Attentional-bias to sleep-related stimuli in children with sleep-problems: An investigation using an induced-change-blindness paradigm

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Clinical Research Portfolio

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Volume I

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Chapter Two: Major Research Project

CHAPTER ONE: SYSTEMATIC REVIEW

Do problem-specific attentional-biases exist in childhood-anxiety?

What the modified emotional Stroop paradigm can tell us.

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ABSTRACT

Introduction. *People experiencing anxiety-disorders are drawn towards certain stimuli due to their threatening nature. This preferential-attention, known as attentional-bias (AB), serves to maintain anxiety-disorders. AB is measured using various paradigms; one of the most common is the Modified Emotional Stroop (MES). Three dominant AB-hypotheses exist: the Developmental Inhibition Hypothesis, the Integral-Bias Hypothesis and the Inferred-Bias Hypothesis. AB research with children is only now gathering pace. This review investigates 1) the existence of problem-specific AB in younger clinical and subclinical anxious-populations, 2) the effectiveness of various Stroop-modifications in measuring childhood AB and 3) which hypothesis best fits the evidence.* **Method.** *Following a multi-approach search using a range of search-terms pertaining to children, AB and psychological-disorders, eleven articles were selected for review. Each paper was quality-rated using a Quality Rating Instrument (QRI). Findings were analysed using narrative-synthesis.* **Results/Conclusions.** *Evidence for problem-specific AB across child/adolescent populations was mixed. No problem-specific AB was found for children/adolescents with Generalised Anxiety Disorder, or sexual-abuse-related Posttraumatic-Stress Disorder (PTSD), although it was observed with children/adolescents with PTSD related to road-traffic accidents/personal violence and in studies with spider-fearful children/adolescents. An increased problem-specific AB was found in more state/trait-anxious/socially-concerned children/adolescents. The relative effects of various modifications (including stimuli-type) of the MES are reviewed and results are discussed in relation to support for AB-hypotheses. Limitations of the key studies are examined in addition to future directions for AB research with children/adolescents using the MES.*

1. INTRODUCTION

The most recent review indicated a 10% prevalence-rate of clinically-diagnosed mental-health problems in 5-16-year-olds across the UK (Green et al, 2005). Almost half of those were experiencing an emotional (i.e. anxiety- or depression-related) disorder. Given this situation, every effort should be made to understand what causes, maintains and exacerbates these problems.

Within emotional disorders, *anxiety*-related problems are most common among children/adolescents (Rapee et al, 2009). Although expected to experience 'normal' anxiety throughout development (e.g. to loud noises as infants, or self-image in adolescence), some children/adolescents experience more chronic problems, which may be maintained into adulthood.

1.1. Cognitive Models of Anxiety Disorders

It is widely-accepted that cognition plays a fundamental role in information-processing in anxiety-problems. With regards to the fight/flight hypothesis, most people accept that humans respond in a certain way to threat; cognitions (thoughts/beliefs/assumptions) aid our coping, enabling survival. When anxiety becomes more clinical, however, cognitions play a significant maintenance-role. Beck and Clark (1988) explain this using the content-specificity-hypothesis: within specific disorders, information is processed so that disorder-relevant information is given preferential-attention. In other words, cognitive-biases (CBs) are present within specific psychological-disorders. So, for example, people with a specific phobia will notice phobia-related information more than non-related information, while someone with posttraumatic-stress disorder will notice trauma-related information more easily. CBs maintain problems because people's world-view becomes skewed towards threat, enhancing/consolidating their anxiety. In a recent review, CBs were found to play a causal role in the development of psychological-disorders; furthermore, they were often disorder-specific (Mathews and MacLeod, 2005). Adding strength to the content-specificity-hypothesis, these authors found CBs in attention, memory and the

interpretation of situations. In this current review, I will focus on biases in *attention*.

1.2. Attentional-Bias and Anxiety

Attentional-bias (AB) is the tendency to notice particular stimuli in the environment over others, due to its emotional-relevance. According to the content-specificity-hypothesis, we selectively attend to problem-specific information as it holds more emotional-relevance. It is generally-accepted that, across anxiety-disorders, a stimulus' sense of *threat* drives AB towards it. For clarity, the term AB will be used throughout this review, however other related terms include: selective-attention, attentional-preference, cognitive-bias and cognitive-interference.

1.2.1. Measuring Attentional-Bias

AB research has developed dramatically recently, with much interest surrounding methods used to measure it. Three dominant paradigms exist to quantify AB and investigate its nature.

The first paradigm to emerge was the Stroop (Stroop, 1935). In its classic form, participants are shown cards with a list of words written in different colours. The task involves naming words' colours while ignoring the actual word. Humans automatically interpret words' meanings; the task, therefore, leads to interference as this automatic process must be suppressed. Recently, the modified *emotional* Stroop (MES) has shown great prominence in testing AB; this will be examined later. The Stroop remains a popular choice for AB research; as a result, much comparison between its effects with different populations can take place. It is simple to explain to participants and has provided robust findings in anxious adults (see Logan & Goetsch, 1993, for review). Some researchers, however, argue that the relatively long time taken to process word-meanings cannot be regarded as part of (speedier, automatic) attentional-processes, thus there is some

debate about whether the Stroop measures AB at all (Kindt & van den Hout, 2001). It has also been suggested that interference on the Stroop may be due to effortful *avoidance* of threat-stimuli, rather than AB towards it (DeRuiter & Brosschot, 1994).

In order to overcome the latter problem, the dot-probe paradigm was created (MacLeod et al, 1986). On a typical dot-probe critical-trial, a computer-screen shows two stimuli (words/pictures), one above the other, for a brief time (500-1000ms). These disappear and a probe (usually a small dot) takes the place of one of the stimuli; one stimulus is emotionally-salient, the other is neutral. Participants hit a response-key whenever they see a dot. On non-critical-trials, half show no dot. Anxious participants tend to be quicker (versus controls) at responding to dots which take the place of threat-related (versus neutral) stimuli due to their AB to such stimuli. The dot-probe may be viewed as a better indicator of AB than the Stroop, as it is clear that shorter response-times to threat-stimuli represent attention towards them, given that the probe is only noticed when attention is drawn to that location. It also holds an advantage over the Stroop in that the time-course of AB can be analysed by varying the time between stimulus-presentation and probe. It is not without problems, however; some participants may strategically divide their attention between the two possible probe-locations, irrespective of the presented stimuli, in order to detect it (Bruce, 2006).

The third paradigm is the Induced-Change-Blindness (ICB) flicker (Rensink et al, 1997). This involves the following cycle of briefly-presented pictorial-stimuli: original-stimulus (OS), mask-screen, changed-stimulus (CS; part of OS has changed), mask-screen, OS etc. This cycle continues until the participant presses a key, indicating identification of the change. In recent studies, OS have consisted of an array of objects - half emotion-related and half neutral - while CS have consisted of emotion-related and neutral objects being removed from the OS. Like the dot-probe, anxious participants tend to be quicker (versus controls) at responding to threat-related (versus neutral) changes given their AB to such

stimuli. This paradigm's strengths lie in the rich, ecologically-valid scenes used to elicit AB. The use of several objects provides more emotional-context than single stimuli in other paradigms. However, this may also be its weakness; such rich contexts may be too specific to elicit individuals' AB.

Although all three paradigms have their strengths, the MES has proved particularly popular in recent years.

1.2.2. The Modified Emotional Stroop

In 1985, Mathews and MacLeod devised the MES to test AB in adults with Generalised Anxiety Disorder (GAD). Using threat- and mild positive-words, they found GAD participants were slower to colour-name threat-words than positive-words, compared to controls. Anxious participants were believed to be preoccupied with threat-words, thus struggling to suppress automatic attention to their meaning. In other words, anxious participants showed AB to threat-words. From this seminal research, it became clear that the MES could effectively investigate disorder-specific AB across disorders.

1.2.3. Problem-Specific Attentional-Bias in Adults

The MES has demonstrated problem-specific AB in adults with health-anxiety, spider-phobias, social-phobia, panic-disorder and PTSD. There is also evidence of a correlation between nonclinical adults' state- and trait-anxiety and threat-related AB, showing that AB occurs in subclinical-anxiety, too (see Williams et al, 1996 for full review).

1.2.4. Problem-Specific Attentional-Bias in Children/Adolescents

Investigations regarding AB in younger populations are only now gathering pace. Although in its infancy, researchers investigating childhood AB have become

increasingly creative in their Stroop-adaptations, in order to tap various cognitive-processes. It has been modified to include pictorial- (pictures or faces) stimuli (e.g. Hadwin et al, 2009; Heim-Dreger et al, 2006; Kindt et al, 2000; Kindt & Brosschot, 1999). It has been altered so stimuli are presented one-at-a-time (single-trial format) instead of altogether on cards (e.g. Morren et al, 2003; Taghavi et al, 2003; Freeman & Beck, 2000). It has also been adjusted to appear in integrated- (stimulus and colour appear as one) forms (e.g. Taghavi et al, 2003; Martin et al, 1992) or non-integrated- (stimulus appears superimposed onto coloured background) forms (e.g. Kindt et al, 2000).

AB research with younger populations has allowed further, more in-depth, investigation into the *nature* of AB. Richards et al (2007) describe current AB-hypotheses. The *Integral-Bias Hypothesis* states that cognitive-processes associated with particular emotions are intrinsic to them; they come as a package and are never separate. Thus, AB should remain constant in nature and magnitude from childhood to adulthood. The *Inferred-Bias Hypothesis* assumes cognitive-processes only become associated with emotions after sufficient repetition. Thus, it assumes that AB is not intrinsic to emotion by nature, but is learned; AB to emotional-material should, therefore, increase in magnitude from childhood to adulthood. The *Developmental Inhibition Hypothesis* postulates that AB to threatening information is a natural characteristic of childhood and, as *we* develop, so does our ability to inhibit AB to such material. The exception, however, is for anxious children, whose ability to inhibit such material fails, leading to persistent AB throughout development. What AB research with younger populations can tell us, therefore, is how AB varies with age, allowing us to investigate such hypotheses.

1.3. Aims of Current Review

Investigating AB in children/adolescents could teach us how to prevent anxiety becoming more problematic in adulthood. To the author's knowledge, no recent reviews exist which examine the literature surrounding investigation of problem-

specific AB in children/adolescents using the MES. This review aims to tie together recent evidence to create conclusions about 1) the existence of problem-specific AB (measured by the MES) in younger clinical- and subclinical-populations, 2) the effectiveness of various Stroop-modifications in measuring AB in children/adolescents and 3) which AB-hypothesis best fits the evidence.

2. METHOD

2.1. Search-Strategy and Identification of Relevant Papers

An electronic literature-search was conducted using the following databases: *Ovid Medline (R) In Process & Other Non-Indexed Citations and Ovid Medline (R)* 1948-present; *EBM Reviews – Cochrane Database of Systematic Reviews* 2005 - February 2011; *EBM Reviews – ACP Journal Club* 1991 – February 2011; *EBM Reviews – Database of Abstracts of Reviews of Effects* 1st Quarter 2011; *EBM Reviews – Cochrane Central Register of Controlled Trials* 1st Quarter 2011; *EBM Reviews – Cochrane Methodology Register* 1st Quarter 2011; *EBM Reviews – Health Technology Assessment* 1st Quarter 2011; *EBM Reviews – NHS Economic Evaluation Database* 1st Quarter 2011; *EMBASE* 1996 - 2011 Week 07; *ERIC* 1965 – February 2011; *PsychINFO* 1987 – February Week 4 2011; *Social Policy and Practice* 2011. A wide range of terms were used to focus the initial search (see Table 1).

INSERT TABLE 1 ABOUT HERE

A hand-search of the following journals was also conducted: *Behavioral and Brain Sciences*, *Behavioral Neuroscience*, *British Journal of Clinical Psychology*, *British Journal of Developmental Psychology*, *British Journal of Psychology*, *Journal of Abnormal Psychology*, *Journal of Consulting and Clinical Psychology* and the *Journal of Experimental Psychology: Learning, Memory and Cognition*. As a final check for papers, the search-engine *Google* was searched using the

same terms as the electronic search. One paper was obtained from references from a key paper.

2.2. Inclusion-Criteria

Papers were included if they met the following criteria: MES used to measure AB; MES modified to tap anxiety (at clinical- and non-clinical-levels); participants were school-aged; participants did not have learning disabilities/developmental-disorders (e.g. Autistic-Spectrum Disorder/Attention-Deficit Hyperactivity Disorder); papers were original, experimental research papers; papers were published and peer-reviewed. Papers were included if they tested AB using other methods in addition to the MES, however, only the relevant Stroop findings were reviewed as such results were deemed appropriate to be interpreted in their own right.

2.3. Quality Assessment

Papers were rated using a Quality Rating Instrument (QRI; Appendix 1.1) which was a hybrid measure, created by the researcher, incorporating several different resources which outline how best to assess the quality of scientific studies, namely: the Scottish Intercollegiate Guidelines Network (SIGN, 2011), the Consolidated Standards of Reporting Trials (CONSORT) statement (Schulz et al, 2010) and the Clinical Trials Assessment Measure (CTAM; Tarrier and Wykes, 2004). Using the QRI, two scores were produced per paper; one from the researcher, one from an independent-rater. The maximum score per paper was 52, however an item could be rated 'not applicable' if it was thought the item was not appropriate for a particular paper. As a result, some papers had a maximum score of less than 52 if such items were deemed inappropriate to be given a score. To compensate for this difference in score denominators, each paper was given a final percentage. Percentages from each rater were averaged to produce a final initial overall percentage (appendices 1.2 to 1.4), which corresponded to quality-description categories: excellent (80-100%); good (60-79%); adequate (40-59%) and poor (below 40%).

Initially, three papers had 100% inter-rater agreement, while the other eight papers highlighted discrepancies. These discrepancies ranged from a difference of 1.3% to a difference of 11.5%. Discussions were held between raters until 100% agreement was reached for all eleven papers.

2.4. Article-Search Results

Initial database-searching acquired 46 papers. Application of inclusion-criteria reduced this to nine. The hand-search revealed no papers, however the *Google*-search exposed one paper. One further paper was obtained from the references of another key paper. Thus, the multi-approach search generated eleven key papers.

2.5. Narrative-Synthesis

This review uses narrative-synthesis, a textual method of research-synthesis, to address the research questions and interpret results. Narrative-synthesis allows a more detailed evaluation of the theoretical-implications of data - in addition to enhanced insight into a study's confounding-factors - than quantitative-methods (e.g. meta-analysis) allow (Rodgers et al, 2009). This method is especially beneficial when analysing results of extremely heterogeneous data, as is the case here. Papers will be systematically-reviewed by problem-categories.

3. LITERATURE REVIEW

3.1. Attentional-Bias and Generalised Anxiety Disorder (GAD) in Children/Adolescents

Taghavi et al (2003) used the single-trial version of the MES with children/adolescents with a diagnosis of GAD (n=19) and controls (n=19). No age-range is provided, however mean ages of GAD- and control-groups were 13.47- and 14.5-years, respectively. Stimuli consisted of words from five categories (happy, neutral, depression-related, threat-related and trauma-related). GAD participants were slower to colour-name threat-words than neutral-words

(an effect not found in controls), however *all* children performed similarly in response to threat- and depression-related words. The difference between response-times (RTs) to threat- vs. depression-related words in GAD participants was not significant. It was concluded, therefore, that GAD children/adolescents show AB for *negative* words in general.

Several methodological flaws existed. Firstly, diagnosis did not involve a specific assessment of depressive-symptoms. Thus, inflated AB towards *all* negative material may have occurred if the sample contained more depressed participants than intended. Secondly, words were categorised by *non-anxious* children and adults; they may not, therefore, have been valid for participants. Lastly, the sample-size was small, weakening the study's power. Each of these issues may have impacted on the failure to find AB for threat-related information in GAD participants. The study does, however, show AB for negative information in GAD children/adolescents. AB to threat-words in young GAD participants is similar to results with GAD adults (Mathews and MacLeod, 1985), lending some support to the Integral-Bias Hypothesis. Longitudinal studies are required, however, to investigate the effect of age on AB and test the other hypotheses.

3.2. Attentional-Bias and Posttraumatic-Stress Disorder (PTSD) in Children/Adolescents

Two studies investigated AB to threat-words in children/adolescents with a diagnosis of PTSD using the MES. Using the same five word-categories as Taghavi et al (2003), Moradi et al (1999) examined 23 PTSD participants and 23 controls (aged 9-17) completing a single-trial MES. PTSD participants had experienced road-traffic accidents (RTAs) or personal-violence events; controls had no history of trauma/psychological-problems by teacher- and parental-report. PTSD participants were slower to colour-name words overall, compared to controls. The PTSD group were also slower to colour-name trauma-words than 1) neutral-words and 2) controls. Furthermore, age had no influence on AB. The authors concluded that anxiety contributes to an overall slowing-effect on a

child's cognitive-processing and interpreted the AB for trauma-words in the PTSD group as hypervigilance to threat. Like Taghavi et al (2003), this study appears to support the Integral-Bias Hypothesis, as age did not affect AB. Again, however, longitudinal data is required before any strong conclusions are made.

Two significant methodological weaknesses are present, each involving the inclusion/exclusion-criteria. Firstly, in the PTSD group, there is no apparent assessment of traumatic brain-injuries (TBIs). This seems odd as TBIs can seriously affect cognitive-functioning, which would affect Stroop-performance. Secondly, in the control group, trauma-history is taken by teacher- and parental-report; this seems an unreliable method. Should violent events have occurred at *home*, it would be unlikely that 1) a parent would disclose this and 2) teachers would be aware of it.

The second study using the MES to investigate AB for threat-words in young PTSD participants is Freeman and Beck (2000); they aimed to replicate previous studies' findings from female adult rape-survivors with PTSD. The sample consisted of 53 girls (aged 11-17) and comprised: sexually-abused girls with a PTSD-diagnosis (PTSD group), sexually-abused girls without current PTSD-diagnosis (abuse group) and controls (no sexual-abuse history/psychological-diagnosis). All participants completed the single-trial MES using words from five categories (abuse-related threat, developmentally-relevant, general threat, positive and neutral). For clarity, developmentally-relevant words included *secret, shame* and *lonely* while abuse-related threat-words included *kissing, naked* and *penetrate*.

