An indirect Measure of Association in Spider Anxious Children; The Approach-Avoidance Task

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Abstract

In this study the Approach-Avoidance Task (AAT) was evaluated as a test of implicit threat associations in children. The AAT is a task in which children respond to a single stimulus appearing on a computer screen by pulling or pushing a joystick. The stimuli are either pictures of a spider or the same pictures without a spider. In one block children were asked to pull the spider pictures towards them by means of the joystick, and to push the pictures without the spiders away from them. In the other block the push and pull movements were reversed. Ninety children aged between nine and twelve were selected from an elementary school located in The Netherlands. As predicted, the very anxious participants responded slower when pulling a picture of a spider towards them, compared to the average anxious participants. The low anxious participants on the other hand responded just as slow as the very anxious participants. Further research is needed to explain these unexpected results.

Introduction

Anxiety disorders are common in children and adolescents. In a review of epidemiological studies, Anderson (1994) concluded that the overall prevalence of anxiety disorders varies between 2 and 9 %. Although many children suffer from an anxiety disorder, they often go unnoticed and untreated, probably because isolated symptoms of fear and anxiety are often found during normal development (Silverman & Treffers, 2001). Whereas isolated symptoms of fear and anxiety are usually short-lived, anxiety disorders have a more chronic course. Many children who experience an unnoticed anxiety disorder continue to have problems during adolescence and adulthood. Keller, Lavori, Wunder and Beardsle (1992) found that nearly one half of the children with an anxiety disorder have this illness for eight years or longer. Knowing more about the nature of anxiety disorders is thus important for its recognition and treatment.

Indirect Measures and Implicit measurement

In the last decades researchers discovered much about cognitive processes in anxiety. They found that behaviour and thus anxiety responses can occur automatically. A function of these automatic responses is to unconsciously evaluate an attitude towards an object or situation. Researchers sometimes refer to implicit responses when speaking about automatic responses because several functionalities of automatic mechanisms are also seen in implicit

mechanisms. Implicit mechanisms can be seen as automatic if 1) the participant cannot control the outcome of the process, 2) the participant is unaware of the process that produced the effect, and 3) the attitudes and cognitions are automatically activated (De Houwer, in press).

The opposite of implicit mechanisms are explicit mechanisms, which are conscious most of the time. Questionnaires and interviews are useful for discovering these so called explicit cognitive memory processes in anxiety disorders, but cannot identify the implicit cognitive processes. Indirect measures are needed to identify these implicit mechanisms. "Measures are indirect when an attitude or cognition is inferred from behaviour other than a self-assessment of the participant. Indirect measures can only measure implicit mechanisms if these attitudes and cognitions are unconscious, uncontrollable and are activated automatically" (De Houwer, in press.; page 21).

These findings have changed the research in anxiety disorders and have led to the development of indirect measures of association. Researchers could now measure cognitive processes such as selective attention, encoding and retrieval rather than just the content of cognition that plays a role in anxiety. Another advantage of indirect measures is that they are also less affected by problems associated with direct measures (interviews and questionnaires), such as, socially desirable answering, and in case the outcome is affected by the properties of the context (e.g., how questions are formulated or who asks the questions; Blair, 2002).

In recent years, many researches developed indirect measures to discover more about implicit cognitive mechanisms and used reaction-time tasks. The common principle in these tasks is that the participants' response speed in the task is affected by the valence of the stimuli experienced by the participant. If a participant, for example, has to respond positively to a threatening stimulus, the responses are slowed down.

