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Vicarious learning of children's social anxiety-related fear beliefs and emotional Stroop bias

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Abstract

Models of social anxiety suggest that negative social experiences contribute to the development of social anxiety and this is supported by self-report research. However, there is relatively little experimental evidence for the effects of learning experiences on social cognitions. The current study examined the effect of observing a social performance situation with a negative outcome on children's (8- to 11-years-old) fear-related beliefs and cognitive processing. Two groups of children were each shown one of two animated films of a person trying to score in basketball while being observed by others; in one film the outcome was negative and in the other it was neutral. Children's fear-related beliefs about performing in front of others were measured before and after the film and children were asked to complete an emotional Stroop task. Results showed that social fear beliefs increased for children who saw the negative social performance film. In addition, these children showed an emotional Stroop bias for social anxiety-related words compared to children who saw the neutral film. The findings have implications for our understanding of social anxiety disorder and suggest that vicarious learning experiences in childhood may contribute to the development of social anxiety.

Keywords: Childhood Fear, Social Anxiety, Vicarious Learning, Observational Learning, Emotional Stroop Task

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Current approaches to the development of social anxiety have highlighted the role of sensitizing social experiences in increasing risk for social anxiety disorder (e.g., Kimbrel, 2008; Rapee & Spence, 2004). These models suggest that aversive learning episodes interact with genetic, early temperament, and environmental risk factors in the onset of social fears, reinforcing the socially anxious and avoidant behaviors that characterize social anxiety disorder. The acquisition of fear from such learning episodes may include both direct (e.g., conditioning) and indirect (e.g., vicarious or informational) learning processes (Rachman, 1977). However, relatively few experimental studies have examined whether these learning processes could be implicated in the acquisition of *social* fear beliefs, and research in social anxiety has instead focused primarily on the role of maintaining mechanisms (e.g., cognitive biases, see Hirsch & Clark, 2004; Schultz & Heimberg, 2008). Consequently, less is known about the role etiological pathways may play in explaining the development of social fears.

Evidence for direct learning processes in social anxiety is based on the theoretical assumption that social fears develop as a consequence of adverse social experiences from earlier in the individual's life (Clark & Wells, 1995; Mineka & Zinbarg, 1995). Research has examined this assumption by asking individuals with social anxiety disorder whether they can recall a traumatic event (i.e., a specific conditioning episode) that marked the start of their social fears. For example, Stemberger, Turner, Beidel, and Calhoun (1995) found a greater percentage of individuals with the specific subtype of social phobia recalled a traumatic conditioning episode involving an anxiety-provoking social situation in comparison to a non-anxious control group. Öst (1987) reported that 58% of his sample recounted acquiring social phobia via a direct conditioning experience. More recent studies have shown that adults with social anxiety disorder report more experiences of childhood teasing than adults with either panic disorder or obsessive compulsive disorder (McCabe, Anthony, Summerfeldt, Liss & Swinson, 2003; McCabe, Miller, Laugesen, Antony, & Young,

2010). In addition, Hackmann, Clark, and McManus (2000) found that 96% of a sample with social anxiety disorder recalled an event that was closely linked to the negative self-image they typically hold in mind during social situations, while 77% of the sample reported the event depicted in the memory subsequently increased their anxiety in social situations. These findings are consistent with research showing that problematic social experiences involving peer groups recalled by both socially anxious adults (Harvey, Ehlers, & Clark, 2005) and adolescents (La Greca & Lopez, 1998) tend to coincide with the onset of social fears.

Although they provide some evidence for the role of learning processes in the development of social fears, the retrospective and correlational nature of these studies limits the conclusions that can be drawn. Indeed, an individual's reconstruction of a past event may affect the reliability of the memory recalled (Anderson & Conway, 1993). Therefore, it is difficult to ascertain whether a distressing social event did in fact directly lead to the development of social fears, when the event recalled may be subject to distortions in memory. In addition, there is some evidence to suggest a subset of people with social anxiety disorder do not recall traumatic conditioning events. For example, Stemberger et al. (1995) found that individuals with the generalized subtype of social phobia did not differ from non-anxious controls in the number who reported a traumatic social experience that marked the start of their social fears.