In general, the PTSD group took longer than controls to colour-name *all* word-types, showing a general slowing-effect similar to Moradi et al (1999). There was no significant difference between the RTs of the PTSD and abuse groups. All groups took longer to respond to abuse-related threat-words than all other word-types; all groups also took longer to respond to developmentally-relevant words

than to positive- and neutral-words. Lastly, all participants took longer to respond to general threat-words than to positive-words.

This outcome partially fits the Developmental Inhibition Hypothesis, as all participants showed AB for threat-words. It may be that no AB was found for abuse-related threat-words in the PTSD group because the comorbidity within this group was high, yielding a less 'pure' PTSD group. It is, however, likely that most people with PTSD will have at least some comorbidity due to its complex nature. The lack of a significant difference between the PTSD and abuse groups' performance - in relation to abuse-related threat-words – may also be due to the high proportion of participants in the abuse group who had been previously-diagnosed with PTSD; the two groups were, therefore, more homogenous than originally assumed. Overall AB for abuse-related threat-words could also exist because adolescents (in general) consider sexual words taboo, thus attracting their attention towards them.

Three main methodological flaws exist. Firstly, the all-female sample limits the findings' generalisability. Secondly, abuse experiences range vastly from child to child; thus, 'abuse-related' words may not have been valid for the PTSD group, which would explain their lack of AB for them. Thirdly, all participants were exposed to the topic of sexual-abuse - via assessment - prior to the Stroop. Overall AB to abuse-related threat-words could be explained by this priming-effect. Two further flaws could seriously impact the results and generalisability of the findings. Firstly, for inclusion purposes, 'sexual-abuse' was defined as "at least direct genital touching of any sort by a male perpetrator"; this, however, excludes those sexually-abused by females. Secondly, controls were assumed to have no abuse-history, based on self-report; disclosure of sexual-abuse, however, often takes time and requires much trust, so is unlikely to occur following brief assessment. Although self-report is the only reasonable method of obtaining this information, caution must be taken when assuming the controls are, indeed, controls.

3.3. Attentional-Bias and Subclinical Spider-Fearful Children/Adolescents

Five studies investigated AB in subclinical spider-fearful children/adolescents using the MES. The first is Martin et al (1992), who split 48 children into three age-groups (young – 6/7 years; middle – 9/10 years; old – 12/13 years) and into either nonphobic or phobic groups, based on their responses to the following questions: "do you like spiders?" and "would you pick up spiders?" Two 'yes' responses resulted in allocation to the nonphobic group; two 'no' responses indicated allocation to the phobic group. All children completed the card-version of the MES. Cards contained words from one of four categories: nonwords (*wpa, doat*), incongruent colour-words (colour-words printed in different-coloured ink), control-words (related to other insects) and spider-words (*web, crawl*). Card presentation-order varied randomly across participants.

Only the phobic group showed AB (slowed RT to colour-name words) for spider-words over control-words. The researchers then compared participants' AB across the three age-groups, finding that AB in phobic children existed in the youngest group and did not change significantly with age. This lends support for the Integral-Bias Hypothesis. Comparing their results to those of a similar study with adults (Watts et al, 1986), they concluded that, as results for similar spider-related AB existed in child and adults samples, even further support for the Integral-Bias Hypothesis was achieved.

Several limitations and methodological flaws are present, however. Firstly, as in Freeman and Beck (2000), all children were primed to think about spiders before the Stroop, via assessment questions. Secondly, it seems unreliable to use these results as evidence that AB exists as integral to emotions; between-participants analysis makes it difficult to separate out any idiosyncratic confounding-factors which could have led to AB. Longitudinal analysis with one sample would provide a more reliable method of assessing this hypothesis. Thirdly, the authors make a questionable link between their results and those of Watts et al (1986) taking this as further evidence that AB remains stable into adulthood; again, this

conclusion requires a longitudinal, within-subjects, design to award it validity. Lastly, allocation to the phobic group was conducted rather loosely; surely some children who do not like spiders/do not like holding them are not phobic, but simply do not like touching insects?

Kindt et al (1997) compared the relative efficacy of the card and single-trial MES formats, using the same word-categories as Martin et al (1992). Children aged 8-12-years (n=145), completed both formats and were allocated into nonphobic and phobic groups using Martin et al's (1992) two questions in addition to scores on the Spider-Phobia Questionnaire for children (SPQ; adapted from Klorman et al, 1974). *All* children showed AB (slower RTs) for spider-words over control-words, on both formats. There was no *specific* AB to spider-words – on either format – for the phobic group. Furthermore, analyses of the effects of age revealed the following on the single-trial MES: as age increased within the phobic group, AB for spider-words increased; as age increased within the nonphobic group, however, AB for spider-words diminished. This fits the Developmental Inhibition Hypothesis, as all young children took longer to respond to threat-related information, regardless of their fear-status, yet this effect changed with age. It may also lend some weight to the Inferred-Bias Hypothesis, given the increase in AB with age in the phobic group. Interestingly, AB effect was stronger on the card-format, possibly due to the amplified emotional-impact awarded by multiple words per card. Importantly, however, the two formats were uncorrelated, leading us to question whether they were measuring different mechanisms.

Methodological flaws must, however, be considered. The fact that all children showed AB to spider-words could be due to the same potential priming-effect in the Freeman and Beck (2000) and Martin et al (1992) studies. The uncorrelated-relationship between both formats may have existed because children completed them on two separate days; thus, individual resources (i.e. attention, concentration, tiredness) may have differed on each occasion.

Continuing their quest to examine the relative efficacy of various MES-adaptations, the same authors conducted a study comparing pictorial- and textual-versions of the task (Kindt & Brosschot, 1999). The authors suggest that previous findings - where all children showed AB for threat-related stimuli - were due to the integrated nature of the studies' stimuli (representing both target colour *and* distracting emotionality), making it more difficult for any child to ignore threatening information. To investigate this claim, 58 participants (aged 8-12) completed single-trial Stroop tasks with 1) non-integrated pictures (spider- and neutral-pictures superimposed onto coloured backgrounds), 2) integrated words (spider- and neutral-words written in different colours) and 3) non-integrated words (using coloured backgrounds) to compare AB across these conditions. Allocation to groups was performed using a similar questionnaire to their 1997 study.

Phobic children showed AB for *non-integrated* spider-words but not spider-pictures. *All* children took longer to colour-name *integrated* spider-words than integrated neutral-words; only the phobic group showed AB for *non-integrated* spider-words over non-integrated neutral-words. This confirms the authors' hypothesis telling us there is something special about integrated threat-stimuli - not present in non-integrated threat-stimuli - that all children find more distracting.

This overall AB to spider-words is assumed to be due to a childhood-characteristic whereby threat-stimuli consume attention and the ability to inhibit this only develops later. This result partially fits the Developmental Inhibition Hypothesis, however, like with Martin et al's (1992), a longitudinal, within-subjects design is required to validate this theory. The lack of AB for spider-pictures in phobic children was surprising given the conscientious step of asking participants to (retrospectively) rate the stimuli; phobic children rated spider-pictures as more arousing than neutral-pictures and spider-words. This result may be because children often acquire fears through negative information from others, rather than from direct contact with a feared-object; thus, pictures may have been

too unfamiliar to cause AB. It must be noted, however, that it is, again, very likely that overall AB to integrated spider-words was the result of priming, as all children completed the spider-phobia questionnaire twice before the Stroop.

Given the unexpected results of the previous study (Kindt & Brosschot, 1999), Kindt et al (2000) further investigated AB for spider-stimuli in spider-fearful and controls. They conducted two experiments aiming to 1) re-examine AB for non-integrated spider-words, 2) investigate whether AB would exist for spider-pictures if children were trained to associate them with spider-words and 3) further explore the effect of age on AB. Experiment one involved 113 girls, aged 8-11-years, allocated to the spider-fearful or control group by questionnaire (as in Kindt & Brosschot, 1999), completing the single-trial MES. The task consisted of non-integrated words and pictures (spider and neutral); children completed both word- and picture-Stroops. This time, half the children underwent training to strengthen associations between the spider-pictures and spider-words. All children were told they may have to confront a real spider at the end of the study, dependent on draws made after the Stroop; it was fixed, however, so no child confronted a spider.

Spider-fearful children did not show specific AB for spider-related pictures - even in those trained - nor did they show increased AB to spider-words over controls. This disproves the theory that spider-pictures required more context to elicit AB (Kindt & Brosschot, 1999). Analyses including *age* showed an identical effect as before; as age increased, AB for spider-words increased in the spider-fearful group but decreased for controls. Again, this supports the Developmental Inhibition Hypothesis (and potentially the Inferred-Bias Hypothesis).

A surprising finding was that, for eight-year-olds completing the word-Stroop, controls showed *more* interference on spider-words than spider-fearful children. Several explanations exist for this: 1) the questionnaire is invalid for such young

children, leading to spider-fearful children being categorised as controls, 2) the intentional fear-heightening via the potential confrontation with a spider did not work (this was not assessed) and 3) the number of eight-year-olds was considerably smaller than other age-groups, thus the results may not be reliably-comparable.

To investigate these issues further, the word-Stroop alone was completed by 121 eight-year-old girls using the same set-up as experiment one. The sample was split as follows, based on spider-fear questionnaire scores: spider-fearful (high scores), normal controls (scores around median) and non-fearful controls (very low scores). Half were asked to (genuinely) confront a spider, based on their draws. Again, all children showed AB for spider-words, irrespective of their fear-grouping or anticipation of confronting the spider. Again, however, all children were primed to think about spiders, before the Stroop, via the questionnaire and draw, so any conclusions made must consider this flaw. *Genuine* anticipation of confronting a spider did not affect AB to spider-words in spider-fearful children.

Kindt et al (2000) conclude that 1) AB for spider-words is a normal characteristic for all eight-year-olds, 2) with age, AB reduces in non-fearful children but remains in spider-fearful children and 3) no AB exists for pictures in spider-fearful children aged 8-11. A clear problem with such bold conclusions is that the sample only consisted of girls, so the most that can be said is that the conclusions are valid for female children. The results appear to support the Developmental Inhibition Hypothesis when age is considered.

Morren et al's (2003) work provides further evidence for the enhanced difficulty of integrated word-stimuli on the MES when investigating AB in spider-fearful children aged 7-11. High spider-fearful (n=170) and non-fearful (n=215) children completed a single-trial Stroop consisting of integrated and non-integrated spider- and neutral-words. In line with the Developmental Inhibition Hypothesis, the

authors predicted that all children would show AB for spider-words at a younger age, but this would diminish with age in non-fearful children, while remaining present in fearful children.

An unexpected pattern was found, however; *all* children responded *faster* to spider-words than neutral-words. Concerned their task was longer than others', Morren et al (2003) conducted further analysis, revealing AB (slower response) *was* present for all children, for spider-words, in the *first* half of the task, but only when stimuli were *integrated*. This was only significant for 7- and 8-year-olds. No such effect was found in non-integrated words. The lack of significant interaction meant the Developmental Inhibition Hypothesis could not be investigated further in terms of whether age had an effect on AB.

Children's overall increased-speed in colour-naming spider-words was assumed to be due to threat-avoidance; the AB effect in integrated-stimuli may reflect more difficulty in threat-avoidance when threat is integrated with the target. A major flaw of this study is, again, the likelihood that all children were primed via spider-fear questionnaires. Perhaps this priming, combined with Morren et al's (2003) avoidance theory, explains the omnibus-effect of a faster response to spider-words across all participants.

3.4. Attentional-Bias and Subclinical High Trait- and State-Anxiety Children/Adolescents

Using the card-version of the MES, Heim-Dreger et al (2006) investigated an alternative AB theory that would fit the results of Morren et al (2003). They argued that AB causes *either* a faster *or* slower colour-naming response on the Stroop, depending on whether the person is vigilant to or avoidant of threat. Vigilant participants would be distracted by threat-stimuli, slowing colour-naming, while avoidant participants would be faster given their preference to engage in the target task. Thus, Heim-Dreger et al (2006) suggest that the

absolute size of AB (i.e. its numerical-value regardless of the positivity/negativity of its sign) would be a better indicator of AB.

In the first experiment, 112 children aged 7-10-years completed the Stroop consisting of threat- and neutral-faces in different colours. Children completed questionnaires - at three points in the study - to measure state-anxiety. An average of these scores represented their trait-anxiety. The sample was then split into 1) those who responded *slower* to threat-faces than neutral-faces (*vigilant* group) and 2) those who responded *quicker* to threat-faces than neutral-faces (*avoidant* group). In the vigilant group, as state-anxiety increased, colour-naming on threat-faces slowed; the opposite occurred with the avoidant group, in line with the authors' theory.

Their second experiment replicated this finding with 82 children aged 6-11; AB to threat-faces increased with state-anxiety, shown by slowing and speeding up of colour-naming in vigilant and avoidant children, respectively. In neither experiment was trait-anxiety correlated with AB, however use of average state-anxiety scores in experiment one seems an unreliable index for this measure. A specific trait-measure was used in the second, however, finding no correlation. The validity of these findings is debatable as the authors' theory regarding the two processes causing AB would surely only apply to anxious children, however this study looks at children in the general population and applies this theory to them. A better method would have been to compare anxious and control children on absolute AB values. Although the study found AB for threat-faces in anxious children, its design did not allow for any of the three hypotheses to be tested.

Richards et al (2007) compared 50 children, aged 10-11, on the card-version of the MES to investigate whether trait-anxiety was correlated with AB to anxiety-words. Children completed the Stroop prior to completing an anxiety-questionnaire (avoiding the risk of priming), before being divided into high- and low-trait-anxiety groups, based on which side of the median *T*-score theirs fell.

AB for anxiety-words (compared to positive- and neutral-words) was observed in more anxious children; high-trait-anxious children took longer to colour-name anxiety-words than low-trait-anxious children. Furthermore, as trait- *and* state-anxiety increased, so did level of interference in colour-naming anxiety-words.

Despite these findings, a question must be raised regarding the groups' validity. Split at a median score, both groups are likely to contain participants whose scores are close to the median and which are, therefore, very similar in trait-anxiety, yet are categorised differently. It may have been wiser to divide the groups by high and low cut-off scores to ensure more homogeneous group-characteristics. Like Heim-Dreger et al (2006), this study's design made it difficult to conclude which hypothesis fit the results.

Like the previous two studies, Hadwin et al (2009) investigated AB for threat in children with elevated anxiety-levels. Children aged 6-12-years (n=74) completed a single-trial MES involving emotion-faces (angry/happy/neutral) and control-faces (same emotions but features scrambled). Instead of naming colours, participants pressed coloured buttons to match coloured face-outlines. Following the Stroop, trait-anxiety (including subscales regarding social-concern, physiological-anxiety and worry) was measured. As social-concern increased, AB for angry-faces increased (slowed response to match colours). Age had no influence over AB. These results may fit the Integral-Bias Hypothesis, given the similar AB for angry-faces found in a study with socially-anxious adults (Horley et al, 2004).

It remains unclear as to why these children were not asked to colour-name stimuli as seems standard in MES studies. On the one hand, one could argue that this is not a true MES as the target and distracter components tap similar cognitive operations (colour-detection in face-outline, then matching coloured buttons). On the other hand, AB was observed as expected, so this may be another way to measure AB using the ever-evolving MES.

4. GENERAL CONCLUSIONS

This review examined 1) whether problem-specific AB exists for children/adolescents with elevated-anxiety using the MES, 2) the effectiveness of Stroop-modifications in measuring AB and 3) which AB-hypothesis best fits these findings.

4.1. Existence of Problem-Specific Attentional-Bias

In general, evidence investigating problem-specific AB in children/adolescents with anxiety problems, using the MES, is mixed and complex. With regards to clinically-diagnosed GAD, those with the disorder did take longer to colour-name problem-specific words but so did controls; thus specific AB in GAD was not found (Taghavi et al, 2003). Similar results occurred when comparing children/adolescents with (clinically-diagnosed) PTSD and a sexual-abuse history with controls; all participants were slower to colour-name abuse-, developmentally-relevant- and general-threat-words (Freeman & Beck, 2000), indicating no specific PTSD-related AB. PTSD-specific AB was, however, found in children/adolescents who had been traumatised via RTAs/personal violence; an effect not found in matched-controls (Moradi et al, 1999).

Five studies examined children/adolescents with spider-fear; the results are mixed regarding the existence of spider-specific AB. One found spider-specific AB in spider-fearful participants compared to controls (Martin et al, 1992). Two later studies, however, found all children/adolescents took longer to colour-name spider-specific stimuli (Kindt et al, 1997; Kindt et al, 2000). Kindt & Brosschot (1999) found spider-specific AB in spider-fearful participants but only in non-integrated words, while all children were slower to colour-name integrated spider-words. Finally, Morren et al (2003) found all children were *faster* to colour-name spider-words than neutral-words.

Three studies investigated anxiety-related AB in children/adolescents with high versus low state/trait-anxiety. Two studies found anxiety-related AB in more anxious/socially-concerned participants (Richards et al, 2007; Hadwin et al, 2009), while another found anxiety-related AB in more anxious participants, but it resulted in two different response-patterns on the Stroop, depending on whether participants were vigilant to or avoided their anxiety (Heim-Dreger et al, 2006).

4.2. Effectiveness of Emotional Stroop Modifications

Across the reviewed papers, there is much variation regarding the Stroop's mode of delivery. Three studies used the card-format, seven used the single-trial-format and one compared formats. In general, the card-format seems better at detecting AB (all studies using card-formats, compared to three out of four using single-trial-formats, found problem-specific AB). Furthermore, format-comparison found stronger AB in card-formats (Kindt et al, 1997).