The prototypical indirect reaction time task used in adults is the *Implicit Association Test (IAT)* developed by Greenwald, McGhee, and Schwartz (1998). In this task, participants have to respond to different words which have a positive or a negative valence. In one block, the participants have to push a button with the indication 'pleasant' when seeing a positive word, and a button indicating 'unpleasant', when seeing a negative word. In the other block the valence of the word is compatible to the valence of the button. The participants have to push the pleasant button when seeing a negative word and to push the unpleasant button when seeing a positive word. In this block, the valence of the word is incompatible to the valence of the button. The participants have longer reaction times in the incompatible block. Several

studies, have shown that spider-anxious adults respond more quickly in the IAT, if spider words are linked to the unpleasant button, compared to reaction times where the spider words are linked to the pleasant button (De Jong, van den Hout, Rietbroek, & Huijding, 2003; Teachman, Gregg, & Woody, 2001). Recently, a number of variations of the IAT have been proposed, including the *Single Target Implicit Association Test* (STIAT, Wigboldus, in prep.) and the *Extrinsic Affective Simon Task* (EAST, de Houwer, 2003).

Another prototypical indirect reaction task is the Stroop task. In Stroop tasks, words are presented in different colours. The participant is asked to name the colour of the word (target stimulus) as quickly as possible and to ignore the content of the word (distracter stimulus). A study performed by Lavy, Van Den Hout and Arntz (1993) found that spider-anxious adults could not ignore the content of the words entirely. The process of naming the colour of the word interfered with the process of the meaning of the word. This interference occurred because attention was given to the word. This interference effect became bigger when a participant paid more attention to the word (e.g., the participant was more afraid of spiders). The spider anxious adults had, in other words, selective attention for information that was linked to spider anxiety. They were therefore slower in naming the colours of spider related words, compared to naming the colours of non-related words. Thus, the Stroop enables researchers to measure the degree of distraction.

Indirect Measures in Children

Although researchers discovered much about the implicit mechanisms and its relation with anxiety disorders, relatively little research is performed with respect to implicit cognitive memory mechanisms of anxiety disorders in children (Kindt, Bierman & Brosschot, 1997).

Only a few studies with children, in which indirect measures were used, were conducted. All studies tried to assess specific fear associations with children who suffer from a specific anxiety disorder. Children having specific anxieties demonstrate a high degree of specificity in the characteristics of their anxiety, and thus give anxiety responses to specific stimuli (Logan & Goetsch, 1993). The studies described below are studies conducted with specific anxiety towards spiders. These studies all used the Stroop task to study implicit mechanisms in spider-anxious children.

The first study, in which the Stroop task was used to assess children's selective attention, was performed by Martin, Honder and Jones (1992). Martin et al. (1992) observed selective attention in spider-anxious children between six and thirteen years old. They used a card format of the Stroop task to assess fear responses to spider-related stimuli. All words in

the first block were related to spiders (e.g., web, hairy, leg). All words in the second block were not related to spiders (e.g., chair, house). Martin et al. (1992) found differences in reaction times between the spider-anxious children compared to the non-anxious children. The spider-anxious children had longer reaction times when reading the colours of the spider-related words compared to the non-anxious children. These differences were not found in the reaction times in the words that were not related to spiders. Martin and Jones (1995) replicated this effect in children aged between four and nine, using a pictorial version of the card format of the Stroop. Martin and Jones (1995) therefore concluded that they had found important implicit-cognitive mechanisms in spider-anxious children.

However a later study run by Kindt, Brosschot and Everaerd (1997) found no differences between anxious and non-anxious children in their selective attention toward spider-related words. They found that all children had selective attention for spider-related words (e.g., they all had longer reaction times in the block with spider-related words). In a follow up study, Kindt, Van Den Hout, de Jong, and Hoekstra (2000), used a pictorial form of the Stroop task. Whereas the participants had to ignore a word in an earlier study, they now had to ignore a spider-related picture. The results showed no differences between anxious and non-anxious children in the spider-related pictures. They found that none of the children showed selective attention for the spider-related pictures. They could not explain why all children did not show selective attention for the spider-related pictures.