Contemporary models of fear acquisition have implicated processes other than direct learning in the development of fear-related beliefs (Davey, 1997; Field & Davey, 2001). These models suggest that fear may develop through indirect processes, without the individual directly experiencing trauma themselves. For example, fears can be socially transmitted, either vicariously through observing other people respond fearfully to a particular stimulus, or via the transmission of negative information from others (Rachman, 1977). Experimental evidence supports the role of the vicarious pathway in fear acquisition (e.g., Askew & Field, 2008). In a series of influential studies, Mineka, Cook, and colleagues showed that lab-reared rhesus monkeys observationally learn to fear

snakes by watching other monkeys interacting fearfully with snakes (e.g., Cook & Mineka, 1989; 1990; Cook, Mineka, Wolkenstein, & Laitsch, 1985; Mineka & Cook, 1993; Mineka, Davidson, Cook, & Keir, 1984). In children, vicarious learning has recently been shown to lead to changes in all three of Lang's (1968) fear response systems: verbal-cognitive, overt behavioral, and physiological responses (Askew, Çakir, Põldsam, & Reynolds, 2014; Askew, Dunne, Özdil, Reynolds, & Field, 2013; Askew & Field, 2007; Askew, Kessock-Philip, & Field, 2008; Dubi, Rapee, Emerton, & Schniering, 2008; Dunne & Askew, 2013; Gerull & Rapee, 2002) as well as attentional bias for animals (Reynolds, Field, & Askew, *in press*).

It appears likely that indirect learning processes are inherent in the development of a broad range of anxiety responses, including social fears. For example, McNeil, Lejuez, and Sorrell (2010) adopted a behavioral perspective to explain the nature of social anxiety disorder. They argue that although traumatic conditioning events may explain why some individuals develop social anxiety, information transfer and vicarious learning are further possible mechanisms that could account for socially anxious behavior. They draw on the example of an individual who hears of others experiencing an embarrassing social situation – the individual may subsequently avoid such situations despite the absence of directly experiencing the event. In support of this view, Mulkens and Bögels (1999) found that individuals with a fear of blushing, a physical symptom of social anxiety disorder, reported more memories of conditioning experiences (i.e., a painful or traumatic event connected with blushing) and vicarious learning experiences (i.e., fear of blushing in family or friends) than individuals without a fear of blushing. In other self-report studies, 12.9 to 15.6% of individuals with social phobia assigned a vicarious learning cause to their fear (Öst, 1985; 1987; 1991; Öst & Hugdahl, 1981). However, these studies are subject to the same criticisms as other studies using retrospective reports to examine the origins of social fears. While the findings suggest a relationship between social fears and adverse social experiences, the direction of causality is unclear. It could be argued that individuals with a fear of blushing displayed a bias towards

recalling such learning experiences because these experiences are consistent with current views of the self.

Experimental paradigms offer an alternative way of assessing the influence of indirect learning processes on social fear beliefs while allowing conclusions to be drawn about causal links. Developmental research using a prospective experimental design has shown that children's social fear beliefs increase after hearing negative information (i.e., voices of people expressing negative opinions) about different types of social situations (Lawson, Banerjee, & Field, 2007). In addition, research examining the effect of maternal modeling on the transmission of social fears has found that infants (12- to 14-month-old) who watch their non-anxious mother behave in a 'socially anxious' manner towards a stranger subsequently display more fearful behavior towards the stranger than when the mother behaves in a non-anxious manner (de Rosnay, Cooper, Tsigaras, & Murray, 2006). This effect also appears to work in the other direction: When children observe their mother, or to a lesser degree also a stranger, interacting positively with an unfamiliar adult they show less wariness toward that adult in a subsequent social interaction (Feiring, Lewis, & Starr, 1984). Such findings are consistent with research showing the relationship between maternal and child social anxiety is mediated by maternal fear of negative child evaluation, as reported by both the child and the mother (Schreier & Heinrichs, 2010), and recent longitudinal research showing the presence of social anxiety disorder in mid-adolescence is predicted by maternal anxiousness in pre-school aged children (Rapee, 2014).

