilst both temperament and psychopathology research have put forward important theories, the lack of integration has prevented increased knowledge about the role of temperamental factors, such as EC, serving as risk factors for subsequent psychopathology. Frick (2004) points out that the largely independent development of research in temperament and in psychopathology has separated researchers in terms of theoretical contexts, research goals and samples studied, and prevented them from effectively integrating research findings. Frick (2004) also notes that there has been limited conceptual clarity, with some viewing temperamental dimensions as predisposing a child to risk of developing certain types of psychopathology whilst others have viewed psychopathology as an extreme end of a spectrum of expression of temperament. This has therefore created difficulties in measurement, perhaps most importantly measures have developed to assess temperamental factors separately from psychopathology, but there is considerable overlap in item content and therefore potential confounding of such measures. It is difficult then to resolve issues about temperament (in this case EC) as a risk factor for psychopathology, or to know

if the two constructs are associated by virtue only of confounding in measures. Frick (2004) calls for greater integration of the two fields of research, hoping that this will allow measurement problems to be unravelled and subsequently questions about links between temperament and psychopathology to be resolved. It is hoped that this would allow earlier identification of and appropriate interventions to overcome temperamental risk factors for later psychopathology. It may then be possible to intervene even before the child begins to experience impairments associated with the disorder, impairments which themselves often lead to increased distress and worsening social interactions and may become self-perpetuating. The greater understanding of mediating factors, such as the attentional processes demonstrated in the current study, would also benefit from further theoretical integration. Longitudinal studies would also be of benefit here; early assessment of temperament using multiple methods (observation, parental rating etc.) and follow-up over time would allow greater insight into temperamental risk factors and the developmental path of problems. This could lead to programmes designed to modify temperament to limit risk of disorder and help the child to acquire important developmental or cognitive processes, even when their temperament is understood to make that more difficult for them (Frick, 2004). Possible interventions related specifically to the current study are outlined below. Continued integration of the research literature across domains will serve to advance both academic and clinical knowledge.

Understanding an Avoidance Effect

The study demonstrated that low EC correlated with increased behavioural and emotional problems across the sample, although this relationship was stronger in boys. It also showed an attentional avoidance effect away from angry faces in

children with higher levels of emotional and behavioural problems. This effect served to partially mediate the relationship between EC and emotional and behavioural problems in boys.

I had anticipated finding a disengagement effect in children with higher levels of problems, thinking that their attention being preferentially maintained on threat stimuli could explain the resultant behavioural and emotional responses. However, in this study, the dominant response in the children with more emotional and behavioural problems was to look away, and to avoid angry faces.

In fact avoidance makes a considerable amount of sense, particularly in relation to the ecological validity of the stimuli used. As discussed in paper two, it may be that something specific about the ecological meaning of the task characteristics (faces rather than words) increases the chances of an avoidance effect being seen. Within an evolutionary context, avoiding eye contact with a threatening other is commonly seen as a submissive gesture and one that can be adaptive in certain situations. The perceived immediacy of the facial threat cue, and level of arousal it engenders, along with having learnt from past experience that such cues should be avoided, may all be reasons that contribute to this avoidance effect. Mansell, Clark, Ehlers, & Chen, (1999) have also suggested that avoidance in a social situation may be related to psychological escape, in that it limits opportunity for further social interaction. They point out that avoiding by looking away from a threatening stimuli would be less productive for a spider phobic, as avoiding the spider would not limit the chances of the feared situation. Something specific about escaping from social threat may then

be important in avoiding facial stimuli, and may reflect an appraisal of social interactions as potentially threatening and aversive.

It would be interesting to see whether this effect is specific to faces, perhaps by using a task that contains both words and faces in different trials. This may allow us to distinguish between the avoidance seen here with threatening faces and hypervigilance to threat and disengagement problems, demonstrated in other studies, typically using threat words (e.g. Derryberry & Reed, 2002; Vasey, Daleiden, Williams & Brown, 1995).

Despite the lack of evidence for hypervigilance in this study, avoidance must involve at least some process of initial scanning, to know to avoid a certain type of stimuli. It will therefore be useful to repeat this study with faster stimuli presentation times to try and observe the scanning effect that is assumed to be in operation.