In a second experiment, Kindt et al. (2000) also took age into account. Their hypothesis was that younger children had a lack of cognitive capacity to inhibit processing the threat information. Children as old as eight could not inhibit processing the threat information and therefore they should show selective attention for spider-related words, independent of their anxiety of spiders. In this study Kindt et al. (2000) divided the children in separated age groups and compared their responses to the Stroop. The results indicated that the similarities between the anxious and non-anxious children disappeared with age. Whereas the non-anxious eight year olds responded in the same way as the anxious participants, the selective attention that was shown decreased with age eight-eleven in the non-anxious group whereas the selective attention that was shown maintained in the anxious group. Kindt et al. (2000) argued that not the selective attention measured by the Stroop itself was an important factor; it was the continuation of the selective attention. Children who develop an anxiety disorder have difficulty inhibiting the selective attention as they grow older.

Although Kindt et al. (2000) did several experiments with spider-anxious and non-anxious children, the different outcomes between their findings and the findings of Martin et

al. (1992) are still hard to explain. A possible explanation for these differences is that both researchers divided their anxious and non anxious children in different ways. Another explanation could be that Kindt et al. (2000) used a computerised version of the Stroop, in which the stimuli were presented one by one. In the card version, used by Martin et al. (1992), the stimuli were presented within a context of the same emotional stimuli. This could have reinforced the emotional impact of the stimuli.

Another unexplained result is the difference found between the pictorial form of the Stroop and the linguistically form of the Stroop. The children who performed the pictorial Stroop did not show selective attention for spider-related pictures, whereas the children who performed the linguistically Stroop did show selective attention for spider-related words. An explanation for these results is that spider words are possibly more frightening than spider pictures, albeit spider-pictures appear to be more strongly associated with spiders than spider-related words (Kindt & Brosschot, 1997).

Apart from the different findings, there are other limitations of the different forms of the Stroop task. Although the Stroop task is an indirect measure, it cannot measure implicit associations. The participants are aware of the fact that the Stroop measures spider anxiety. They perceive the spider-related words consciously instead of unconsciously. Kindt and van den Hout, 2001 (page 197) concluded that "it is the response to consciously perceived rather than unconsciously perceived threat that marked the transition from non-clinical anxiety to clinical anxiety."

Another major disadvantage is that the Stroop task mainly taps into the semantic aspects of emotional information processing by measuring the strength of interference with the spider-related stimuli. Emotional reactions, however, consist of a much more complex pattern of responses. Emotional reactions not only consist of cognitive responses, but also of behavioural, and physiological responses (Lang, Bradley, & Cuthbert, 1990). In anxiety disorders it is very important to also measure the behavioural and physiological responses because they can tell us more about the nature of anxiety disorders.

The purpose of this research is to find possible differences between spider-anxious and non-anxious children, using a task that can measure more aspects of anxiety disorders.

The Approach-Avoidance Task (AAT)

When looking at implicit cognitive processes in anxious and non-anxious adults, several researchers used a new paradigm: The Approach-Avoidance Task (AAT, De Houwer, Grombez, Baeyens & Hermans, 2001; Mogg, Bradley, Field & De Houwer, 2003; Rinck & Becker, in prep.). The AAT is a task in which single stimuli are presented to participants on a computer screen. In this study, neutral and negative stimuli are presented. The negative stimuli are pictures of spiders presented against a background, the neutral stimuli are 'empty' pictures, that is, they just contain the background of the spider picture without the spider. Thus, the crucial difference between the spider and the empty picture is the absence or presence of the spider. The pictures that are presented on the screen become smaller when someone pushes a joystick away from himself. The pictures become bigger when someone pulls the picture towards himself.

The participants' task is to respond as fast as possible to each stimulus presented on the screen. In one block the participant pushes a joystick away from himself when seeing a picture of a spider and pulls a joystick towards himself when seeing an empty picture. In the other block the task is reversed. The compatible task is when the participant pushes the joystick away from himself when seeing a spider. The incompatible task is when the participant pulls the joystick towards himself when seeing a spider. If response times in the compatible situation are shorter than in the incompatible situation, an AAT effect is said to occur. This AAT effect should be directly related to the strength of the behavioural tendencies. It is therefore expected that spider-anxious children show larger AAT effects than non-anxious children.