The use of integrated and non-integrated stimuli was an interesting variation across studies. Seven studies used integrated stimuli, two used non-integrated and two used both. Findings are mixed across stimuli-types, however comparison of integrated and non-integrated word-stimuli showed problem-specific AB in spider-fearful participants for *non-integrated* words, yet an overall slowing-effect for *integrated* spider-words across all children, implying that integrated threat-stimuli contain something that cause all children difficulties in the Stroop (Kindt & Brosschot, 1999). Morren et al (2003) also showed larger AB effects in spider-fearful participants for integrated spider-words (not non-integrated) in at least part of their sample.

Stimuli-type also varied in terms of its pictorial, facial or linguistic nature. Pictorial-stimuli did not elicit problem-specific AB (Kindt & Brosschot, 1999; Kindt et al, 2000). Facial-stimuli, however, elicited problem-specific AB for threatening-faces in more state-anxious participants (Heim-Dreger et al, 2003)

and angry-faces in more socially-concerned participants (Hadwin et al, 2009). Linguistic-stimuli elicited problem-specific AB in PTSD, spider-fearful and state/trait-anxious children/adolescents.

Most studies used the classic method of colour-naming stimuli; Hadwin et al (2009), however, assessed AB by asking participants to match colour-buttons to stimuli-colour. Despite no methodological explanation, this method elicited the predicted problem-specific AB and may represent another valid Stroop-modification.

4.3. Evidence for Attentional-Bias Hypotheses

Good support is shown for the *Developmental Inhibition Hypothesis*, with two studies finding all children (anxious and control) show AB for threat-stimuli, which reduces with age for controls but increases for fearful-participants (Kindt et al, 1997; Kindt et al, 2000). Partial-evidence for this hypothesis is shown by three other studies which find overall AB effects in all children in relation to threat-stimuli (Kindt & Brosschot, 1999; Freeman & Beck, 2000; Morren et al, 2003). Evidence for the *Inferred-Bias Hypothesis* is also achieved from these studies, as problem-specific AB increases with age in fearful children/adolescents. These studies also support the Developmental Inhibition Hypotheses, however, so perhaps not all hypotheses are mutually-exclusive. Four studies support the *Integral-Bias Hypothesis* as children/adolescents' AB appeared to mirror that of adults with similar problems, leading to the conclusion that AB is integral to emotions, remaining constant over time. However, it must be noted that, to fully test all hypotheses, longitudinal within-subjects data are required.

4.4. General Limitations of Key Studies

Two major flaws cast doubt over some key studies' validity. Firstly, assessment-measures were administered before Stroop-completion in six studies – all spider-

fear studies and a sexual-abuse-related-PTSD study. These participants were likely primed to think about spiders/sexual-abuse prior to the Stroop. Interestingly, of these studies, all but one supported (at least partially) the Developmental Inhibition Hypothesis as all children showed interference in colour-naming threat-words; the potential priming may, however, invalidate these results. Secondly, experimenters observed the Stroop in all studies. Although necessary to ensure correct implementation, this could lead to increased performance-anxiety, potentially diluting any true AB effects given that anxiety to perform may also lead to increased reaction times.

4.5. Future Directions

Based on the current review, future studies should consider the following. Firstly, research is required to investigate problem-specific AB in *other* clinically-diagnosed childhood anxiety problems. Secondly, research is needed to further investigate why AB is not elicited for pictorial-stimuli. Thirdly, it is important to explore whether the card MES and integrated stimuli are truly more difficult for younger anxious participants. Fourthly, support for any AB-hypothesis will only be obtained through longitudinal, within-subjects data. Lastly, all AB researchers should administer the Stroop prior to assessment-measures to avoid problematic priming-biases, increasing the validity of any findings.

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Table 1. Categorised Search-Terms for Initial Search

Search Category	Terms Used for Search
Attentional Bias (AB) - related	(Stimuli or stimulus) (attention* adj1 bias*) (selective* atten* or (attention adj preference*) or change blindness) (paradigm* and (dot probe or flicker or change blindness)) Stroop (cognit* adj1 bias*) (cognit* adj1 interfer*)
Child-related	(child or children or childhood or p?ediatric* or pre?school or primary school* or elementary school* or toddler* or infan* or schoolage* or school-age*)
Psychopathology-related	((psych* or mental*) and (disorder* or illness* or problem*)) (social* anx* or obsessive-compulsive or anorexi* or bulimi* or panic disorder* or panic attack* or agoraphobi* or mutism or separation anxiety or mute or anxiety or anxious or overanx* or encopresis or enuresis or post-traumatic stress or PTSD or PTS or self-harm* or suicid* or trauma or phobi* or attention* deficit* or hyperactiv* or oppositional or defianc* or ODD or conduct disorder* or CD or depressi* or auti* or asperger* or reactive attachment* or attention deficit* or psychosis or psychotic* or sleep problem* or sleep disorder* or insomni* or sleep apnoea or sleep apnea or parasomni* or sleepwalk* or sleeptalk* or sleep-walk* or sleep-talk* or night terror* or narcolep*) Psychopatholog*

CHAPTER TWO: MAJOR RESEARCH PROJECT

Attentional-bias to sleep-related stimuli in children with sleep-problems: An investigation using an induced-change-blindness paradigm

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Prepared in accordance with submission-guidelines for *Behaviour, Research and Therapy (*Appendix 2.1)

LAY SUMMARY of RESEARCH

Childhood sleep-problems are highly-prevalent in this country. It is important to understand what might cause and/or worsen these problems so that treatment can be better-designed to help such children. Previous research has shown that psychological-problems are partially-maintained by changes that occur in our attention when we develop such problems. These changes cause us to pay more attention to things in our environment that fit the particular problem we are experiencing. So, for example, someone scared of wasps will very quickly identify wasps' buzzing, more so than those not scared of wasps. This research study aims to examine whether the same attention-changes are present in children with sleep-problems using a computerised-technique which measures attention to sleep-related (versus non-sleep-related) objects. Poor-sleepers were expected to pay more attention to sleep-related objects, however they, instead, showed patterns which may indicate that they *avoid* things in the environment that remind them of their problems. This study also found that parents' health-beliefs influence how proactive they are in dealing with their children's sleep-problems. This might encourage psychologists working with such children to incorporate parental-work to improve treatment outcomes.

ABSTRACT

Introduction. *High prevalence-rates of childhood sleep-problems have highlighted the importance to understand what causes/maintains them. Attentional-bias (AB), a phenomenon involved in psychological problem-maintenance, involves attention becoming skewed towards problem-specific stimuli. Research into AB in childhood psychological-problems is now growing. Other research shows parental health-beliefs to be influential on their children's health.* ***Method.*** *Using an induced-change-blindness flicker paradigm, the current study investigates AB to sleep-related stimuli in children with sleep-problems aged 6-11, while correlational-analysis examines the relationship between parental health-beliefs and effort made to address children's sleep-problem.* ***Results.*** *All children detected sleep-related changes quicker than neutral changes. Of those completing the sleep-related task, good sleepers were quicker, while of those completing the neutral task, poor sleepers were quicker. The more parents believed they could influence their own health-status, the more effort they made to address their child's health-problem.* ***Discussion.*** *Potential theories for the results are presented in addition to methodological flaws, limitations and general conclusions.*

1. INTRODUCTION

1.1 Childhood Sleep-Problems

Recent evidence suggests high prevalence-rates of poor sleep within child-populations; around 31% of 6-13 year-olds complain of problems initiating/maintaining sleep (Spruyt et al, 2005). Sleep-problems have an adverse impact on a child's affect, behaviour, cognitive-development and family-relationships (Carr et al, 2007). With such concerning prevalence-rates, it seems important to investigate the potential underlying-mechanisms that may be causing – and/or maintaining – children's sleep-problems, to provide focus for effective intervention.

1.2. Cognitive Theory of Psychological-Problem Maintenance

Most people have experienced times when their attention focuses on personally-salient information. For instance, when we are looking to buy a new house, we tend to notice 'for-sale' signs on every street. We are programmed to pay attention to what is important to us. Attention also becomes skewed towards salient information in those with psychological-problems. Most models explaining psychological-problems incorporate some element of introspection/rumination/self-monitoring, which serve to maintain the problem. For example, Beck (1976) proposed that people with depression are quicker to notice the negative details of their environment than the positive, including comments from others (external-environment) or personal thoughts (internal-environment). Similarly, he argued that people with social-phobia interpret the slightest negative cues made by others as criticism, due to their cognitive-processes being primed to monitor for negativity (Beck, Emery and Greenberg, 1985). Thus, Beck's theory suggests that attention is skewed towards congruent, disorder-specific information in individuals with particular psychological-disorders, serving to strengthen the maladaptive beliefs driving the problem.

Wells (2000) provides an alternative theory regarding attention's role in problem-maintenance: the self-regulatory executive function (S-REF) model. This model suggests that other processes (self-regulation, perception and memory) mediate attention towards threatening environmental-stimuli. It proposes a 'cognitive-

attentional syndrome', associated with psychological-problems, which triggers negative-beliefs, increases worry and focuses attention on threat-stimuli. Wells (2000) argues that, usually, other cognitive-processes (self-regulation/memory/perception) counter these maladaptive events, however the cognitive-attentional syndrome prevents this from happening, strengthening maladaptive processes and maintaining the disorder.

It is of great clinical importance to understand what factors maintain specific psychological-disorders; only by understanding symptoms' maintaining processes can we inform clinicians about how to reduce them.

1.3. Attentional-Bias

Both problem-maintenance theories detailed above involve a cognitive-phenomenon known as attentional-bias (AB). AB refers to a person's cognitive predisposition to focus on stimuli that are, for some reason, important to them. This phenomenon is also referred to as 'information-processing bias', 'cognitive-bias' or 'selective-attention', but for the purposes of this study, it will be referred to as AB.

As humans, we have a strong instinct to stay alive. Our pre-programmed response to psychological-threat (i.e. losing a job for those with depression or public-criticism for those with social-phobia) is identical to the response generated if faced with a genuinely life-threatening situation. Therefore, when faced with a situation which taps our psychological weakness, our instinct is to deal with that situation as if it is a truly life-or-death situation. One of the ways in which mammals cope in these circumstances is to focus all resources – including attention – towards the threat-stimuli in the environment. By doing so, we absorb as much information as possible to assess how best to survive. Illustrated like this, AB can be understood as a protective-mechanism. Despite this, however, AB serves to maintain psychological-problems. It is a phenomenon, therefore, that is highly-destructive to the human already in distress.

Much support for the existence of threat-related AB in adults with various psychological-problems has been demonstrated through research over the past

few decades. It has been found to exist in adults with generalized-anxiety disorder (MacLeod et al, 1986; Mathews and MacLeod, 1985), posttraumatic-stress disorder (Bryant and Harvey, 1997), specific-phobias (Lavy et al, 1993), social-phobia (Hope et al, 1990), obsessive-compulsive disorder (Foa et al, 1993) and panic-disorder (McNally et al, 1994; Ehlers et al, 1988).

The threat-related theory sits well when describing AB in the context of anxiety-related disorders. How, then, is it understood in terms of maintaining depression? In his cognitive theory for depression, Beck (1976) outlined how negative events in early life can lead to negatively-skewed world-views. He hypothesised that depression-sufferers tend to over-scrutinise the negative value in everyday-situations (due to pessimistic cognitive-processes), before filtering/distorting environmental-information that is inconsistent with this negative view; this, in turn, maintains the depression-cycle (Beck et al, 1979). Thus, depression-sufferers are likely to selectively-attend to negative environmental-information not because of *threat*, but because it fits their negative-filter, through which all environmental-information must pass. In terms of Wells' (2000) model, any attempts at self-regulation to halt this negative cycle are thwarted by the cognitive-attentional syndrome. Support has been demonstrated for the existence of AB towards negative information in depression-sufferers (Beevers and Miller, 2004; White et al, 1992).

Therefore, by combining Beck's (1976) cognitive theory with Wells' (2000) S-REF model, it seems logical that AB serves to maintain psychological-problems, regardless of their nature, via the survival-instinct in anxiety-related disorders and the negative-filter in depression-related disorders.

1.4. Attentional-Bias in Sleep-Problems

Recent research has shown convincing evidence for the existence of AB towards sleep-related stimuli in poor adult sleepers and has gone some way to establishing its role in the precipitation and maintenance of sleep-disorders (MacMahon et al, 2006; Marchetti et al, 2006; Jones et al, 2005). AB to sleep-related stimuli can be

explained, in terms of its maintenance-role, using a conditioning framework in addition to the threat-hypothesis previously discussed.

Since the 1970s, it has been suggested that bedroom-objects command some control over our sleep-quality in terms of their role in creating associations with sleep-behaviour (Bootzin, 1972). Good-sleepers will, subconsciously, prepare for sleep by noticing objects in their sleeping-environment which they associate with a positive sleep-experience. If people begin to experience poor sleep, however, these previously-adaptive associations become maladaptive and threatening, serving to maintain the sleep-problem (Bootzin, Epstein & Wood, 1991).

In line with this explanation, interventions offered to poor-sleepers often include stimulus-control, a programme which strengthens associations between bedroom-objects and a positive sleeping-experience, while weakening associations between bedroom-objects and wakefulness. Stimulus-control was deemed effective in a recent review on treatment for adult insomniacs (Morin et al, 2006).

There is growing evidence for AB across a range of different psychological-problems. How, though, is this fascinating phenomenon measured? The following section addresses this question with a brief review of the various AB assessment methods.

1.5. Measuring Attentional-Bias

Three paradigms for measuring AB are prominent in the literature: the Stroop, visual-dot-probe (VDP) and induced-change-blindness (ICB) flicker paradigms. This section will focus on these, however the author is aware that others may exist which are less frequently-used.

1.5.1. Stroop Paradigm

The Stroop is possibly the most well-known method of AB-measurement. The classic version (Stroop, 1935) requires the participant to name the colour of ink in which presented words are written, while ignoring the actual word. The theory stands that, as humans, we are programmed to automatically read the word and interpret its meaning. Thus, it takes great effort to inhibit this automatic process

and complete the task. Recently, Stroop-modifications have emerged; the modified emotional-Stroop (MES) is a popular choice for researchers investigating AB in psychological-problems (e.g. Taghavi et al, 2003; Kindt & Brosschot, 1999; Foa et al, 1991). Using the same process as the classic Stroop, the MES utilises emotive, disorder-specific words (e.g. '*heart attack*' in panic-disordered participants, '*blood*' in traumatised participants) to investigate whether they elicit AB (shown by increased response-time) in participants with these disorders compared to neutral words. The Stroop has also been modified to use pictorial-stimuli instead of words (e.g. Hadwin et al, 2009; Heim-Dreger et al, 2006). Pictorial-versions of the Stroop are particularly popular in AB research with children as it overcomes the potentially-confounding issue regarding participants' reading ability-levels.

1.5.2. Visual-Dot-Probe Paradigm

The VDP paradigm emerged in the mid-1980s in response to fears that the Stroop may not be an adequate measuring-device. MacLeod and colleagues (1986) claimed that impaired performance on the Stroop may, in fact, be related to participants' overall-increase in anxiety upon exposure to threatening stimuli, as opposed to being a function of their attention being consumed by the meaning of the word, as originally hypothesised. So, they created the VDP paradigm to compensate for this potential conceptual problem.

The VDP involves two stimuli (words/pictures) being shown one above the other on a computer-screen. Typically, one stimulus is disorder-specific; the other is neutral. They are shown for a short period before they disappear and a small dot briefly appears where one of the stimuli was located. The participant must detect the dot. The response-latency (time taken to respond correctly) indicates the presence of AB; participants with particular psychological problems should notice dots more quickly if they appear where disorder-specific stimulus has just been, as they will have been drawn to this more than the neutral stimulus. The VDP has also been shown to demonstrate AB towards disorder-specific stimuli in several studies (e.g. Mogg & Bradley, 1999; Asmundson & Stein, 1994) and can, like the Stroop, be used with textual- or pictorial-stimuli.

1.5.3. Induced-Change-Blindness Flicker Paradigm

The ICB flicker paradigm was designed by Rensink and colleagues (1997) to measure AB using more realistic visual-scenes. In this task, the participant is presented with an image of a real-world scene. This is presented briefly before being replaced by a mask-screen (blank/filled with XXXXXs). The original-scene is then shown again, but with a single object removed/changed, with the change having occurred out-of-sight. The cycle of original-stimulus (OS) – mask – changed-stimulus (CS) – mask (etc) repeats until participants notice the change and respond using a response-key. The participant is essentially asked to 'spot-the-difference'; time taken to spot this difference indicates how salient the changed-object is to the participant. Use of the flicker paradigm to investigate AB is beginning to increase and has already proved useful and valid with people experiencing psychological-problems (e.g. Jones et al, 2005; Jones et al, 2003).

1.6. Attentional Bias in Children

As soon as we first enter the world, we are bombarded with information. Newborns' visual perception is, however, poor compared to fully-developed adults' and this may be designed as such to allow newborns to only pay attention to objects of most relevance to them – their parents, who intuitively interact with their infant at close range (Slater, 2002). Research indicates that, as children develop, their ability to selectively-attend to relevant environmental information while inhibiting less relevant information improves (see Ridderinkhof & van der Stelt, 2000 for review). It is thought that this normal pattern of attention development is linked to the development of the frontal cortex, which is involved in executive functioning (van der Molen, 2000).

Research investigating AB in children is now growing and evidence exists for AB in childhood psychological-problems including generalised-anxiety disorder (GAD; Taghavi et al, 1999; Vasey et al, 1995), phobias (Kindt & Brosschot, 1999; Kindt et al, 1997) and posttraumatic-stress disorder (PTSD; Dalgleish et al, 2001; Moradi et al, 1999).

1.7. Using the ICB Flicker Paradigm to Investigate Attentional-Bias in Children with Sleep-Problems

In line with cognitive theories (Wells, 2000; Beck, 1976) and the threat-hypothesis described above, AB has helped explain, at least partially, the maintenance of insomnia in adults (MacMahon et al, 2006; Marchetti et al, 2006; Jones et al, 2005). Little work, however, has been done to investigate AB in children with sleep-problems, despite evidence regarding the existence of AB in other childhood psychological-problems. Perhaps this is due to a difficulty in identifying poor-sleeping children; children often rely on parents to report health-problems to professionals. Some children may not discuss sleep-difficulties with parents and so have no opportunity to resolve the problem. Despite potential barriers to conducting research in this area, it is important to determine whether or not AB exists in children with sleep-problems, since it could provide direction for beneficial interventions.