Avoidance appears, by the nature of switching attention away from a certain class of stimuli, to be a more deliberative process and it is perhaps more difficult to understand the role that EC might play on influencing the expression of avoidance as a modulator of attention. For example, one might assume that those with high EC would have a more enhanced ability to switch attention in this way. However, the correlation with low EC indicates that this process may not result from adaptive switching of attention, or initiating a subdominant response. Although it is not possible to comment on causality, the relationship of avoidance with emotional and behavioural problems suggests that this avoidance is not an adaptive mechanism. In those with high EC we could expect the avoidant response to be overridden if it

served an adaptive purpose. However, in the current task, the children who avoided the angry face ended up being quicker to achieve the task (to respond to the target stimulus) which in some sense could be argued to be more adaptive, given the demands of the task. Thus, children with high EC actually performed less well (identified the target more slowly) in the context of invalid cueing by angry faces. To some extent this is a paradox of the current experimental design and it would be interesting to try and tease these effects apart in future research.

It is also interesting to consider the role of avoidance in a cognitive behavioural understanding of psychopathology. Here avoidance processes are often viewed as maintaining factors in negative thinking or maladaptive behaviour. Psychologists commonly view avoidance as unhelpful but also as an unintentional or automatic process. People in treatment may often be able to recognise that their avoidance maintains a problem, and want not to avoid a certain stimulus. One thinks, for example, about those who seek help for phobias but often struggle to engage in exposure-based treatments. This automatic feature of avoidance and its possible relationship with an automatic attentional process requires further research and understanding.

Clinical Implications and Further Research

If it can be replicated, the results obtained here and the magnitude of the effect size, especially in boys, indicate that an avoidance of angry faces may be very strongly implicated in social and emotional problems in boys.

In order to fully understand the processes involved, and therefore to best target clinical interventions, it will be important to examine the behavioural correlates of this avoidance effect. Whilst this study has found an experimental analogue of a potentially important clinical process, we have little idea, as yet, about how it operates socially and interactively. Such factors as how children who show the attentional avoidance of angry faces handle conflict and how they approach relationships with other children will be very interesting. For example, it may be that the cognitive avoidance detected reflects an appraisal that social interactions will be aversive or threatening, which may lead to social withdrawal or hostility.

It may be that these children overestimate the level of danger associated with an angry face, which results in them avoiding it. Their subsequent behaviour may then prevent opportunities for disconfirming their initial, possibly erroneous interpretations. In real-life interactions, angry faces may be pretend, short-lived or directed elsewhere. However, by immediate avoidance, the child may inaccurately interpret the situation and base their subsequent behaviour on this initial misinterpretation. It is also possible that these children, by virtue of immediate avoidance, may fail to notice when others are annoyed with them, thus preventing social feedback and opportunities to resolve conflict and to learn appropriate social interactions. Resultant conflict and inappropriate emotional and behavioural responses can therefore be formulated as understandable and possibly stemming from avoidance based on inaccurate cognitive processing. Chen, Ehlers, Clark and Mansell (2002) explain a maintenance process in social anxiety whereby the avoidant person may fail to notice responses that would help them to see they are being viewed more positively than they imagine. Secondly, the tendency to look away may

interfere with their own social interaction, making them appear bored and therefore reducing the chance of positive social interaction. Again this is related to the ecological validity of faces and it would be interesting to further investigate whether a disengagement effect is more likely than avoidance if using less ecologically valid stimuli, such as threat words as cues.

It is also worth speculating on the causes for such an attentional avoidance effect. As suggested in paper two, there may be reasons based on past experience, why some children find it adaptive to avoid the potentially useful social information contained in an angry face. It is possible to imagine a child who had been abused, for example, having more reason to avoid any interaction or further processing of an angry face. Recent research has noted increased avoidance of threatening faces in children who have been physically abused or have a diagnosis of posttraumatic stress disorder (PTSD) (Pine et al. 2005). In a study with adults, it has been shown that attentional avoidance effects can be induced on neutral stimuli, if these have previously been paired with an aversive noise through classical conditioning (Stormark, Hugdahl & Posner, 1999). It may be that a child's past experience has taught them that avoiding such a stimuli helps to limit aversive interactions. It is possible, given the social salience of an angry face that the children in the current study viewed the angry face as aversive, perceive social interactions as threatening and are driven to avoid by an expectation that people will be hostile towards them.