These behavioural movements, (e.g., pushing a joystick or pulling a joystick) performed by the participant in the AAT have also been a central topic in former research. As early as in 1960, Solarz found that participants responded to aversive stimuli with a 'push' movement, whereas participants responded to pleasant stimuli with a 'pull' movement. Later research confirmed these findings (Chen & Bargh, 1999). With these experiments they demonstrated the existence of a direct link between automatic evaluation and approach avoidance behaviour. Why these arm movements are so strong and what kind of underlying mechanism is responsible for these movements is not clear (Rotteveel & Phaf, 2004).

Rinck and Becker (in prep.) used the AAT in their research of spider-anxious and non-anxious adults. In their first study, they found an AAT effect for the spider-anxious participants. The anxious participants had longer reaction times when pulling a picture of a spider towards themselves compared to the pushing of a spider-picture. As predicted, this AAT effect was not found in non-anxious participants. The AAT effects were also correlated

to the anxiety questionnaires. The more anxious a participant was, the bigger the AAT effect became. This AAT effect was not found in the 'empty' pictures block (background of the spider). The participants all had the same reaction times independent of the pushing or pulling of an 'empty' picture.

In their second study, Rinck and Becker (in prep.) examined a possible interference with the results found in their first study. The pushing of the joystick away from the body could also be interpreted as a pulling towards the spider picture on the screen. In this study, the participants received the instruction that they had to push the spider picture away from the screen instead of pushing the spider picture away from their body. The reversed movement was measured. The results indicated that there was no AAT effect found in either of the groups. They suggested that the AAT may be a valid procedure for assessing how strongly individuals react with avoidance. They argue in their conclusion that the AAT has important advantages compared to other indirect measures, such as the card format of the Stroop task. The AAT uses spider pictures instead of spider-related words and the AAT is a nonverbal task, indicating that the participants reading skills are unimportant. Most of all, the AAT not just measures reaction time, it also takes behavioural responses (e.g., avoidance and approach behaviour) into account.

I believe that the AAT is useful for younger children because of the simple instruction of the task and the fact that the stimuli are nonverbal. Furthermore, the pictures of spiders are more confronting than words, especially in younger children who cannot read. I therefore expect that children, like adults, with spider anxiety will have more problems pulling the spider pictures towards themselves and therefore reveal longer reaction times in this condition compared to the non-anxious children. The children without spider anxiety just have a little antipathy toward the spider, and therefore respond much faster than the other group. I also expect that high-anxious children shall make more mistakes when pulling a spider towards themselves because it is an incompatible movement.

Method

Participants

Children were recruited from an elementary school in The Netherlands. After parents granted permission for cooperation of their child in the study, a total of 87 children aged between nine and twelve participated in the study. The mean age of the children was 10;4 and

there were 41 boys and 46 girls. These children were given two self-report measures of anxiety: The Fear Survey Schedule for Children- revised, (FSSC-R; Ollendick, 1983) translated in Dutch by Oosterlaan, Prins, Hartman and Sergeant (1995). The children were also given the Spider Anxiety Screening (SAS; Rinck et al., 2002).

The children were assigned to three different groups, based on their answers given on the self reports. The children were assigned to the high-anxiety group if they met the Survey, answering 'very afraid' to item 12 on FFSC-R and had a score above 16 on the SAS. The children were assigned to the average-anxiety group if they met the Survey, answering 'a little afraid' to item 12 on the FFSC-R and had a score between 2 and 16 on the SAS. The children were assigned to the low-anxiety group if they met the Survey, answering 'not afraid' to item 12 on the FFSC-R and had a score between 0 and 2 on the SAS. The dataset of twelve participants were incomplete, due to technical and logistic problems. The data of twelve participants were eliminated from the study due to unreliable reactions on the AAT. A total of 63 participants participated in the experiment, consisting of 14 high-anxious children (2 males and 12 females), 32 average-anxious children (16 males, 16 females) and 12 low-anxious children (9 males, 3 females).

Materials and Apparatus

The FFSC is a self-report test; participants are asked to answer 80 questions on a three-point scale: not afraid, a little afraid, or very afraid. These 80 questions are divided into 5 subscales: fear for school, fear for new situations, fear for small animals and fear for medical acts. Question 12 is about fear of spider (See Appendix A).