Previous research on AB in poor adult sleepers has successfully utilised the ICB flicker paradigm (Marchetti et al, 2006; Jones et al, 2005). This research revealed that poor-sleepers detect sleep-related changes to a visual-scene quicker than good-sleepers (Marchetti et al, 2006). A strong case has been put forward by Broomfield et al (2005) as to why this particular paradigm is relevant and valid for assessing AB in sleep-related problems. They argue that it allows researchers to use stimuli highly-representative of bedroom environments, given the fact that stimuli used in this paradigm are visual and can include more than one object at a time. This paradigm offers several advantages over others in its use with children: it is quick to do and simple to explain so children of all ages can be studied; it holds ecological-validity as it appeals to children's general enjoyment of 'spot-the-difference' games; it also escapes the need to consider children's reading ability.

1.8. Parental Health-Beliefs

Lack of parental-awareness and children's over-/under-estimation of difficulties are two of the many factors that may influence whether a child's sleep-problem is addressed. Another factor is parental health locus-of-control (HLoC). A growing area of research supports the theory that parents who possess high 'internality' in

terms of HLoC will address their child's health-needs effectively and proactively (e.g. Lencova et al, 2008; Chase et al, 2004). Thus, if they believe *they* hold most influence over their *own* health-status (i.e. attribute it to internal factors), they are more likely to monitor their child's health and address any concerns. This is compared to those who attribute their health-status to powerful others (e.g. medical staff) or chance. Some research suggests that parental-internality is a protective-factor for a child's future health (Lencova et al, 2008; Chase et al, 2004). Further evidence supporting the link between high parental-internality and increased pro-activity regarding children's health-needs may help direct intervention towards including parents in their children's psychological-care to alter parents' unhelpful attributions.

2. AIMS and HYPOTHESES

2.1. Aims

The current study investigates the existence of AB towards sleep-related stimuli in children with self- and parent-reported sleep-problems. Furthermore, it examines whether parents' own health-beliefs have an impact on the extent to which they have addressed their child's sleep-problem.

2.2. Hypotheses

Hypothesis 1: Children with a sleep-problem will detect a change made to sleep-related objects in a computerised ICB flicker task quicker than children with no sleep-problem.

Hypothesis 2: There will be no difference in time taken to detect changes made to neutral objects in a computerised ICB flicker task between children with a sleep-problem and children with no sleep-problem.

Secondary-Hypothesis: Parents of children with sleep-problems who exhibit higher internality of HLoC will have made more efforts to address their child's sleep-problem.

A further research-question will examine the relationship of the condition (sleep flicker vs. neutral flicker) within groups (good-sleepers and poor-sleepers) and whether there is a main-effect of flicker-type.

3. METHOD

3.1. Participants

Informed, written parental-consent was obtained for 168 children aged 6-11 years 0 months (78 males, 90 females) and their participating parent. Outliers' removal, based on extreme (very high/low) reaction times (RTs) on the flicker task left a final sample of 154 children (72 males, 82 females). The sample represents a nonclinical-population; participants were recruited from Glasgow Science Centre (GSC), a community-based, interactive science museum situated in Glasgow city-centre.

3.2. Inclusion/Exclusion Criteria

Children who were outwith the specified age-range (6-11 years 0 months), did not speak English, had a history of epilepsy, brain-injury, depression or any other psychiatric-illness, had a learning-disability, had a chronic physical-condition, had (or have had queried) Attention-Deficit-Hyperactivity Disorder, conduct-problems or an autistic-spectrum-disorder (ASD), were on medications, were afraid of the dark, or did not spend every night in the same house were excluded from the study. Presence of these factors can affect children's attention/ability to perform the ICB flicker task. Their removal improves the likelihood of any true effects being discovered. Age-range was decided upon based on the study's focus being on *children's* sleep; by age 12, children may experience sleep-patterns more akin to adolescence. As phenomena such as Delayed-Sleep-Phase Syndrome occur more often in adolescence, this study's age-range was restricted to reduce the possibility of this interfering with results. Children meeting the above criteria were excluded from analysis. A total of 193 children and parents participated. Aside from the RT outliers (n=14), participants were excluded due to: stating an incorrect item had changed (n=16), computer-crash (n=2), depression-score above clinical-level (n=1), presence of medical-condition affecting sleep (n=1), ASD (n=1), forgetting to press response-key (n=1), failure

to complete measures (n=1), consent retracted (n=1) and child spending half the week at each parent's house (n=1).

3.3. Design

A totally between-subjects 2 (sleep quality: good vs. poor) x 2 (nature of ICB flicker task change-to-be-detected: sleep vs. neutral) factorial-design was employed. The dependent-variable for the main hypotheses was change-detection-latency in the ICB flicker task. Participants were allocated to the good sleepers' (GS) or poor sleepers' (PS) group *after* they completed the flicker task. This retrospective-allocation design avoided asking children about their sleep at the start of the study, as this would almost certainly have primed them to attend to sleep-related objects in the task.

3.4. Child-Measures

3.4.1. Children's Depression Inventory-Short Version (CDI-S; Kovacs, 1985)

The CDI is a widely-used tool to screen and identify symptoms of major-depressive/dysthymic-disorders. It consists of 27 items and is intended for use with school-aged children aged 7-17 years. Three possible responses are attached to each item. Internal-consistency reliability (.59-.88) and test-retest reliability (.38-.87) have been demonstrated for the CDI; its concurrent-validity is also moderately-high (Myers & Winters, 2002). Despite the wide-ranging reliability, it was deemed appropriate to use this tool for this study as it is commonly used in child and adolescent mental-health services to assess/screen for depressive-symptomatology. The short-version (CDI-S; Appendix 2.2) has provided comparable results to the CDI and high internal-consistency has been demonstrated (Kovacs, 1992). In non-clinical samples, test-retest reliability-coefficients of the CDI-S range from .74 - .77 (Smucker et al, 1986). A cut-off score of 8 or above was used to determine the clinical-level of depression (Kovacs, 1985).

3.5. Parental-Measures

3.5.1. Parental-Demographics Questionnaire

This measure included seven items pertaining to gender, age, marital-status, number of children at home, annual household-income, disability-status and ethnicity (see Appendix 2.3).

3.5.2. Extent of Management of Child's Sleep-Problem Questionnaire (EMCS-PQ)

Parents of poor-sleepers were asked eight questions to identify the extent to which they had addressed their child's sleep-problem (see Appendix 2.4). Items were assigned a score of 1 or 0; a minimum-score of 0 indicated total lack of addressing the problem while a maximum-score of 8 indicated high-involvement in addressing the problem. This questionnaire was designed for this study, so it has no published ratings of reliability/validity attached to it as yet. Assessment of internal-reliability was, however, conducted; the results of which are reported later.

3.5.3. Multidimensional Health Locus-of-Control (MHLC; Wallston et al, 1978)

It was predicted that parents who believed their health to be maintained by personal preventative-measures and maintaining a healthy lifestyle would be more proactive in helping a child with their sleep-problem. To measure this belief, Form B from the MHLC scales (Appendix 2.5) was used to measure parental-internality of Health Locus-of-Control (HLoC). This form consists of 18 items and assesses attributions regarding influences on health-status. Attributions fall into 3 categories: internal, external and chance. An example of an internal item is *"My physical wellbeing depends on how well I take care of myself"*. Responses range from 'strongly-disagree' (1 point) to 'strongly-agree' (6 points). Six items assess internality; internality-scores, therefore, range from 6-36. MHLC scales are widely-used and Cronbach-alphas in the range of .60-.75 and test-retest coefficients ranging from .60-.70 reflect moderate-reliability (Wallston, 2005). Construct- and external-validity have also been demonstrated (Rock et al, 1987). Form B was administered in the intended, standardised way in this study and data was extracted from the internality-subscale. Assessment of internal-reliability of the internality-subscale was conducted, the results of which are reported later

3.6. Induced-Change-Blindness (ICB) Flicker Task

3.6.1. Pilot-Study to Identify Stimuli

A pilot-study determined the sleep-related and neutral stimuli for the study. Ten children aged 6-11 years 0 months personally-known to the researcher were asked to name three objects that made them think of going to sleep at night-time. From their responses, all objects which were of appropriate size to be included in the flicker task described below (n=9) were photographed against the same-colour background. Eight other objects, matched visually for size and considered to be non-sleep related, or neutral, were also photographed against the same background as the sleep objects above. Twelve different children from a local gymnastics class (aged 6-11 years 0 months) then categorised these 17 photos as 'sleep'/'not sleep'/'not sure'. Seven sleep-experts from the Glasgow Sleep Centre then repeated this procedure with the same 17 photos. The top-rated photos for 'sleep' and 'not sleep' were used for the sleep-related and neutral stimuli. Those most endorsed by both groups were chosen as the changed-stimulus for each level.

3.6.2. ICB Flicker Task Procedure

The computer-software system SuperLab (version-4.5; Cedrus Corporation, San Pedro, California) was used via a Toshiba laptop (Satellite Pro L450-13M) to execute the flicker paradigm. A photograph of an array of objects was displayed on a computer-screen approximately 60cm from the participant. Photographs were presented in full-colour and were taken in natural-daylight. The left-hand-side of the photo contained sleep-related objects (pillow, alarm clock, pyjamas, toothbrush, toothpaste, slippers, lamp), while the right-hand-side contained neutral objects (photo frame, juice bottle, scissors, phone, mug, lightbulb, ketchup). This complete photo (original stimulus; OS) was displayed for 250ms. Immediately after the OS, a mask-screen was displayed for 80ms. A new photo (changed stimulus; CS) was displayed immediately after the mask-screen. The CS was identical to the OS apart from one object, which had been removed; in the sleep-related level, the lamp was removed and in the neutral level, the ketchup was removed (see Figure 1). The CS was displayed for 250ms and was then followed immediately by a mask-screen again for 80ms. This flicker-cycle (OS-mask-CS-mask; Figure 2) was repeated until the child indicated change-detection

by pressing a response-key, before verbally-clarifying the change. This is the standard flicker paradigm approach, as explained by the architects of the original experiment (Rensink et al, 1997).

Original Stimulus (OS)

Changed Stimulus, Sleep-related Condition (CS/S): lamp removed

Changed Stimulus, Neutral Condition (CS/N): ketchup removed

Figure 1: Black and white versions of full-colour photos used in ICB flicker task

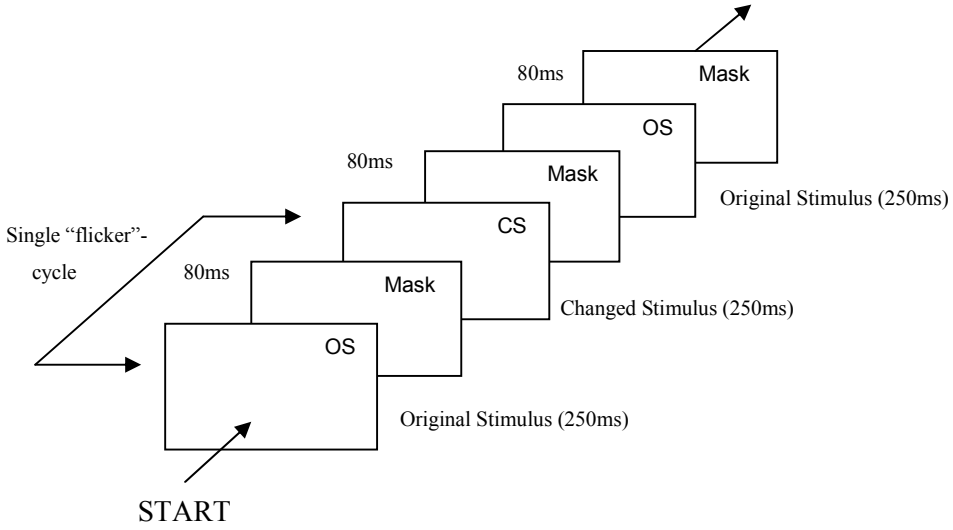

Figure 2: Flicker paradigm illustrating a single "flicker"-cycle

Change-detection-latency data will be reported as raw RT. Some authors (i.e. Jones et al, 2005; Rensink et al, 1997) have measured similar data as *number of flicker-cycles* to detect change, however there is ambiguity as to what constitutes one flicker-cycle. As this is a time-task, the data will be measured as such, although reference to number of flicker-cycles is also made at some points. Other authors measuring AB using this paradigm have also opted to report results in terms of RT (Sheth et al, 2011; Fletcher-Watson et al, 2009).

3.7. Criteria for Good- and Poor-Sleepers' Groups

Following flicker task-completion, children and parents were asked the following questions, respectively: *"Do you think you have problems sleeping?"* and *"Do you think your child has a sleep-problem?"* These questions hold high validity in determining presence of a sleep-problem, given sleep's subjective nature. Two 'yes' responses signified eligibility for inclusion in the PSs group, while two 'no' responses signified eligibility for inclusion in the GSs group. It was decided that, should a mismatch of responses occur, participant data would be excluded. This did not, however, occur.

3.8. Research Procedures

The researcher was located in a prominent position within GSC. Passers-by were invited into the study by the researcher. Parents and children were given an information-sheet (Appendix 2.6). Children unable to read this had the study explained to them verbally. Parents provided written-consent for their child to participate, after the child had provided verbal consent (see Appendix 2.7). Children completed the CDI-S to exclude those with clinical-levels of depression. Children showing difficulty understanding the questionnaire had it verbally-administered. Meanwhile, parents completed a checklist to ensure their child met inclusion-criteria (Appendix 2.8) and the demographics-questionnaire. All children meeting inclusion-criteria picked a letter ('S'/'N') from an envelope; this determined which level of the ICB flicker task (sleep/neutral) they would complete and ensured randomised-allocation. Equal numbers of the two letters ensured half the sample completed the sleep-level and half completed the neutral-level. Children were invited to complete the computer task behind large screens, to minimise distraction. Verbal-instructions were provided by the researcher

Children were asked to press a response-key when they identified the changing-object. Following identification, children named the changing-object to ensure accurate response. Inaccurate responses were not included in final analyses.

Following flicker task-completion, children were asked the relevant questions to ascertain to which group – GS or PS – they belonged. The sleep-aspect of the study was explained at this point. Lastly, parents of poor-sleepers answered the EMCS-PQ before completing Form B from the MHLC scales.

3.9. Justification of Sample-size

A power-analysis calculation was conducted using G*Power Version 3.0.10 to reveal the required sample-size. Based on effect-sizes found by Jones et al (2005) comparing AB in adult-insomniacs and good-sleepers using the ICB flicker paradigm, the sample required here was 33 participants per group (GS and PS). This was calculated using an effect-size of .91 (from Jones et al, 2005), an alpha-(error probability) value of .05 and a power-value of .95. A two-tailed independent samples t-test was selected for input to account for the unknown direction of the experiment's result. Based on the 31% prevalence rate of sleep problems amongst children aged 6-13 years (Spruyt et al, 2005), it was decided that a minimum of 150 children should be recruited for participation to ensure adequate numbers of poor and good sleepers per group. This larger number was required due to group allocation having to occur *after* completion of the computer task to avoid priming issues and to allow a margin for potential attrition. A total of 193 children and their parents participated; this was more than required as a minimum, however the experiment proved popular at GSC and the increased sample size allowed for a larger margin of potential attrition.

4. RESULTS

4.1. Participant-Characteristics

Participants' age-range was 6-11 years 0 months; the sample consisted of 72 males, 82 females. Within the GSs, the males to females ratio was 49:45, within the PSs it was 23:37, within those completing the sleep-related flicker it was 38:40 and within those completing the neutral flicker it was 34:42. Pearson's chi-square analysis revealed that gender did not differ across GSs and PSs [χ^2 (1, 154)

= 2.80, p = .09]. In general, most parents' ages fell between 36-45 years, most were married/cohabiting/in civil-partnerships, most had two children at home, most were White-British and most had no disability. Annual household-income centred around two categories: £36 000-£40 999 and over £100 000, however this demographic was fairly evenly-spread across participants. Demographic-characteristics did not vary greatly according to group/condition. Demographic-variances across groups and conditions are outlined in Table 1.

INSERT TABLE 1 ABOUT HERE

4.2. Reaction-Time Data

Several approaches strengthened the data's validity. Outliers representing extreme RTs on the flicker task were removed (n=14) to create a less skewed-distribution (see Figure 3). Data were then visually-inspected to assess normality (see Figure 4). Data were still not entirely normally-distributed, so skewness-(1.19, SE .20) and Kurtosis-values (1.47, SE .39) were examined to ensure they fell between -1.96 and 1.96, critical-values for skewness and Kurtosis. Data fell within this range, so an analysis of variance (ANOVA) was then used to investigate RT differences between GSs and PSs in sleep and neutral conditions. ANOVA is considered a robust test, even when normality-assumptions are violated (Schmider et al, 2010).

INSERT FIGURES 3 & 4 ABOUT HERE

Hypothesis 1*: Children with a sleep-problem will detect a change made to sleep-related objects in a computerised ICB flicker task quicker than children with no sleep-problem.*

Hypothesis 2: *There will be no difference in time taken to detect changes made to neutral objects in a computerised ICB flicker task between children with a sleep-problem and children with no sleep-problem.*

Research-Question: *What is the relationship of the condition (sleep vs. neutral flicker) within groups (GSs and PSs)? In other words, is there a main-effect of flicker-type?*

Given the totally between-subjects 2x2 factorial-design, an ANOVA was conducted to address the hypotheses and research-question. A significant model was produced, showing a significant omnibus-effect within the RTs of GSs compared to PSs completing the sleep-related and neutral tasks, $F(3, 150) = 12.48$, $p = < .001$ (see Appendix 2.9). Mean RTs across groups and conditions are illustrated in Figure 5:

INSERT FIGURE 5 ABOUT HERE

Post-hoc Bonferroni-tests revealed where the significant RT differences lay (Appendix 2.10). For clarity, where RT is converted into flicker-cycles, one flicker-cycle here comprises a changed-stimulus, a mask, an original-stimulus and a mask (CS-mask-OS-mask).