In terms of specific interventions for attentional avoidance and attentional control, early work in attentional training in children has shown some benefit (Rothbart, 2004). Mathews, Mogg, Kentish and Eysenk (1995) CBT treatment of GAD resulted

in a virtual elimination of previous attentional biases on Stroop tasks. This suggests that the attentional biases are state dependent, operating when triggered by stress or anxiety and therefore may be of importance as a maintainer rather than necessarily being a causal factor in clinical anxiety. Such research suggests the importance of incorporating work on attentional biases in clinical interventions.

Currently treatment for internalising behaviours in children commonly focuses on cognitive behavioural techniques such as psychoeducation, cognitive restructuring, exposure programming and reward systems; whereas in externalising problems, treatment frequently address social skills and problem solving and more family based issues such as parenting skills and communication (Carr, 1999). The present study suggests that EC and attentional processes may be shown to be significant determinants of childhood behavioural problems and therefore that, when working with children, and especially with boys, there may be benefit in including both temperamental and attentional bias effects in assessment and formulation. An understanding of a child's level of EC would allow the clinician a greater insight into the nature of behavioural problems and the possibility that they were maintained by a limited ability to inhibit a dominant response. It would also indicate the possible worth of some form of education and training to counteract these responses.

An awareness of the role of automatic attentional biases could also aid clinical work by highlighting the need for attentional training and possibly for some form of habituation or exposure programme to angry faces or other forms of salient social stimuli. To understand the relevance of such work, further investigation will need to understand the behavioural correlates and the extent to which behaviour is negatively

impacted upon by this avoidance effect. If, as indicated by the current study, there is a subgroup of children whose attention is modulated by avoidance of angry faces to their detriment, the importance of targeted interventions could be understood. It may be possible for an emotional cueing task to be used to screen for this effect. Those who do avoid may then benefit from intervention focused on habituation or exposure to lessen the automatic avoidance effect. Some form of targeted educational programme on socially appropriate responding may also help to correct social skills deficits that could be understood to have resulted from a life-long pattern of avoiding in this way. Early identification and intervention to combat temperamental risk factors and mediating factors (in this case EC and attentional avoidance) may prevent children from going on to show behavioural manifestations of specific psychopathologies or limit their significance. Such an early intervention could be particularly beneficial as psychopathology in children frequently also impacts negatively on social and educational domains which can then worsen the child's problems.

Knowledge about a child's attentional biases and EC would also be useful in structuring sessions. A child with low EC may, for example, require a more structured environment with rewards or praise for attending and overriding dominant responses. Behavioural techniques may be extended to out of session treatment with parents being trained in appropriate reward contingencies based around overcoming the EC deficit. A further intervention related directly to the avoidance of angry faces may involve education of parents and teachers. Negative consequences or reprimands may, of course, be necessary when the child misbehaves but if we formulate that they avoid and shut-off from angry faces, it is unlikely that they effectively process

instructions or feedback when delivered by an angry adult thus further inhibiting their corrective learning opportunities. It may therefore be beneficial to limit instructions given when angry and important to repeat instructions in a calm manner, and to utilise tools such as written materials to ensure that these children remain aware of what is expected of them and benefit from the opportunity to learn from their mistakes.

Clinical work of this nature would be something of a departure from the ordinary for both clinicians and patients alike. It would be vital therefore that attentional training remains credible. Such an effect could be partially achieved by furthering the research base and by obtaining successful treatment outcomes. It would also need some degree of face validity, in order to be able to sell such an intervention to service providers and to those seeking help. I can imagine considerable difficulty in explaining habituation to angry faces as an intervention in a young boy with conduct disorder for example. However, with a sufficient research base as a foundation, evidence of efficacy and by continually reflecting on an individualised formulation of the role of attention, clinicians may feel increasingly comfortable in diversifying from traditional psychological techniques to incorporate work from both temperament and cognitive domains in the treatment of psychopathology.

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Appendices

Appendix A

Notification of Ethical Approval



The Graduate School
University College London
Gower Street London WC1E 6BT

Professor Leslie C Aiello
Head of the Graduate School

Tel: _____

25 November 2004

Ms Sarah Allen
Sub-Department of Clinical Health Psychology
Department of Psychology
UCL

Dear Ms Allen

Re: Notification of Ethical Approval

An investigation of cognitive processes mediating the link between effortful control and social competence

The above research has been given ethical approval following review by the Chair of the UCL Committee for the Ethics of non-NHS Human Research for the duration of the project subject to the following conditions:

1. 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 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'.