The children were also given the Spider Anxiety Screening (SAS; Rinck et al. 2002). The SAS is a questionnaire in which the children respond to 4 spider-related questions on a 6-point scale. A Dutch version of the SAS was used in this experiment (See Appendix B).

The Behavioural Assessment Test (BAT) was used to assess the children's anxiety towards real spiders. The BAT is a behavioural test; participants are asked to approach a spider as fast as possible from a distance of four meters. The BAT was scored with respect to duration and its distance towards the spider. The experimenter also noted when the child did not want the spider box to be opened.

Children were asked to perform an Approach-Avoidance Task (AAT). The task requires from children to react to a single stimulus appearing on a computer screen by pulling or pushing a joystick. The stimuli are either pictures of spiders or just 'empty' pictures

(picture of the spiders' background): 8 pictures of spiders and 8 pictures of just the backgrounds of the spider pictures were selected for the experiment.

The AAT was presented to the participant via a laptop computer with a mobile 1.6 GHz processor and an extern 15'' colour monitor. The joystick was connected to the computer. A computer program was designed to present the stimuli and to record the response times automatically. All pictures appeared on the centre of the computer screen. Each picture was on the screen until the participant reacted. If the participant pushed the joystick away from him or herself the picture became smaller and smaller. The picture disappeared as soon as the participant pushed the joystick 45 degree away from himself. If the participant pulled the joystick towards him or herself, the picture became bigger and bigger. The picture disappeared as soon as the participant pulled the joystick 45 degree towards him or herself. The participant had to push a button before the next picture appeared on the screen.

Procedure

Each participant was asked to sit in front of a computer screen and was told that single pictures of spiders and 'empty' pictures would be presented on the computer screen. The task was to respond as fast as possible to the picture by pulling or pushing a joystick. The joystick was located on the table between the participant and the computer screen.

In the first session half of the participants were asked to push the joystick away from themselves when seeing a spider and to pull the joystick towards themselves when seeing an 'empty' picture. The other half got the reversed instruction. After 16 practice trials, 80 trials with spider pictures and 80 trials with 'empty' pictures were presented on the screen in a random order. The program was designed so that not more than 3 pictures of the same type were presented successively.

The participants performed the second session within three weeks from the first session. In the second session the instruction was reversed. The participants, who had first pushed the spider away and pulled the 'empty' pictures, now had to push the 'empty' pictures and pull the spider pictures towards themselves. The participants, who had performed the other condition, were asked to push the spider pictures and pull the 'empty' pictures. After 16 practice trials, 80 trials with spider pictures and 80 trials with 'empty' pictures were presented on the screen in a random order. The program was designed so that not more than 3 pictures of the same type were presented successively. Each participant performed 80 trials in each of the four possible combinations of picture type (spider/empty) and response direction (pull/push).After performing the second AAT, the participants were asked to perform a BAT.

Design

Two full combinations of the two within-participant factors 'picture type' (spider/empty) and 'response direction' (push/pull) with the between-participants factor group (low, average, high) yielded a 2*2*3 factorial design. Participants' manual reaction times of correct and of incorrect responses were used as dependent variables.

To compare the AAT with the SAS, the FFSC and the BAT, a correlation matrix was computed.

Results

Only the median of the reaction times of the correct responses were analyzed, so that extreme low or high reaction times were eliminated. A split half test was conducted to assure that the participants responded reliably during the experiment. A reaction time that differed more than 2 standard deviations between the first and second part of the task was considered unreliable. Ten participants had differences over 400 milliseconds between the two parts of the experiment (> 2 *SD*) and were therefore eliminated from the study. No differences were observed for error rates, the error rates were uniformly low (2, 4 %), except for two participants (12 % and 8 %); they were also eliminated from the study.