A significant difference in RT existed between GSs completing the neutral task and GSs completing the sleep-related task ($p < .01$). The mean difference was 6161.06 milliseconds (6.16 seconds/9 flicker-cycles) with those completing the sleep-related task reacting quicker. In the wider population of similar participants, it is highly likely that this difference will lie between 3343.72 and 8978.41 milliseconds (3.34 and 8.98 seconds/between 5 and 13 flicker-cycles).
A significant difference in RT existed between GSs completing the neutral task and PSs completing the neutral task ($p = < .01$). The mean difference was 4005.04 milliseconds (4.00 seconds/6 flicker-cycles) with the PS group reacting quicker. In the wider population of similar participants, it is highly likely that this

difference will lie between 780.01 and 7230.07 milliseconds (.78 and 7.23 seconds/between 1 and 10 flicker-cycles).

A significant difference in RT existed between GSs completing the neutral task and PSs completing the sleep-related task (p = < 0.01). The mean difference was 4927.95 milliseconds (4.93 seconds/7 flicker-cycles) with the PSs completing the sleep-related task reacting quicker than the GSs completing the neutral task. In the wider population of similar participants, it is highly likely that this difference will lie between 1767.92 and 8087.99 milliseconds (1.77 and 8.09 seconds/or between 2 and 12 flicker-cycles). Table 2 summarises these results.

INSERT TABLE 2 ABOUT HERE

With reference to *Hypothesis 1*, no significant difference was found between mean RTs of GSs and PSs completing the sleep-related task. With reference to *Hypothesis 2*, a significant difference was found between the mean RT of GSs and PSs completing the neutral task in that PSs reacted quicker to the change. These results were unexpected; PSs were expected to be quicker than GSs on sleep-related trials, while no difference was predicted between RTs of both groups on neutral trials. Potential explanations for these results are offered in the Discussion.

No main-effect of group-type was found ($F(1, 150) = 2.69$, $p = .103$), indicating that GSs and PSs performed similarly in general. This is likely due to the low power-level available to detect significant differences (observed power = .37). There was, however, a main-effect of flicker-type ($F(1, 150) = 17.60$, $p < .001$), indicating that those completing the *sleep-related* task (mean = 8275.70, SE = 590.95) performed *quicker* than those completing the neutral task (mean = 11817.69, SE = 603.10), regardless of group-type. Cohen's *d* indicated that effect-size for flicker-type was large ($d = .653$). A significant group x flicker interaction ($F(1, 150) = 9.62$, $p < .01$) was also found; participants completing the *sleep-related* task were faster if they were a GS, however participants completing

the *neutral* task were quicker if they were a PS. The interaction effect-size was large (partial $\eta^2 = .6$; see Cohen, 1988 for conversion of η^2 to sizes of effects). Table 3 summarises the main-effects and interaction.

INSERT TABLE 3 ABOUT HERE

With reference to the *Research-Question*, a significant main-effect was found for flicker-type (sleep-related vs. neutral), suggesting those completing the sleep-related task noticed changes made to the scene more quickly than those completing the neutral task, regardless of their group-affiliation. This finding, along with the observed interaction-effect, is unexpected given Hypotheses 1 and 2. Potential reasons for these results are offered in the Discussion.

4.3. Health Locus-of-Control (HLoC) and Management of Child's Sleep-Problem Data

Secondary Hypothesis: *Parents of children with a sleep-problem who exhibit higher internality of HLoC will have made more efforts to address their child's sleep-problem.*

Spearman's-rho correlation-analysis revealed a small, but significant, positive-association between parental-internality of HLoC and the extent to which they had addressed their child's sleep-problem, $r(58) = .28$, $p < .05$ (Appendix 2.11). Two-tailed correlation-analysis was selected as the direction was unknown prior to testing. This correlation is illustrated in scatterplot-format in Figure 6.

INSERT FIGURE 6 ABOUT HERE

With reference to the *Secondary-Hypothesis*, this correlation indicates that, among parents of PSs, as internality-scores increase, so does effort to address their child's sleep-problem. Thus, the more the parent believes they can influence

their own health-status, the more effort they are likely to make to address their child's health-problem. The small size of this effect indicates that, although this is a contributing factor, other contributory factors are also influencing variance.

4.4. Internal-Reliability of Scales

Internal-reliability assessments were conducted for the internality-subscale of the MHLC and the EMCS-PQ. Cronbach's-alpha was .690 for the internality-subscale and .598 for the EMCS-PQ, indicating that although neither has high internal-consistency, the internality-subscale is approaching satisfactory internal-consistency (see Gliem & Gliem, 2003). Analysis conducted to assess internal-reliability if items were removed showed different things for each scale. For the internality-scale, each item was of similar importance in terms of creating a reliable scale; alpha-range when items were deleted was .62-.69. For the EMCS-PQ, however, analysis showed that three items (measuring whether parents had asked their child about the cause/nature/duration of their sleep-problem) were very important to overall reliability and, if removed, would lead to a scale that had very poor internal-consistency; alpha-range when items were deleted was .40-.61. Thus, the other five items in the EMCS-PQ appeared to be less reliable.

5. DISCUSSION

The main findings were as follows. Mean RTs between GSs and PSs did not differ significantly on the sleep-related task; Hypothesis 1 predicted that PSs would perform faster than GSs in this condition. Furthermore, the main-effect for flicker-type indicated that *all* participants noticed sleep-related changes quicker than neutral changes. Several explanations exist for these findings. Overall speedier-identification of sleep-related changes may be due to the sleep-related objects' advantageous screen-position. In all trials, they were positioned on the left-hand-side, while neutral objects were positioned on the right. English-speaking children would, most likely, scan the screen from left-to-right, coming across the sleep-related change more quickly. Additionally, the sleep-related CS (lamp) was larger than its neutral counterpart (ketchup bottle), thus its removal may have been more obvious. The sleep-related objects used in this study may also have been more familiar than the neutral objects. No familiarity-assessment was conducted to

investigate this possibility. Future studies should, therefore, aim to: evenly-split CSs' position across trials, better match their sizes and assess object-familiarity to allow truer comparison of stimuli-types. A further measure that could be taken to increase similar future studies' validity would be to increase matching for colours across objects in the experimental array; this would further enhance the likelihood of participants' attention being influenced by objects' *salience* as opposed to their physical characteristics.

These results might, however, have an alternative explanation. It could be that there is something fundamentally-salient about sleep-related objects to children in this age-group, given that all children detected sleep-related changes quicker than neutral changes. Further research is needed to investigate this theory.

On the neutral task, PSs performed quicker than GSs; Hypothesis 2 predicted, however, that both groups would perform similarly in this condition. Furthermore, the group x flicker-type interaction found that (opposite to what was expected) the GSs were faster on the sleep task than they were on the neutral task, while the PSs were faster on the neutral task than they were on the sleep task. Group-categorization methods may have contributed to PSs' enhanced speed in detecting the neutral change: sleep-quality was categorised based on asking participants and parents if they believed the child had a sleep-problem. Thus, perhaps the subjective nature of this assessment contributed to less distinct groups, making any effect harder to detect. Future studies should include an additional objective sleep assessment measure to compensate for this possibility.

This finding could be interpreted differently, however. Up until recently, it had been assumed that AB was characterised by vigilance towards threatening stimuli. Research is now emerging alluding to the fact that AB may be characterised as *either* attention shifts towards threat-related information (vigilance) *or* attention shifts away from threat-related information (following its detection) to avoid distress (see Gamble and Rapee, 2009; Heim-Dreger, 2006). The results of this study may fit this avoidance theory; perhaps PSs detected the sleep objects, but then avoided them by shifting attention to the neutral objects (to

prevent distress) leading to overall faster detection of neutral changes. Future research should further investigate these different coping mechanisms to contribute to the evidence-base for clinicians working with anxious children to improve our understanding of how anxiety (and other psychological problems) is being maintained. An interesting method of assessment may be to track participants' eye-movements to further monitor vigilant and avoidant coping strategies when faced with threatening stimuli.

Within the PSs group, a small (positive) correlation was found between parental-internality of HLoC and the extent to which they had addressed their child's sleep-problem, indicating that (as predicted), as internality increased, so did efforts made to address the problem. Some research exists to suggest that parental beliefs, attitudes and behaviours can actually influence children's anxiety-related AB (see Hadwin et al, 2005 for review). Given that this 'inherited' AB could predispose children to psychological disorders in later life, future research should further investigate the influence of other parental factors on children's AB.

The method of sleep-quality categorisation was selected following a discussion with sleep-researchers; given sleep-quality's subjective nature, this method was deemed more ecologically-valid in gathering instinctive data than using standardised (less subjective) self-report measures that are open to misinterpretation. As already suggested, future research should use both methods to assess sleep-quality and investigate whether they are correlated. A methodological strength here was that the flicker task was completed prior to sleep-quality assessment, avoiding a priming-effect towards sleep-related stimuli and allowing researcher-blindness to participants' group during the attention task.

Some general methodological flaws must be addressed. First, the sample was one of convenience and not representative of the Greater Glasgow area. Recruitment took place at a reasonably-expensive museum which (generally) attracted families from middle-class, educated backgrounds. Second, children may have acted upon a social-desirability-effect at various stages of the study. Most parents watched them complete the CDI; parents often appeared upset/disappointed when their

child endorsed certain items, thus some children who should have been excluded due to high depression-scores may have been erroneously included. Future studies should attempt to have children complete such measures alone. Social-desirability (and/or performance-anxiety) may have been induced during the flicker task, too, as the experimenter (and often parent) observed each trial. This may have led to incorrect/slowed-responses. Third, three items on the EMCS-PQ were dominant in providing internal-validity; this imbalance may have reduced the power of the correlation between this measure and parental-internality of HLoC. Future studies should amend this scale to achieve more balance across items' influence on the scale's reliability. Fourth, the power for detecting any main-effect of group was low. Future studies could improve on this by expanding the sample-size or using more sensitive sleep-quality measures to ensure groups truly differ on this measurement. Lastly, participants' individual ages were not recorded; something which would have been interesting to add to analysis and which future studies should aim to investigate. It would have been useful to look at participants' ages to investigate whether any age-related changes in AB occurred, given the normal developmental patterns of attention whereby, as age increases, relevant information is more readily focussed on, while irrelevant information is inhibited. For example, some researchers have found that, as children's age increases, AB effect also increases towards threat-related stimuli (Kindt & Brosschot, 1999; Freeman & Beck, 2000; Morren et al, 2003).

6. CONCLUSIONS

This study investigated the existence of sleep-related AB in children with sleep-problems and examined the relationship between parental health-beliefs and effort made to address their child's sleep-problem.

Only one predicted hypothesis was supported; as parental-internality of HLoC increased, so did their effort to address their child's sleep-problem. This has wider implications for clinical practice in that parental health-beliefs influence the support children will receive. Thus, perhaps all clinicians working with children with health-problems should target parental health-beliefs, as well as working directly with the child, to improve clinical-outcome.

The ICB flicker paradigm seems valid for use with children, given participants' ability to complete it and apparent enjoyment of the task. However, an alternative approach to interpreting AB using this paradigm may be required. Despite some results not supporting the hypotheses, they do support Heim-Dreger et al's (2006) claim that AB can be exhibited as slower *or* faster RTs, depending on participant coping-styles. PSs' speedier response to neutral stimuli here may indicate their avoidance of threat- (sleep-related) stimuli. This could imply that avoidance - as well as hypervigilance - is a significant maintaining-factor in childhood psychological-problems. Given the high prevalence-rates of childhood sleep-problems, this finding might encourage clinicians working with such clients to include graded-exposure in therapeutic-interventions to target this avoidance.

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Table 1. Participant Demographic-Characteristics

Demographic Characteristic Breakdown	General Sample	Good Sleepers	Poor Sleepers	Sleep Flicker Condition	Neutral Flicker Condition
Child Gender (M:F Ratio)	*72:82*	*49:45*	*23:37*	*38:40*	*34:42*
Parental Age Range	*26-30 (3.9%) 31-35 (12.5%) 36-40 (35.5%) 41-45(33.6%) 46-50 (11.8%) 51-55 (2.6%; n=4)*	*26-30 (4.3%; n=4) 31-35 (14.1%) 36-40 (34.8%) 41-45(32.6%) 46-50 (14.1%)*	*26-30 (3.3%; n=2) 31-35 (10%) 36-40 (36.7%) 41-45(35%) 46-50 (8.3%) 51-55 (6.7%; n=4)*	*26-30 (3.8%; n=3) 31-35 (14.1%) 36-40 (35.9%) 41-45(32.1%) 46-50 (11.5%) 51-55 (2.6%; n=2)*	*26-30 (4.1%; n=3) 31-35 (10.8%) 36-40 (35.1%) 41-45(35.1%) 46-50 (12.2%) 51-55 (2.7%; n=2)*
Parental Marital Status	*Single (5.9%) Married/ cohabiting/civil partnership (84.2%) Divorced/ separated (9.9%)*	*Single (5.4%; n=5) Married/ cohabiting/civil partnership (82.6%) Divorced/ separated (12%)*	*Single (6.7%; n=4) Married/ cohabiting/civil partnership (86.7%) Divorced/separated (6.7%; n=4)*	*Single (5.1%; n=4) Married/ cohabiting/civil partnership (87.2%) Divorced/ separated (7.7%)*	*Single (6.8%; n=5) Married/ cohabiting/civil partnership (81.1%) Divorced/ separated (12.2%)*
Number of Children at Home	*0 (3.3%) 1 (13.8%) 2 (57.2%) 3 (19.7%) 4 (5.3%) 5 and over (0.7%; n=1)*	*0 (5.4%) 1 (18.5%) 2 (53.3%) 3 (17.4%) 4 (4.3%; n=4) 5 and over (1.1%; n=1)*	*1 (6.7%) 2 (63.3%) 3 (23.3%) 4 (6.7%)*	*0 (2.6%; n=2) 1 (11.5%) 2 (59.0%) 3 (23.1%) 4 (3.8%; n=3)*	*0 (4.1%; n=3) 1 (16.2%) 2 (55.4%) 3 (16.2%) 4 (6.8%) 5 and over (1.4%; n=1)*
Parental Household Income	*Cat. 1 (14.7%) Cat. 2 (25.5%) Cat. 3 (28.1%) Cat. 4 (10.8%) Cat. 5 (10%) Cat. 6 (10.7%)*	*Cat. 1 (16.9%) Cat. 2 (28.1%) Cat. 3 (26.9%) Cat. 4 (7.8%) Cat. 5 (11.2%) Cat. 6 (9%)*	*Cat. 1 (11.6%) Cat. 2 (21.6%) Cat. 3 (30%) Cat. 4 (15%) Cat. 5 (8.3%) Cat. 6 (13.3%)*	*Cat. 1 (11.5%) Cat. 2 (23%) Cat. 3 (32%) Cat. 4 (11.6%) Cat. 5 (9%) Cat. 6 (12.8%)*	*Cat. 1 (18.2%) Cat. 2 (28.1%) Cat. 3 (23.9%) Cat. 4 (9.8%) Cat. 5 (11.2%) Cat. 6 (8.5%)*
Parental Disability Status	*No disability (98.0%) Wheelchair user/mobility problems (0.7%; n=1) Other (1.3%; n=2)*	*No disability (98.9%) Other (1.1%; n=1)*	*No disability (96.7%) Wheelchair user/mobility problems (1.7%; n=1) Other (1.7%; n=1)*	*No disability (96.2%) Wheelchair user/mobility problems (1.3%; n=1) Other (2.6%; n=2)*	*No disability (100%)*
Parental Ethnicity Status	*White British (94.1%) White Irish (1.3%; n=2) White – Other (1.3%; n=2) Mixed – Other (0.7%; n=1) Asian/Asian British – Indian (0.7%; n=1) Asian/Asian British – Pakistani (2.0%; n=3)*	*White British (95.7%) White Irish (1.1%; n=1) White – Other (2.2%; n=2) Asian/Asian British – Pakistani (1.1%; n=1)*	*White British (91.7%) White Irish (1.7%; n=1) Mixed – Other (1.7%; n=1) Asian/Asian British – Indian (1.7%; n=1) Asian/Asian British – Pakistani (3.3%; n=2)*	*White British (93.6%) White Irish (1.3%; n=1) Mixed – Other (1.3%; n=1) Asian/Asian British – Pakistani (3.8%; n=3)*	*White British (94.6%) White Irish (1.4%; n=1) White – Other (2.7%; n=2) Asian/Asian British – Indian (1.4%; n=1)*

INCOME KEY:
Category 1: < £10000 to £25 999 *Category 3: £46 000 to £65 999* *Category 5: £86 000 to £100 000*
Category 2: £26 000 to £45 999 *Category 4: £66 000 to £85 999* *Category 6: £100 000+*

Table 2. Summary of Significant Bonferroni-Comparisons of Mean Reaction-Times across Groups

GS/Neutral Flicker RT > GS/Sleep Flicker RT > PS/Neutral Flicker RT > PS/Sleep Flicker RT
All other comparisons of RT = not significant

Table 3: Main-Effects and Interaction

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Observed Power[b]
Corrected Model	9.767E8	3	3.256E8	12.477	.000	.200	1.000
Intercept	1.478E10	1	1.478E10	566.300	.000	.791	1.000
FlickerType	4.592E8	1	4.592E8	17.597	.000	.105	.986
SleeperType	7.030E7	1	7.030E7	2.694	.103	.018	.371
FlickerType * SleeperType	2.510E8	1	2.510E8	9.621	.002	.060	.869
Error	3.914E9	150	2.609E7				
Total	2.089E10	154					
Corrected Total	4.891E9	153					