2. 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), 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.

3. On completion of the research you **MUST** submit a brief report (maximum of two sides of A4) of your findings to the Committee. Please comment in particular on any ethical issues you might wish to draw to the attention of the Committee. We are particularly interested in comments that may help to inform the ethics of future similar research.

Yours sincerely

Sir John Birch
Chair of the UCL Committee for the Ethics of Non-NHS Human Research

Cc: Dr Pasco Fearon, Sub-Department of Clinical Health Psychology,
Department of Psychology, UCL

Appendix B

Parental Information Sheet



Sub-Department of Clinical Health Psychology

UNIVERSITY COLLEGE LONDON

GOWER STREET LONDON WC1E 6BT

Re: 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. We are hoping to collect data from both those children who experience these difficulties and those who do not.

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 children's chance of developing behavioural and emotional problems, one important factor is related to attention. We are hoping to find out more about the link between attention and children's difficulties. It is hoped this may provide useful information for professionals who work to help children overcome these difficulties.

Why are we being asked to take part?

We are approaching all parents/guardians of children who are aged between nine and 11 at your child's school. This school has been chosen because it takes both boys and girls. We hope to collect information from 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, completion of which should take about 10-15 minutes. Children will then be seen in school time and will be asked to fill in two brief questionnaires which are designed for their age and have been used before in other studies. These questionnaires will ask about your child's attention and their thoughts about responsibility and the actions of others. Completing the questionnaires will take no longer than about 30 minutes. Children will also be asked to complete a five-minute computer task which involves them tapping a button in response to changing pictures of different facial expressions. Most children enjoy tasks like this. Finally your child's teacher will also be asked about the children's behaviour in a similar way to the first questionnaire attached.

Is the research confidential?

Yes. All information collected will be used for research purposes only and an ID number used to keep answers confidential. Teachers will not see the forms the children or parents complete. The consent form will be separated from the questionnaires and id coded to enable us to match up parent, child and teacher responses.

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. The UCL Committee on the Ethics of Non-NHS Human Research approved this proposal. If you do have any concerns, you are free to contact us at the address given below.

Who should I contact if I have any questions?

Please contact Sarah Allen 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 the slip at the bottom of this information sheet and complete the attached questionnaires. The consent form and the two questionnaires can be placed in an envelope if desired and should be returned to your child's class teacher/tutor or to the box in school as soon as possible.

Your child will be entered into a draw to win gift vouchers (one x £20, one x £15 and three x £5) as a way of thanking them for their participation in the project.

Thank you for taking the time to read this information sheet.

Yours sincerely,

Sarah Allen
BSc, Trainee Clinical Psychologist
Sub-Department of Clinical Health Psychology, University College London
Gower Street, London, WC1 6BT, Email:

Appendix C

Parental Consent Form

PLEASE RETURN

Clinical Psychology Investigation of Factors Affecting Behaviour in Children

Please complete this slip and return it (attached to the completed questionnaires) to your child's class teacher/tutor or to the box in school.

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

Child's Name:.....

Class Teacher/Tutor Group.....

Parent/Guardian Name:

Signed:

Date

Appendix D
Child Information Sheet

Information for Participants
(to be read by the investigator, prior to questionnaire administration)

My name is Sarah Allen and I am training to be a Clinical Psychologist at University. I am interested in finding out more about how children are able to control their behaviour and the way they think.

I want to find out what helps children to get on with others and feel good about themselves. I am trying to meet as many children as I can in your year.

Your parents have 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 short task on the computer. You will be doing a short task on the computer which will involve tapping a button when you see changing pictures of different facial expressions.

If you decide that you would like to take part, I will ask you to fill out some questionnaires that have been designed for people your age, they ask you about how you pay attention and how you think about things that other people do. To say thank you, those who do take part in the study will be entered into a draw – and five winners will get gift vouchers.

What 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'm finished talking. It is ok if you feel that you want to stop after you have started, you just have to say.

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 this is not a test, and there are no right or wrong answers.

Any questions?

Appendix E

Child Consent Form



Sub-Department of Clinical Health Psychology

UNIVERSITY COLLEGE LONDON

GOWER STREET LONDON WC1E 6BT

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

Investigator: Sarah Allen

Please put a circle round your answer

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

and the date here

Thank you for your help.