The 2*2*3 ANOVA of the reaction times yielded a significant effect of picture type ($F(1,60) = 109.8$; $p = .001$; $eta^2 = .65$). Participants responded more quickly to spiders than to 'empty' pictures. There was an effect of response direction ($F(1, 60) = 21,32$; $p = .001$; $eta^2 = .26$): on average the pushing was faster than pulling.

Most important, the ANOVA yielded a marginally significant three-way interaction of picture type, response direction, and group ($F(2,60) = 2,6$; $p = .083$; $eta^2 = .08$). Separate analyses for the comparison between the groups were significant for the comparison between the low-anxiety and the average-anxiety group ($F(1,49) = 7.25$; $p = .01$; $eta^2 = .13$) and for the comparison between the average-anxiety group and the high-anxiety group ($F(1,47) = 6.84$; $p = .01$; $eta^2 = .12$). The differences between the low-anxiety and the high-anxiety group were not significant ($F < 1$). The mean reaction times and AAT effects are shown in Table 1, separately for each combination of group, picture type, and response direction.

Table 1

The Mean Reaction Times and AAT Effects for each Group in each Condition

Anxious	Spider			Empty		
	Push	Pull	AAT effect	Push	Pull	AAT effect
Low	689	767	-78	759	764	-5
Average	747	770	-23	813	828	-15
High	728	792	-64	819	805	14

The 2*2*3 ANOVA of the percentages 'wrong answer' revealed that the expected three-way interaction of group, picture type, and response direction was not significant (F < 1). The different groups had the same amount of wrong answers during the task. Separate analyses of pulling the empty pictures showed a marginal signification between the low-anxious and the moderate-anxious group ($F(1,62) = 3,0$; $p = .087$; $eta^2 = .07$): The low-anxious participants made less mistakes than the moderate-anxious group. The differences between the other groups were not significant (F < 1). All groups made the same amount of mistakes independent of the different picture types and response directions. The mean percentages of the movements which were wrong are shown in Table 2, separately for each combination of group, picture type, and response direction.

Table 2

The mean percentages of the movements which were wrong, separately for each combination of group, picture type, and response direction

Anxious	Spider		Empty	
	Push	Pull	Push	Pull
Low	4,4	3,8	4,9	4,6
Moderate	4,6	4,8	5,4	7,1
High	5,3	4,9	5,9	7,6

To validate the observed effects, the effects of the movements (AAT) were related with direct measures of spider fear; the FFSC-R and the SAS. The effects of the movements were also related to fear-related behaviour, measured with the BAT. Both questionnaires did not correlate with the AAT effects of the movement. The effect of the movement was also not

correlated with the BAT scores .07 ($p > .005$). The questionnaires did correlate with each other; the FFSC-R and the SAS correlated .78 ($p < .001$). The questionnaires also correlated with the BAT. The SAS and the BAT correlated significant .37 ($p < .001$). The FFSC-R and BAT also correlated significant .30 ($p < .005$).The different correlations are shown in table 3.

Table 3

Correlation matrix for the BAT the FFSC-R, the SAS and the AAT

	BAT	FFSC-R item 12	SAS	AAT
BAT	**-**	**.30***	**.37****	**.07**
FFSC-R item 12	**.30***	**-**	**.78****	**.08**
SAS	**.37****	**.78****	**-**	**-.054**
AAT	**.07**	**.08**	**-.054**	**-**

*** Correlation is significant at the 0.05 level (2-tailed)**
**** Correlation is significant at the 0.01 level (2-tailed)**

Discussion

The purpose of this research was to find possible differences between spider-anxious and non-anxious children, using the Approach-Avoidance Task. It was expected that children, like adults, with spider anxiety had more problems pulling the spider pictures towards themselves and therefore had longer reaction times. It was also expected that the children without spider anxiety just had a little antipathy toward the spider, and therefore responded much faster than the other group. Moreover, it was expected that high-anxious children made more mistakes when pulling a spider pictures towards themselves because it was an incompatible movement. As expected, the high-anxious children had significantly more difficulty pulling the joystick towards themselves compared with the moderate-anxious children. The low-anxious children on the other hand responded just as slow as the high-anxious children.