Figure 3: Boxplots Illustrating Outliers

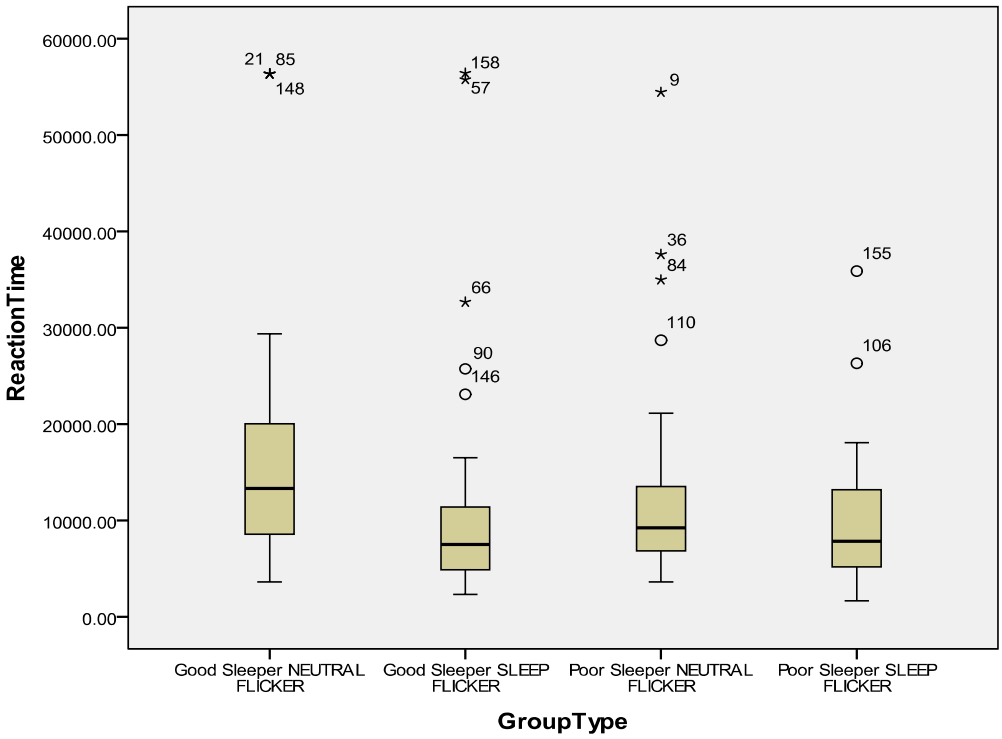


Figure 4: Normality -Curve for RT Data Across Sample (n=154)

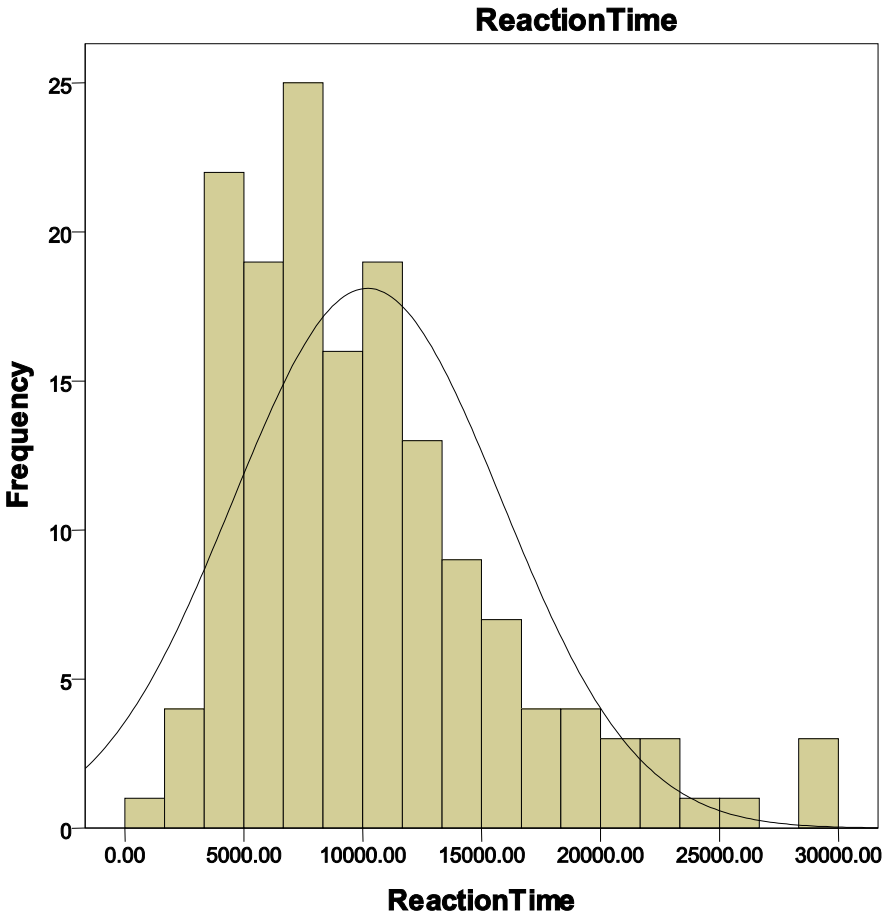


Figure 5: Mean Reaction-Times Across Groups and Conditions

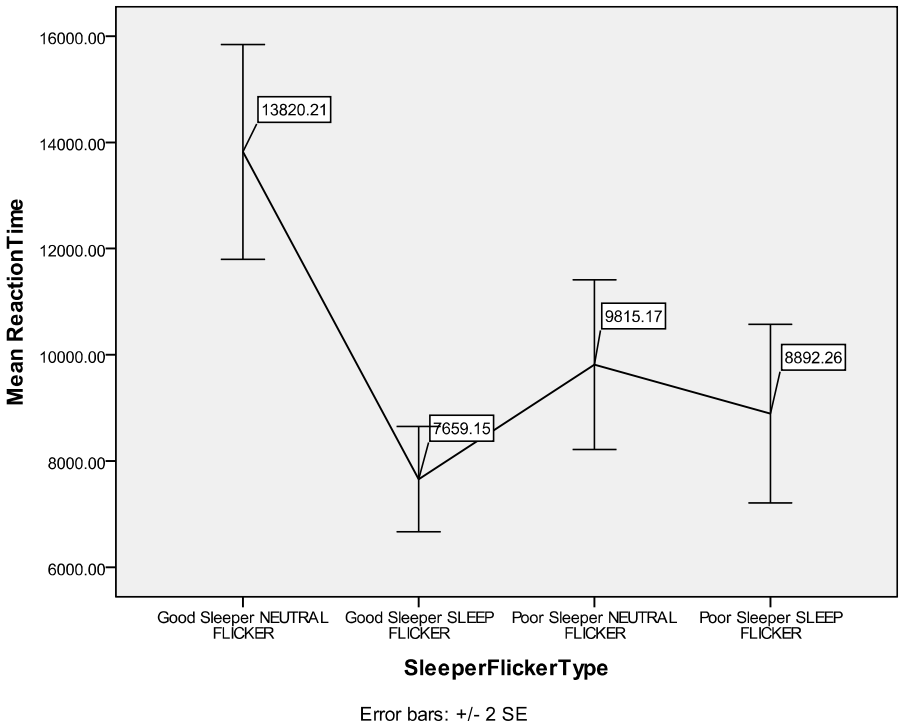
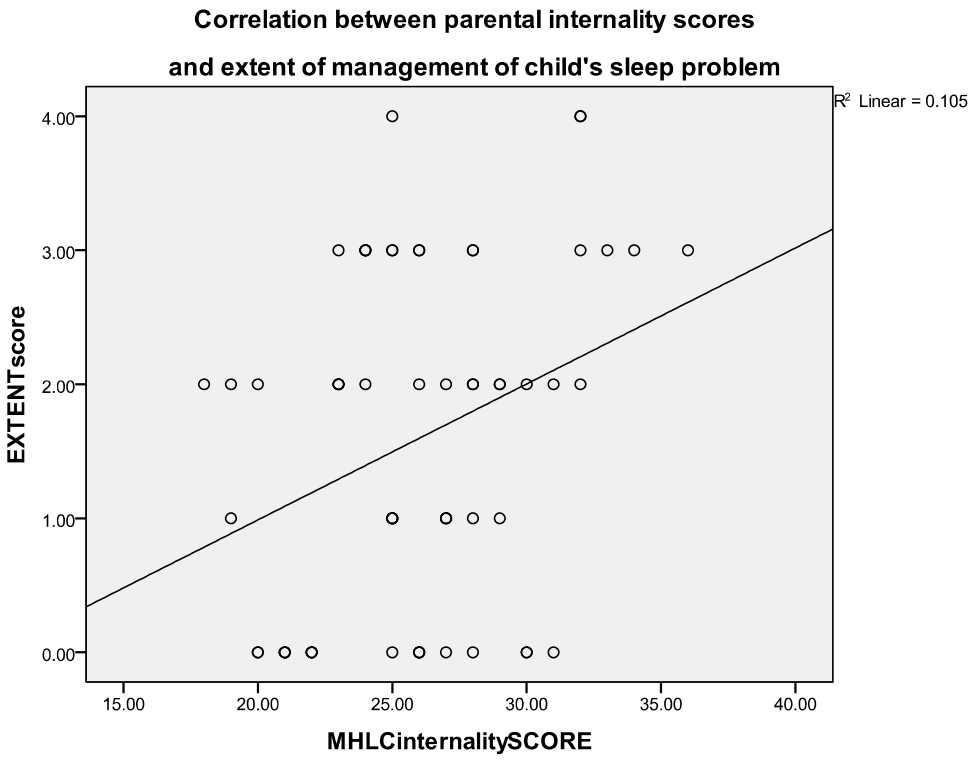


Figure 6: Scatterplot Illustration of Correlation-Analysis



CHAPTER THREE: ADVANCED CLINICAL PRACTICE I
REFLECTIVE CRITICAL ACCOUNT

Reflections on the personal and professional impact of ethical decision-making in clinical practice and the challenges of systemic practice

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ABSTRACT

This reflective account details a series of experiences, encountered in clinical practice, involving ethical decision-making regarding potential harm to a child. The challenges of working within systems are also considered. Reflections about these experiences are discussed, framed by Boud et al's (1985) model and Schon's (1983) explanation of reflection-in-action and reflection-on-action. The account concludes with a reflective-review, addressing potential changes in future clinical practice and an increased understanding of the importance of clinical supervision for Clinical Psychologists, as a result of the reflections detailed in the account. A critique of the models/theories used to frame the account is offered, while a meta-reflection is provided to consider the impact of completion of the reflective account itself on professional development.

CHAPTER FOUR: ADVANCED CLINICAL PRACTICE II
REFLECTIVE CRITICAL ACCOUNT

Reflecting back, projecting forward:
A reflective account of reflection itself at various stages of a young career in psychology and a personal account of the comparison of the roles of a CAAP and a Clinical Psychologist in light of current services trends

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ABSTRACT

This reflective account tracks the development of reflective skills across the early years of a career in psychology, from the author's training as a Clinical Associate in Applied Psychology (CAAP) to the end of their doctoral-training. Kolb's (1984) Experiential Learning Theory is used to process these reflections. Further reflections are then offered regarding the different roles of the CAAP and Clinical Psychologist, as experienced by the author, within the context of the recent political movement known as Improving Access to Psychological Therapies and current service structures. A reflective-review and concluding remarks are provided to bring the account to a close.

APPENDICES

Appendix 1.1: Quality Rating Instrument (QRI)

A. Rationale and Objectives	
1. Is a scientific background to the study provided and does it lead to a clear rationale for conducting the study? (CONSORT)	Adequate = 2 Partial = 1 Inadequate = 0 Not reported = 0 Not applicable
2. Are the aims/questions clearly stated or described? (SIGN)	Well covered = 3 Adequately addressed = 2 Poorly addressed = 1 Not addressed = 0 Not reported = 0 Not applicable
B. Sampling and Allocation	
3. Baseline demographic and clinical characteristics of the group are specified to allow for appropriate comparisons (e.g. age, gender)? (CONSORT)	Well covered = 3 Adequately addressed = 2 Poorly addressed = 1 Not addressed = 0 Not reported = 0 Not applicable
4. Eligibility: inclusion and exclusion criteria for participation in study are clearly specified. (CONSORT)	Well covered = 3 Adequately addressed = 2 Poorly addressed = 1 Not addressed = 0 Not reported = 0 Not applicable
5. Type of sample group: Geographic cohort, convenience, or highly selective (CTAM)	Geographic cohort = 2 Convenience = 1 Highly selective = 0
6. Is the sample size based on adequate power calculations? (CTAM)	Adequate = 2 Partial = 1 Inadequate = 0 Not reported = 0 Not applicable
7. Was a well-matched control group employed (or in the absence of a control group, were attempts made to control for confounding variables in design)? (CTAM)	Adequate = 2 Partial = 1 Inadequate = 0 Not reported = 0 Not applicable
8. Were the inclusion/exclusion criteria for allocation to experimental/control groups adequately described? (CONSORT)	Adequate = 2 Partial = 1 Inadequate = 0 Not reported = 0 Not applicable
C. Design	
9. Is the study design appropriate to test the hypotheses?	Adequate = 2 Partial = 1 Inadequate = 0 Not reported = 0 Not applicable
10. Were confounders accounted for in the study design? (SIGN)	Adequate = 2 Partial = 1 Inadequate = 0 Not reported = 0 Not applicable
D. Assessment	
11. Are standardized – and validated - assessments used to measure children's levels of anxiety? (CTAM)	Adequate = 2 Partial = 1 Inadequate = 0 Not reported = 0 Not applicable
12. Is the Stroop task method clearly explained and described? (CTAM)	Adequate = 2 Partial = 1 Inadequate = 0 Not reported = 0 Not applicable

13. Are researchers blind to participants' group and version of experiment completed? (CTAM)	Adequate = 2 Partial = 1 Inadequate = 0 Not reported = 0 Not applicable
E. Analysis	
14. Is the analysis is appropriate to aims, design and type of outcome measure? (CTAM)	Adequate = 2 Partial = 1 Inadequate = 0 Not reported = 0 Not applicable
15. Does the study address how many people who were asked to take part did so? (SIGN)	Well covered = 3 Adequately addressed = 2 Poorly addressed = 1 Not addressed = 0 Not reported = 0 Not applicable
16. Does the study address attrition rates? (SIGN)	Well covered = 3 Adequately addressed = 2 Poorly addressed = 1 Not addressed = 0 Not reported = 0 Not applicable
17. Is comparison made between those who took part and those lost by the end of the study? (SIGN)	Adequate = 2 Partial = 1 Inadequate = 0 Not reported = 0 Not applicable
18. Is there adequate reporting of summary statistics?	Well covered = 3 Adequately addressed = 2 Poorly addressed = 1 Not addressed = 0 Not reported = 0 Not applicable
19. Is there adequate reporting of effect sizes, p-values, confidence intervals etc. (where appropriate)? (SIGN)	Adequate = 2 Partial = 1 Inadequate = 0 Not reported = 0 Not applicable
F. Results and Discussion	
20. Do the findings relate to the aims/questions/hypotheses? (SIGN)	Adequate = 2 Partial = 1 Inadequate = 0 Not reported = 0 Not applicable
21. Are recommendations/implications for clinical practice/future research discussed in relation to the findings? (CONSORT)	Well covered = 3 Adequately addressed = 2 Poorly addressed = 1 Not addressed = 0 Not reported = 0 Not applicable
22. Are limitations of the study clearly discussed/expressed?	Well covered = 3 Adequately addressed = 2 Poorly addressed = 1 Not addressed = 0 Not reported = 0 Not applicable

Appendix 1.2: Average Quality-Rating Instrument scores break-down by criteria - GAD and PTSD papers

Key Papers **QRS Criterion**	Taghavi et al (2003)	Moradi et al (1999)	Freeman & Beck (2000)
1. Scientific background leading to clear rationale	2	2	2
2. Aims/questions clearly stated	3	2.5	3
3. Baseline demographics of groups specified	2.5	2.5	3
4. Inclusion/exclusion criteria clearly stated	3	2.5	3
5. Geographic cohort/convenience/highly selective sample	0.5	0.5	0
6. Sample size based on adequate power	0	0	0
7. Well-matched control group	2	2	2
8. Criteria for group allocation adequately described	2	2	2
9. Design appropriate to test hypotheses	2	2	2
10. Confounders accounted for	1.5	1.5	2
11. Standardised/validated tests used to measure anxiety	2	2	2
12. Stroop method clearly explained and described	2	2	2
13. Researchers blind to groups	1	0	0
14. Appropriate analysis	2	2	2
15. Number of people asked to participate is addressed	1	0	0
16. Attrition rates addressed	1	0	0
17. Comparison made between participants and those lost by end	0	0	0
18. Adequate reporting of summary statistics	2.5	2.5	3
19. Adequate reporting of effect sizes, p-values, confidence intervals	2	2	2
20. Findings relate to aims/questions/hypotheses	2	2	2
21. Recommendations for future research/implications of study addressed	3	2	2.5
22. Limitations clearly discussed	3	0	3
QRS average total scores and quality description	**40** **(76.9%)** **Good**	**32** **(61.6%)** **Good**	**37.5** **(72.2%)** **Good**

Appendix 1.3: Average Quality-Rating Instrument scores break-down by criteria – Spider-fear papers

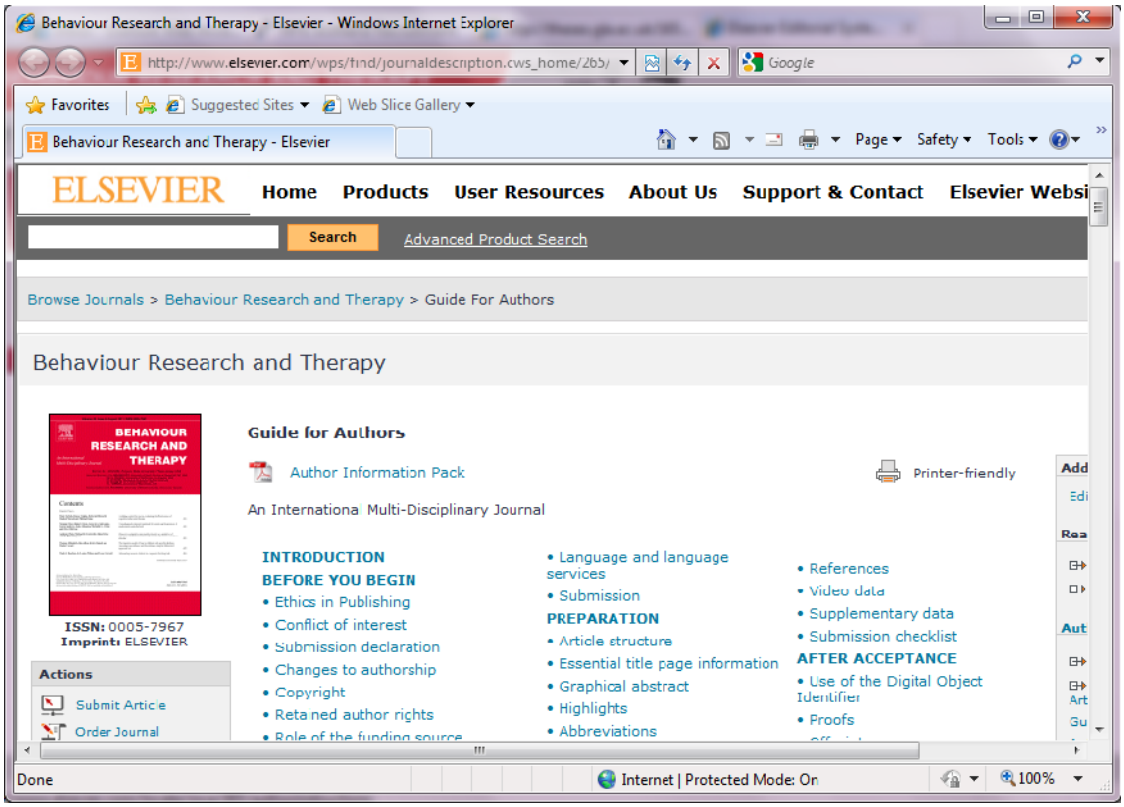
Key Papers **QRS Criterion**	Martin et al (1992)	Kindt et al (1997)	Kindt & Brosschot (1999)	Kindt et al (2000)	Morren at al (2003)
1. Scientific background leading to clear rationale	2	2	2	2	2
2. Aims/questions clearly stated	3	3	2.5	3	3
3. Baseline demographics of groups specified	1	2.5	2	2.5	3
4. Inclusion/exclusion criteria clearly stated	2.5	2.5	2.5	3	3
5. Geographic cohort/convenience/highly selective Sample	0.5	0.5	0.5	1	0
6. Sample size based on adequate power	0	0	0	0	0
7. Well-matched control group	2	2	2	2	2
8. Criteria for group allocation adequately Described	2	2	2	2	2
9. Design appropriate to test hypotheses	2	2	2	2	2
10. Confounders accounted for	2	2	1.5	1.5	2
11. Standardised/validated tests used to measure Anxiety	0	1	1.5	1.5	2
12. Stroop method clearly explained and described	2	2	2	2	2
13. Researchers blind to groups	0	1.5	0	0	0
14. Appropriate analysis	1	2	2	2	2
15. Number of people asked to participate is addressed	0	2.5	1	1	3
16. Attrition rates addressed	0	2.5	0	0	3
17. Comparison made between participants and those lost by end	0	2	0	0	0
18. Adequate reporting of summary statistics	3	2.5	3	3	3
19. Adequate reporting of effect sizes, p-values, confidence intervals	2	2	2	2	2
20. Findings relate to aims/questions/hypotheses	2	2	2	2	2
21. Recommendations for future research/implications of study addressed	3	2.5	2	2.5	3
22. Limitations clearly discussed	3	2.5	1.5	2	3
QRS average total scores and quality description	**33** **(66.1%)** **Good**	**43.5** **(83.3%)** **Excellent**	**34** **(65.4%)** **Good**	**37** **(71.2%)** **Good**	**44** **(84.6%)** **Excellent**

Appendix 1.4: Average Quality-Rating Instrument scores break-down by criteria – State/trait-anxiety papers

Key Papers **QRS Criterion**	Heim-Dreger et al (2006)	Richards et al (2007)	Hadwin et al (2009)
1. Scientific background leading to clear rationale	2	2	2
2. Aims/questions clearly stated	2.5	3	2.5
3. Baseline demographics of groups specified	1.5	2.5	2.5
4. Inclusion/exclusion criteria clearly stated	1	2.5	0
5. Geographic cohort/convenience/highly selective sample	1	1	1
6. Sample size based on adequate power	0	0	0
7. Well-matched control group	1	2	0
8. Criteria for group allocation adequately described	n/a	1.5	0
9. Design appropriate to test hypotheses	2	2	2
10. Confounders accounted for	1	2	0
11. Standardised/validated tests used to measure anxiety	2	2	2
12. Stroop method clearly explained and described	2	2	1.5
13. Researchers blind to groups	1.5	0	0
14. Appropriate analysis	2	2	1.5
15. Number of people asked to participate is addressed	0	2.5	0
16. Attrition rates addressed	0	0	0
17. Comparison made between participants and those lost by end	0	n/a	0
18. Adequate reporting of summary statistics	2.5	3	2.5
19. Adequate reporting of effect sizes, p-values, confidence intervals	1.5	2	1.5
20. Findings relate to aims/questions/hypotheses	2	2	1.5
21. Recommendations for future research/implications of study addressed	1	2.5	2
22. Limitations clearly discussed	1	2	1.5
QRS average total scores and quality description	**27.5** **(55%)** **Adequate**	**38.5** **(79.3%)** **Good**	**24** **(47.1%)** **Adequate**

Appendix 2.1: Author guidelines for submission to *Behaviour Research and Therapy*

Full Instructions in 'Author Information Pack' at:
http://www.elsevier.com/wps/find/journaldescription.cws_home/265/authorinstructions



Appendix 2.2: Children's Depression Inventory-Short Version (Kovacs, 1992)

Kids sometimes have different feelings and ideas.

This form lists the feelings and ideas in groups. From each group of three sentences, pick one sentence that describes you ***best*** for the past two weeks. After you pick a sentence from the first group, go on to the next group.

There is no right or wrong answer. Just pick the sentence that best describes the way you have been recently. Put a mark like this [x] next to your answer. Put the mark in the box next to the sentence that you pick.

Here is an example of how this form works. Try it. Put a mark next to the sentence that describes you ***best***.

Example: ☐ *I read books all the time.*

☐ *I read books once in a while.*

☐ *I never read books.*

Remember, pick out the sentences that describe you best in the PAST TWO WEEKS.

Item 1

☐ I am sad once in a while.

☐ I am sad many times.

☐ I am sad all the time.

Item 2

☐ Nothing will ever work out for me.

☐ I am not sure if things will work out for me.

☐ Things will work out for me OK.

Item 3

☐ I do most things OK.

☐ I do many things wrong.

☐ I do everything wrong.

Item 4

☐ I hate myself.

☐ I do not like myself.

☐ I like myself.

Item 5

- ☐ I feel like crying every day.
- ☐ I feel like crying many days.
- ☐ I feel like crying once in a while

Item 6

- ☐ Things bother me all the time.
- ☐ Things bother me many times.
- ☐ Things bother me once in a while

Item 7

- ☐ I look OK.
- ☐ There are some bad things about my looks.
- ☐ I look ugly.

Item 8

- ☐ I do not feel alone.
- ☐ I feel alone many times.
- ☐ I feel alone all the time.

Item 9

- ☐ I have plenty of friends.
- ☐ I have some friends but I wish I had more.
- ☐ I do not have any friends.

Item 10

- ☐ Nobody really loves me.
- ☐ I am not sure if anybody loves me.
- ☐ I am sure that somebody loves me.

Appendix 2.3: Parental-Demographics Questionnaire

Why am I being asked to provide this information?

Gathering this information will help us ensure that our participants include people of a variety of ages, ethnicities, incomes etc. By providing us this information, we are able to ensure that the results of our study can be applied to most people in the general population.

Instructions:

Please answer all questions by circling the relevant responses to each question. If you do not wish to answer any of these questions, please leave the box blank.

1) Your gender: Male Female

2) Your age range:
16-20 years
21-25 years
26-30 years
31-35 years
36-40 years
41-45 years
46-50 years
51-56 years
56-60 years
60+ years

3) Your marital status:
Single
Married/civil partnership/cohabiting
Divorced/separated
Widowed

4) Number of children living at home with you:
1
2
3
4
5+

5) Annual household income:

< £10 000
£10 000 - £15 999
£16 000 - £20 999
£21 000 - £25 999
£26 000 - £30 999
£31 000 - £35 999
£36 000 - £40 999
£41 000 - £45 999
£46 000 - £50 999
£51 000 - £55 999
£56 000 - £60 999
£61 000 - £65 999
£66 000 - £70 999
£71 000 - £75 999
£76 000 - £80 999
£81 000 - £85 999
£86 000 - £90 999
£91 000 - £95 999
£96 000 - £100 000
£100 000+

6) Do you consider yourself to have a disability? Yes No

If yes, please circle the appropriate response:

Blind/partially sighted
Deaf/hearing impairment
Wheelchair user/mobility difficulties
Personal care support needed
Dyslexia
Unseen disability (diabetes/epilepsy/asthma)
Mental health difficulties
Learning disability
Other disability/special need – please specify

_____

7) What is your ethnic group?

White – British
White – Irish
White – other background (please specify)_____
Mixed – White and Black Caribbean
Mixed – White and Black African
Mixed – White and Asian
Mixed – other background (please specify)_____
Asian/Asian British – Indian
Asian/Asian British – Pakistani
Asian/Asian British – Bangladeshi
Asian/Asian British – other background (please specify)
_____
Black/Black British - Caribbean
Black/Black British - African
Black/Black British – other background (please specify)
_____
Chinese
Middle Eastern
North African
Any other background (please specify)_____

Thank-you for completing this questionnaire

Appendix 2.4: Extent of Management of Child's Sleep-Problem Questionnaire

Instructions:

Please tick either the 'YES' or 'NO' box for each question. Please answer all questions, unless otherwise directed. There are no right or wrong answers.

	YES	NO
Q1 Have you contacted any professionals about your child's sleep-problem? (if YES, please go to question 5)	Y	N
Q2 Have you thought about contacting professionals about your child's sleep-problem?	Y	N
Q3 Do you intend to contact professionals about your child's sleep-problem? (if NO, please go to question 5)	Y	N
Q4 Do you have a plan yet for how you'll go about contacting professionals about the sleep-problem?	Y	N
Q5 Have you talked to your child about what might be *causing* their sleep-problem?	Y	N
Q6 Have you talked to your child about the *nature* of their sleep-problem (i.e. what the problem involves)?	Y	N
Q7 Have you talked to your child about the *duration* of their sleep-problem (i.e. how long it's gone on for)?	Y	N
Q8 Have you found any useful materials (e.g. books, leaflets, websites) about sleep-problems to help you understand the problem better?	Y	N

Appendix 2.5: Multidimensional Health Locus of Control Scale (Form B; Wallston, Wallston & DeVellis, 1978)

INSTRUCTIONS:
Please read each statement and circle the response that represents the extent to which you agree/disagree with it. There are no right or wrong answers, but please only circle one response per item. Please make sure you answer ALL items.

		Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
1	If I become sick, I have the power to make myself well again.	1	2	3	4	5	6
2	Often I feel that no matter what I do, if I am going to get sick, I will get sick.	1	2	3	4	5	6
3	If I see an excellent doctor regularly, I am less likely to have health problems.	1	2	3	4	5	6
4	It seems that my health is greatly influenced by accidental happenings.	1	2	3	4	5	6
5	I can only maintain my health by consulting health professionals.	1	2	3	4	5	6
6	I am directly responsible for my health.	1	2	3	4	5	6
7	Other people play a big part in whether I stay healthy or become sick.	1	2	3	4	5	6
8	Whatever goes wrong with my health is my own fault.	1	2	3	4	5	6
9	When I am sick, I just have to let nature run its course.	1	2	3	4	5	6
10	Health professionals keep me healthy.	1	2	3	4	5	6
11	When I stay healthy, I'm just plain lucky.	1	2	3	4	5	6
12	My physical well-being depends on how well I take care of myself.	1	2	3	4	5	6
13	When I feel ill, I know it is because I have not been taking care of myself properly.	1	2	3	4	5	6

14	The type of care I receive from other people is what is responsible for how well I recover from an illness.	**Strongly Disagree** 1	**Moderately Disagree** 2	**Slightly Disagree** 3	**Slightly Agree** 4	**Moderately Agree** 5	**Strongly Agree** 6
15	Even when I take care of myself, it's easy to get sick.	1	2	3	4	5	6
16	When I become ill, it's a matter of fate.	1	2	3	4	5	6
17	I can pretty much stay healthy by taking good care of myself.	1	2	3	4	5	6
18	Following doctor's orders to the letter is the best way for me to stay healthy.	1	2	3	4	5	6

Thank-you for completing this form.

Appendix 2.6: Participant Information-Sheet

WEST OF SCOTLAND NHS / UNIVERSITY OF GLASGOW
DOCTORATE IN CLINICAL PSYCHOLOGY

Research study reference FM00309

Reaction Times to Computerised Tasks in Children

PARTICIPANT INFORMATION SHEET

My name is Victoria Creanor and I am a final year Trainee Clinical Psychologist from the University of Glasgow. I would like to invite you to participate in a research study I am carrying out. My study will look at reaction times of children when they are completing a computerised task. The information you provide is purely for research purposes and is a requirement of my training in clinical psychology. Neither you nor your child will be identifiable at any stage during the study or after the results have been published.

In order for you to decide whether or not you are happy to take part in my study, it is important that you know what will be involved. I have provided this information below, so please take your time to read through it carefully. If you have any questions, please do not hesitate to ask me.

What is the purpose of the study?

The purpose of the study is to explore what factors might influence children's reaction times to a computerised 'spot-the-difference' task.

Why have I been chosen?

You and your child have been chosen because this study requires children aged between 6years and 11 years to complete the computerised task. It is also important we speak to children's parents to help us find out certain information that may have affected their child's reaction times on the computer task.

Do I have to take part?

It is up to you to decide whether or not to take part. If you do decide to take part, you will be given this information sheet to keep and you will be asked to sign a consent form. If you decide to take part, you are still free to change your mind at any time and you do not have to give a reason as to why you no longer wish to take part.

What will happen to me and my child if I take part?

The study will consist of you, the parent, answering some brief questions about your child's general health and day-to-day functioning. Your child will also be asked some brief questions about their health and will also be invited to take part in a brief computer-based 'spot-the-difference' task. Participation in the entire study is expected to take between 5 and 7 minutes.

What are the disadvantages and risks of taking part?

There are no known disadvantages or risks of taking part in this study.

What are the possible benefits of taking part?

You will receive no direct benefit from taking part in the study. The information you and your child provide will give us a better understanding of what factors may influence how quickly children are able to react to certain computerised tasks.

Will my taking part in this study be kept confidential?

All information which is collected about you and your child during the course of this study will be kept strictly confidential. You will only be identified by a number. Therefore, no one will have access to information such as your names, address, or any other information which could identify you or your child. The consent form is the only document which will have your name and your child's name on it as you will be asked to sign it – and so it will be kept in a locked, confidential file until the end of the study, when it will be completely destroyed.

What will happen to the results of the research study?

The results of this study are likely to be published towards the end of 2011 and will be available in the Maria Henderson Library at Gartnavel Royal Hospital. Again, all information published will be completely anonymous; that is to say that your personal details will not be identified in any part of the publication.

Who is organising and funding the study?

The University of Glasgow is paying for this study to take place.

Who has reviewed the study?

The study has been reviewed by the University of Glasgow's Ethics Committee and has received ethical approval.

What if I wish to complain about something?

If you wish to make a complaint about any aspect of this study or how you or your child was treated during the study, you can contact my supervisor, Professor Colin Espie, at the University of Glasgow. His contact details are found at the foot of this page. He will be able to advise you on how to follow the complaints procedure.

Contact for further information

If you have any questions you would like to ask following your participation, or if you would like to find out more about the study, please do not hesitate to contact me or my research supervisor (details below).

Victoria Creanor
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Glasgow G12 0XH

Professor Colin Espie (research supervisor)
Professor of Clinical Psychology
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Glasgow G51 4TF

Email: 0005145m@student.gla.ac.uk
Telephone numbers: 0141 211 3920
0141 232 7696

Thank-you for taking the time to read this.

Appendix 2.7: Participant Consent-Form

WEST OF SCOTLAND NHS / UNIVERSITY OF GLASGOW
DOCTORATE IN CLINICAL PSYCHOLOGY

Reaction Times to Computerised Tasks in Children

CONSENT FORM

Name of Researcher: **Mrs Victoria Creanor MA MSc**

Name of Participant (PARENT): _____

Name of Participant (CHILD): _____

	Please initial:	**YES**	**NO**
Have you read the information sheet provided?		[ ]	[ ]
Have you had the opportunity to ask questions/discuss the study?		[ ]	[ ]
Have you received satisfactory answers to any questions?		[ ]	[ ]
Have you received enough information to proceed?		[ ]	[ ]
Do you understand that you are free to withdraw your consent:			
- at **any** time?		[ ]	[ ]
- without having to give a reason?		[ ]	[ ]
Do you consent to the information being used for research purposes only?		[ ]	[ ]

Your name in block capitals_____

Your *signature* (participant)_____ Date_____

Researcher name in block capitals_____

Researcher *signature*_____ Date_____

Appendix 2.8: Inclusion-Criteria Checklist

The child...