There were no differences between the groups, with respect to the number of mistakes that were made. The spider-anxious participants did not make more mistakes when pulling a spider-pictures towards themselves compared to the non-anxious participants. Separate analyses of pulling the empty pictures only showed a marginal signification between the low-anxious and the moderate-anxious group.

To give insight in the validation of the test, correlation matrixes were computed. There were no significant correlation between the AAT and the other questionnaires and the BAT. This result does not confirm the hypothesis. As expected the questionnaires and the BAT did correlate with each other.

Whereas the high spider-anxious children and the average spider-anxious children reacted just as predicted, the low spider-anxious children had a different reaction pattern. Due to these unpredicted results, the correlation matrixes also showed different results. The participants who scored average or high on the BAT, the FFSC-R and the SAS all showed the predicted AAT effect. These low correlations between the AAT and the other tests were due to the strange results of the low-anxious group.

A possible explanation is that the low-anxious children had difficulty perceiving their anxiety. Another possibility is that children of this age are highly sensitive for social evaluation and therefore give socially desirable answers. Although these explanations may appear reasonable, these reasons are hard to defend because all children performed a behaviour test (BAT). In this behaviour test all children were challenged to approach a real spider. All low-anxious children had high scores on the BAT, which suggests that they were not afraid of spiders.

Although the BAT seems a good approach to measure children's anxiety of spiders, the classification of the groups in this study was based on the scores on the self reports. A classification based on the BAT would have been better. The problem with the BAT was that all children were so excited about the task that they ran as fast as possible to the spider. The test did not measure whether the children actually looked at the spider or directly ran away from the spider. This means that there was not enough variation between de scores of the children. In future research a ten-point scale of the BAT should be used in order to obtain larger differences between the spider anxious and the non anxious children. A ten-point scale of the BAT requires that children fulfil different steps which are leading them closer and closer to a real spider. A child receives 10 points if he dares to touch the spider for more than ten seconds. Research done with this ten-point scale of the BAT showed that the BAT was valid and reliable (Arntz, 1993).

Kindt et al. (2000) had another explanation for these outcomes. They argued that children at a younger age all show selective attention, independent of their height of anxiety. Kindt et al. (1997) found that low-anxious children showed a decrease in selective attention with age (8-12), whereas the high-anxious children showed an increased in selective attention with age. Although these results suggest that children of different ages respond differently, I

have not taken age into account. It is possible that the differences in age were responsible for these unexpected results. As Kindt et al. (2000) also noted girls are generally more afraid of spiders than boys. I have not taken sex into account in this study. When looking at the data most of the boys were located in the low-anxious group whereas most of the girls were located in the high-anxious group. The average-anxious group represented the same numbers of boys and girls. It is possible that these sex differences in the different groups lead to these results. In further studies sex and age should be taken into account when looking for differences between low-anxious and high-anxious children.

Furthermore the AAT itself has some limitations, when compared to other indirect measures. Although the AAT takes behavioural tendencies into account, these tendencies are limited to approach and avoidance behaviour in a standard setting. Second, The AAT does not distinguish between different types of associations, which might relate to approach and avoidance behaviour. The AAT cannot, for example, distinguish between anxiety and disgust towards spiders.

Further research is required to evaluate the Approach-Avoidance Task (AAT) for its value in studying the underlying mechanisms of anxiety in children. Although it is hard to draw clear conclusions from this experiment, interesting new questions certainly came up which can lead us to the right direction in further research to measure the implicit mechanisms of anxiety in children.

At the end of this article I would like to explain its relation and value for handling learning problems. Although learning problems are well defined, certain researchers emphasize the relation between learning problems and behaviour problems, like anxiety disorders (Bosman & Braams, in prep.; Huntington en Bender (1993); Prior, Sanson, Smart & Oberklaid, 1999). Prior et al. (1999), for example, found that 24 % of the children with mathematical and spelling difficulties had phobic disorders or anxiety. These associations between learning problems and anxiety even persisted after controlling for intelligence and social economic status. Bosman and Braams (in prep.) also found that the parents of dyslectic children judged their children as more anxious compared to the judgements made by the parents of normal children.