- Is aged 6 years -11 years 0 months ☐
- Speaks English as 1st language ☐
- Does NOT have a history of epilepsy ☐
- Does NOT have history of brain injury ☐
- Does NOT have diagnosis of Depression ☐
- Does NOT have any other psychiatric illness ☐
- Does NOT have a learning disability ☐
- Does NOT have a chronic physical condition ☐
- Does NOT have (or has had queried) Attention-Deficit Hyperactivity Disorder (ADHD) ☐
- Does NOT have (or has had queried) conduct problems ☐
- Does NOT have (or has had queried) an autistic spectrum disorder (ASD/Asperger's) ☐
- Is NOT on medication ☐
- Is NOT afraid of the dark ☐
- Spends every night of the week in the same house ☐

Appendix 2.9: Analysis of Variance (ANOVA)

ANOVA – One Way

ReactionTime

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	9.767E8	3	3.256E8	12.477	.000
Within Groups	3.914E9	150	2.609E7		
Total	4.891E9	153			

Appendix 2.10: Bonferroni Comparisons

Multiple Comparisons

ReactionTime Bonferroni

(I) SleeperFlickerType	(J) SleeperFlickerType	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Good Sleeper NEUTRAL FLICKER	Good Sleeper SLEEP FLICKER	6161.06383*	1053.72613	.000	3343.7166	8978.4110
	Poor Sleeper NEUTRAL FLICKER	4005.04035*	1206.20340	.007	780.0147	7230.0660
	Poor Sleeper SLEEP FLICKER	4927.95470*	1181.89585	.000	1767.9202	8087.9892
Good Sleeper SLEEP FLICKER	Good Sleeper NEUTRAL FLICKER	-6161.06383*	1053.72613	.000	-8978.4110	-3343.7166
	Poor Sleeper NEUTRAL FLICKER	-2156.02348	1206.20340	.455	-5381.0491	1069.0021
	Poor Sleeper SLEEP FLICKER	-1233.10913	1181.89585	1.000	-4393.1436	1926.9254
Poor Sleeper NEUTRAL FLICKER	Good Sleeper NEUTRAL FLICKER	-4005.04035*	1206.20340	.007	-7230.0660	-780.0147
	Good Sleeper SLEEP FLICKER	2156.02348	1206.20340	.455	-1069.0021	5381.0491
	Poor Sleeper SLEEP FLICKER	922.91435	1319.64605	1.000	-2605.4228	4451.2515
Poor Sleeper SLEEP FLICKER	Good Sleeper NEUTRAL FLICKER	-4927.95470*	1181.89585	.000	-8087.9892	-1767.9202
	Good Sleeper SLEEP FLICKER	1233.10913	1181.89585	1.000	-1926.9254	4393.1436
	Poor Sleeper NEUTRAL FLICKER	-922.91435	1319.64605	1.000	-4451.2515	2605.4228

*. The mean difference is significant at the 0.05 level.

Appendix 2.11: Spearman's-Rho Two-tailed Correlation

Correlations

			EXTENT score	MHLC Internality SCORE
Spearman's rho	EXTENTscore	Correlation Coefficient	1.000	.278*
		Sig. (2-tailed)	.	.032
		N	60	60
	MHLCinternalitySCORE	Correlation Coefficient	.278*	1.000
		Sig. (2-tailed)	.032	.
		N	60	60

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

Appendix 3.1: Major Research Project Proposal

ABSTRACT

Background: Attentional-bias (AB) to sleep-related stimuli has been discovered in adult insomniacs using the induced-change-blindness (ICB) flicker paradigm. Little research exists regarding this phenomenon in children with sleep-problems. Emerging research supports the relationship between parental health locus-of-control (HLoC) and how far they address their children's health-problems. *Aims:* This study aims to 1) investigate the presence of AB in children with sleep-problems and 2) investigate whether parents of problem-sleepers more likely to address the sleep-problem if they are more internally-oriented. *Methods:* A between-subjects design will be employed. Half the good-sleepers (GSs) and half the poor-sleepers (PSs) will complete the sleep-related ICB flicker task, while the other halves of each group will complete the neutral task. GSs' vs. PSs' change-detection latencies will be compared on both the sleep and neutral tasks. Parental-internality will be measured using the Multidimensional Health Locus of Control (MHLC) scales. Scores from the MHLC scales will be correlated with scores from a series of questions targeting the extent to which parents have addressed the sleep-problem. *Applications:* It is hoped that any significant findings will help fill the literary gap regarding AB in children with sleep-problems and determine which treatment components may benefit them. A significant link between parental-internality and addressing sleep-problems could inform parental psycho-education.

INTRODUCTION

Sleep has long since been indicated as a prevalent health-concern in adults. Recent evidence suggests that prevalence rates are also high in child populations, with around 31% of 6-13 year-olds complaining of problems initiating and maintaining sleep (Spruyt et al, 2005). Childhood sleep-problems are of concern because of the adverse impact such disturbances can have on the child's affect, behaviour, cognitive development and family-relationships (Carr et al, 2007). With such concerning prevalence rates, it seems important to investigate the potential underlying mechanisms that may be causing – and/or maintaining – children's sleep-problems, to create a focus for effective intervention.

Recent research has shown convincing evidence for the existence of an AB towards sleep-related stimuli in poor adult sleepers and has gone some way to establishing its role both in the precipitation and the maintenance of sleep-disorders (MacMahon et al, 2006; Marchetti et al, 2006; Jones et al, 2005; Lundh et al, 1997). AB to sleep-related stimuli can be explained, in terms of its maintenance-role, using a conditioning framework. Since the early 1970s, it has been suggested that bedroom-objects command a certain amount of control over how well we sleep in terms of the role they play in creating associations with sleep-behaviour (Bootzin, 1972). GSs will, subconsciously, begin to prepare for sleep by noticing objects in their sleeping-environment which they have come to associate with a positive sleep-experience. If people begin to experience poor sleep, however, these previously-adaptive associations become maladaptive, thus serving to maintain the sleep-problem (Bootzin, Epstein & Wood, 1991). In line with this explanation, interventions offered to PSs often include stimulus-control; a programme which aims to

strengthen associations between bedroom-objects and a positive sleeping-experience and weaken associations between bedroom-objects and wakefulness. Indeed, stimulus-control was deemed effective in a recent systematic review on treatment for adult insomniacs (Morin et al, 2006).

Previous research on AB in poor adult sleepers has successfully utilised a method known as the induced-change-blindness (ICB) flicker paradigm to investigate the phenomenon (Marchetti et al, 2006; Jones et al, 2005). This paradigm involves a single object in a visual-scene being changed between repeated 'flickers' (very brief presentations), with the change occurring out of sight. The participant is essentially asked to 'spot-the-difference'; the time taken to spot this difference is believed to be an indication of how salient the changed-object is to the participant. In terms of AB, investigations using this paradigm have revealed that PSs detect sleep-related changes quicker than GSs (Marchetti et al, 2006).

Although AB has been found to explain, at least partially, the maintenance of insomnia in adults, little work has been carried out to investigate whether an AB exists in children with sleep-problems. A reason for this may be the potential difficulty in identifying poor child sleepers; children may rely on their parents to raise concerns about their poor sleep and yet may not ever discuss their sleep-difficulties with their parents. Recent findings have also shown a significant discordance between subjective parental-reports of a child's sleep-behaviour and an actual, objective sleep-disorder in the child; reasons for which include parental lack of awareness and children's overestimation of difficulties (Gregory et al, 2006; Owens et al, 2000). Despite these potential barriers to conducting research in this area, it is important to determine whether or not this phenomenon exists in children with sleep-problems, since it could provide an indication about interventions which could be of benefit to such children.

Parental lack of awareness and children's overestimation of difficulties are only two of the many factors that may influence whether or not a child's sleep-problem is addressed. Another factor, the influence of which will be explored within this study, is parental health locus-of-control (HLoC). There is a small area of research which supports the theory that, if a parent possesses high 'internality' in terms of HLoC, they will address their child's health-needs effectively and proactively. That is to say, if they believe *they* hold the most influence over their *own* health (i.e. attribute their own health-status to internal factors), they are more likely to monitor their child's health and address any concerns. This is compared to those who attribute their health-status to powerful others (e.g. medical staff) or to chance. Some of this research suggests that parental-internality (compared to parental attributions of child health-problems to external or chance factors) acts as a protective factor in terms of their child's future health and increases engagement in preventative strategies (Chase et al, 2004; Lencova et al, 2008). Further evidence supporting the relationship between high parental-internality and more proactive responses to their child's health-needs could direct clinicians towards including work on challenging external or chance HLOC attributions in parents of children with sleep- (and other health-) problems.

AIMS and HYPOTHESES

Aims

The main aim of this research is to investigate whether or not an AB exists in children with sleep-problems using the ICB flicker paradigm. Another aim is to investigate the relationship between parental HLoC internality (in parents of children with sleep-problems) and their attempts to address the sleep-problem. Given the lack of research available in both of these areas, it is hoped that any significant findings will add to the existing research and provide direction for the treatment of childhood sleep-problems via children and their parents.

Main Hypotheses

(i) Children with a confirmed (self- **and** parentally-reported) sleep-problem will detect a change made to sleep-related objects quicker than children with no confirmed sleep-problem.

(ii) There will be no difference in time taken to detect changes made to neutral objects between children with a confirmed (self- **and** parentally-reported) sleep-problem and children with no confirmed sleep-problem.

Sub-hypothesis

(iii) Parents of children with a confirmed (self- **and** parentally-reported) sleep-problem who exhibit higher internality of HLoC will have made more efforts to address their child's sleep-problem than those who exhibit a higher external or chance HLoC.

PLAN of INVESTIGATION

Participants

Children (aged 6-11 years) and their main caregiver will be asked to take part in a study about sleep; all will be recruited from Glasgow. The participant age-range was decided upon based on the focus of the study being on *children's* sleep; if the age-range was expanded, there is the possibility that a confounding factor would be present because, by age 12, children may be experiencing sleep-patterns more akin to adolescence. As phenomena such as Delayed Sleep Phase Syndrome occur more often in adolescence, the age-range was restricted to help reduce the possibility of this interfering with the results.

Inclusion/Exclusion Criteria

As an initial screening-question, children and their main caregiver will be asked the following questions, respectively: *"Do you think you have problems sleeping?"* and *"Do you think your child has a sleep-problem?"* This screening-question holds high validity in determining the presence of a sleep-problem, given sleep's very subjective nature. A response of *yes* to both questions will signify eligibility for participation in the PSs group, while a response of *no* to both questions will signify eligibility for participation in the GSs group. Based on a 40% prevalence-rate of sleep-problems in school-children (Owens et al, 2000), it is expected that 165 children will

be required to be screened to obtain the number of participants needed to attain appropriate power for this study.

Children who are outwith the specified age-range (6 years -11 years 0 months), do not speak English, have a history of epilepsy, brain injury, depression or any other psychiatric illness, have a learning disability, have a chronic physical condition, have (or have had queried) ADHD, conduct-problems or an autistic-spectrum disorder, are on medications, are afraid of the dark, do not spend every night of the week in the same house, or have only a recent onset of sleep-problems (< 3 months) will be excluded from the study. The reason for these exclusions is that their presence could affect a child's attention, their ability to perform the ICB flicker task or the legitimacy of the presence of an actual sleep-problem. Removing these possible confounding factors will improve the chance of any true effects being discovered. All children who do not meet the above criteria will be included for analysis.

Recruitment Procedures

Participants will be recruited to the study through the Glasgow Science Centre, via the "Meet the Scientist" programme. A stall will be set up within the Science Centre for those interested in participating. The Science Centre has been chosen for recruitment based on a recent study's success in recruiting school-children from this venue for participation in a sleep-related project (Thompson, in preparation).

Measures

The Children's Depression Inventory (Short Version; CDI; Kovacs, 1985) will be administered to each child to aid participant-exclusion regarding current depression. This is a 10-item questionnaire, is either completed by the child or administered to the child, verbally, by the interviewer and is intended to identify and assess the symptoms of a major-depressive or dysthymic disorder.

Each child will then complete the computer-based ICB flicker task to measure their visual change-detection-latency to changes in the visual-scenes with which they are presented. Each child will complete either the sleep-related or neutral level of the task, which will be explained as a 'spot-the- difference' exercise.

All parents will be asked to complete a standard demographics-questionnaire. Parents of the PSs will be asked several questions to identify the extent to which they have addressed their child's sleep-problem. These questions will be assigned a score of 1 or 0 with a minimum score of 0, for total lack of addressing the problem and a maximum score of 8, indicating high involvement in addressing the problem. They will then be asked to complete Form B from the MHLC scales (Wallston et al, 1978) to measure their internality of HLoC. This form consists of 18 items and assesses their attributions about the main influences on their health-status. These attributions fall

into 3 categories: internal, external and chance. An example of an internal item is *"My physical wellbeing depends on how well I take care of myself".* Respondents are asked to endorse how much they agree with each item from 'strongly-disagree' (1 point) to 'strongly-agree' (6 points). There are 6 items regarding internality; scores of internality will therefore range from 6 to 36.

Parents and children in the PSs group will be asked to complete the Children's Sleep Habits Questionnaire (CSHQ; Owens et al, 1998) and the Sleep Self-Report (Child Version; SSR; Owens et al, 2000), respectively. These are self-report measures which explore the nature of the child's sleep-problems. The data from these measures will be analysed in a parallel-study of the current study.

Design

A 2 (sleep quality) x 2 (nature of ICB flicker task change-to-be-detected) factorial-design will be employed. The dependent-variable for the main hypotheses is detection-of-change-latency in the ICB flicker task.

Research Procedures

All children who meet inclusion-criteria will be invited to complete the computer-task following verbal instructions by the researcher. Participants from both the GSs group and the PSs group will be randomised to complete either the sleep-related level or the neutral level of this task. Randomisation will be achieved by the child either picking an 'S' or an 'N' out of a hat prior to completing the computer-task. There will be equal numbers of both letters, symbolising the 'sleep'-related and 'neutral' tasks, in the hat. Therefore, half the GSs will complete the sleep-related level and half will complete the neutral level. Half the PSs will complete the sleep-related level and half will complete the neutral level. Parents, meanwhile, will be asked to complete a standard demographics-questionnaire. Parents in the PSs group will also be asked to answer several questions regarding the extent to which they have addressed their child's sleep-problem and will then be asked to complete Form B from the MHLC scales. It is expected that, for those children completing all stages of the procedures, it will take approximately 10 minutes in total.

Justification of Sample-size

A power-analysis calculation was conducted using G*Power Version 3.0.10 to reveal the number of participants needed for this study. Based on the effect-sizes found by Jones et al (2005) comparing AB in adult insomniacs and GSs, using the ICB flicker paradigm, it was established that the sample should contain at least 33 participants in each of the two (GSs and PSs) groups. This was calculated, via G*Power, by entering an effect-size of 0.91 (from Jones et al, 2005), an alpha- (error-probability) value of 0.05 and a power-value of 0.95. The type of test used to calculate the sample-size was a two-tailed independent samples t-test to account for the unknown direction of the experiment's result. The output from G*Power, regarding total sample-size was N=66, indicating the need to have 33 participants in each group.

Settings and Equipment

Completion of the ICB flicker task will take place at the Glasgow Science Centre, behind screens to minimise distraction. The same original-stimulus (OS) will be used for both levels of the task (sleep-related and neutral). The OS will be a visual scene, presented on the computer-screen, containing an array of objects. This array will be arranged so that sleep-related objects and neutral objects will be located at either side of the midline of the screen. For each of the levels of the task, different stimuli will be removed between flickers while the rest of the scene remains unchanged; a teddy-bear will be removed in the sleep-related level and a mug will be removed in the neutral level. Photographs of visual-scenes will be presented in full-colour and will be taken in natural-daylight. A mask-screen will be used in between presentations of the OS and the changed-stimulus (CS). Therefore, the OS will be presented, followed by a mask-screen, followed by either the sleep-related or the neutral CS, followed by another mask-screen. This procedure will continue until the child indicates that they notice the change.

The sleep-related and neutral stimuli used in the current study will be the same as those currently being used to investigate AB in children of parents with sleep-problems (Thomson, in preparation) and are valid for use with children.

Data Analysis

The means and standard-deviations of each group's latencies on the ICB tasks will be used to examine the descriptive-statistics. Then, examination of the parametric assumptions will be carried out to determine whether a normal-distribution exists or not. If the data is normally-distributed, an Analysis of Variance (ANOVA) will be used to analyse the difference in change-detection-latency between GSs and PSs within the sleep-related and neutral levels. If normal-distribution is not present, non-parametric tests will be carried out (e.g. Kruskall-Wallis) to examine the same values. A Pearson's correlation-analysis will be used to investigate the relationship between parental HLoC and effort to address children's sleep-problem in parents of children with confirmed sleep-problems.

HEALTH and SAFETY ISSUES

Researcher safety issues

At this time, there are no apparent health-and-safety issues for the researchers, as no home-visits will be conducted.

Participant safety issues

Extra care will be taken to ensure all children's safety. They will be accompanied to the study by the main caregiver and will be in the presence of a trained professional at all times during the study.

ETHICAL ISSUES

Ethical-approval will be sought from the University of Glasgow Ethics Committee. Should a clinical issue be discovered in any of the participants during this study, an effort will be made to

alert the supervisor overseeing the project of the issue, discuss the concerns with the child and their parent and offer a referral to an appropriate healthcare-professional.

FINANCIAL ISSUES

Equipment costs

It is understood that all equipment required is available from the Glasgow Sleep Centre and Department of Psychological Medicine, Glasgow University. Use of this equipment is expected to be offered free-of-charge.

Travel

Based on an estimate of 10 weekly-trips to the Science Centre, it is expected to cost £32 in travel expenses based on an allowance of 40p per mile.

TIMETABLE

May-July 2009: research proposal approval/changes made

July-September 2009: start ethics procedure

September 2009-March 2010: start recruitment once ethics approval has been granted

March 2010- July 2010: analyse results and write up study

PRACTICAL APPLICATIONS

Findings from this study could potentially aid clinicians working with children with sleep-problems in choosing appropriate, specific interventions, related to AB, to target the problem. Significant findings could also provide support for addressing parents' HLoC while, simultaneously, treating their children for sleep- (and other health-) problems.

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