One of the main disadvantages of anxiety is that highly-anxious children have difficulty encoding information, organizing information into larger patterns of meaning, and effectively employing meta-cognitive processes such as self monitoring (Benjamin, McKeachie, Lin, & Holinger, 1981). These disadvantages can influence the development of the child in a negative way. Children with learning problems already face main disadvantages

in for example reading, and therefore really need these skills to make progress. It seems thus important to early recognize anxiety disorders in children with learning problems to prevent them from dropping behind.

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Appendix A

Translated version of the FFSC-R (Vragenlijst voor Angst bij Kinderen)

1. Voor de klas iets moeten vertellen
2. In de auto of bus meerijden
3. Straf krijgen van moeder
4. Hagedissen
5. Er zelf gek uit zien
6. Geesten of spoken
7. Scherpe dingen
8. Zelf naar het ziekenhuis moeten
9. Dood of dode mensen
10. Verdwalen op plaatsen waar je de weg niet weet
11. Slangen
12. Iemand opbellen
13. Achtbaan of botsautootjes
14. Ziek worden op school
15. Nadat de directeur of directrice van de school gestuurd worden
16. Met de trein rijden
17. Thuis achterblijven met een oppas
18. Beren of wolven
19. Iemand voor het eerst zien
20. Aanvallen met bommen – verovering van ons land door een ander land
21. Een prik krijgen van de verpleegster of doktor
22. Naar de tandarts gaan
23. Hoge plaatsen zoals bergtoppen
24. Geplaagd worden
25. Spinnen
26. Een dief die in ons huis inbreekt
27. In een vliegtuig vliegen
28. Bij de meester of juf moeten komen
29. Slechte cijfers krijgen
30. Vleermuizen of vogels
31. M’n vader en moeder die zeggen dat ik iets niet goed gedaan heb
32. Geweren
33. Met anderen vechten
34. Vuur – brandwonden krijgen
35. Je snijden of gewond raken
36. Veel mensen om me heen
37. Onweer
38. Iets moeten eten wat ik niet lekker vind
39. Katten
40. Een proefwerk slecht maken
41. Aangereden worden door een auto of vrachtauto
42. naar school moeten
43. Wilde spelletjes doen tijdens het speelkwartier
44. Ruzie tussen mijn vader en moeder
45. Donkere kamers en kasten
46. Iets opvoeren

47. Mieren of kevers
48. Als andere mensen zeggen dat ik iets niet goed doe
49. Mensen die er raar uitzien
50. Bloed zien
51. Naar de dokter gaan
52. Een hond die ik niet ken of die er gemeen uitziet
53. Begraafplaats
54. Je rapport krijgen
55. Als je har wordt geknipt
56. Diep water of de zee
57. Nare dromen
58. Van een hoogte vallen
59. Een elektrische schok krijgen
60. Naar bed gaan in het donker
61. Misselijk worden als je in de auto, bus, trein of het vliegtuig ben
62. Alleen zijn
63. Kleren aan moeten die anderen niet aan hebben
64. Straf krijgen van mijn vader
65. Na moeten blijven op school
66. Fouten maken
67. Griezelfilm
68. Harde sirenes
69. Iets nieuws doen
70. Besmet worden of een ernstige ziekte krijgen
71. Kleine ruimten waarin alle deuren en ramen dicht zijn
72. Aardbevingen
73. Rusland
74. Liften waarmee je omhoog en omlaag kan gaan
75. Donkere plaatsen
76. Niet kunnen ademhalen
77. Gestoken worden door een bij
78. Wormen of slakken
79. Ratten of muizen
80. Een proefwerk maken

Appendix B

The Spider Anxiety Screening (SAS)

1. Ik ben bang voor spinnen
2. Bij de aanblik van spinnen word ik zenuwachtig en krijg ik hartkloppingen
3. Ik vermijd spinnen
4. Mijn angst voor spinnen belast mij