Further research has shown an enhanced tendency for adults with social anxiety disorder to form aversive associations. In a study comparing individuals with social anxiety disorder and non-anxious controls, Lissek et al. (2008) repeatedly paired neutral facial expressions (the conditioned stimuli) with one of three socially-relevant unconditioned stimuli (a critical face with negative insults, a happy face with positive compliments, or a neutral face with neutral comments). They found a greater fear-potentiated startle response to neutral faces that had been paired with the

critical face and negative insults, but only within the social anxiety group. However, the authors of this study acknowledged that using preselected groups of individuals with and without social anxiety disorder meant that it could not be determined whether this greater learning response is a precursor to the disorder or a result of the disorder itself. Adopting a similar methodology to Lissek et al. (2008), Haddad, Lissek, Pine, and Lau (2011) examined whether such social conditioning could subsequently influence attentional biases for threat in typically developing adolescents (12- to 15-year-olds). The results of this study showed that socially positive and negative unconditioned stimuli (i.e., a child with a happy face and a positive comment, and a child with an angry face and an insulting comment, respectively) could change perceptions of previously neutral stimuli (i.e., children with neutral facial expressions). In addition, those adolescents who rated the neutral stimuli as particularly negative subsequently demonstrated a stronger attentional bias towards these stimuli, as measured by a dot probe task. Taken together, this research offers support for the role of learning mechanisms in the development of social fears, and suggests fear conditioning could affect specific types of information processing, particularly attention towards social stimuli.

McNeil et al.'s (2010) behavioral model of social anxiety predicts avoidance of social situations following vicarious learning. Previous experimental studies (e.g. Haddad et al., 2011) have successfully investigated the effect of emotional faces on adolescents' cognitions for other social stimuli (faces), or focused on young infants' avoidance of a social stimulus (stranger) in response to their mothers' modelling (e.g., De Rosnay et al., 2006). These are convincing demonstrations of vicarious learning, but it is not yet known whether children's fear-related responses are learned in response to the specific stimulus involved in the learning episode (e.g., the specific stranger in the experiment) or if they would generalize to similar social stimuli or situations (e.g., social interactions with other strangers). The current study utilized a new paradigm in which 8- to 11-year olds were presented with animated films of a social performance situation that had a negative (embarrassing, humiliating) or neutral outcome and children's fear cognitions for both the

specific and general social performance situations were measured. It was predicted that children would show increased fear-related cognitions for the social performance situation seen during learning and concepts related to social performance more generally.

Method

The 8 to 11 years age group was chosen because social phobia typically has onset during adolescence (Öst, 1987), though it can occur much earlier with reports of children as young as 8-years-old showing signs of the disorder (Beidel, Turner, & Morris, 1999). Moreover, De Rosney et al. (2006) have shown that children aged 12 to 14 months can observationally learn to be more fearful and avoidant of strangers. Therefore, it made sense to investigate children who are younger than the typical age of onset. However, at the same time children also needed to be old enough for direct and indirect measures of cognitions to be reliably taken. A well-established phenomenon in the learning literature is that previous learning history with a stimulus can inhibit subsequent learning for it (Lubow, 1973; Lubow & Moore, 1959). Thus the more experience children were likely to have with the social situation, the less learning would likely be observed. Thus it was also important that children were as young as possible to have relatively few experiences of the social performance situation used in the experiment.

Children's social fear beliefs were measured before and after vicarious learning in the current study with the expectation that vicarious learning would increase children's social fear beliefs for the social performance situation. One potential weakness of self-reported fear beliefs as the sole measure of children's fear-related cognitions is that they might be subject to demand characteristics because participants can potentially control their responses. One form of cognitive response that is less under conscious control is Stroop interference in the emotional Stroop task (see e.g., Williams, Mathews, & MacLeod, 1996, for a review). The emotional Stroop task is a modified version of the traditional Stroop task (Stroop, 1935) but typically involves participants naming the color of threatening words or pictures, rather than the names of colors. Stroop interference is believed to

occur when automatic processing of threatening words reduces the speed of color naming (Watts, McKenna, Sharrock & Trezise, 1986). Stroop bias is frequently described as attentional bias (e.g., Williams et al., 1996) but other authors have argued that the task cannot distinguish between selective attention, inhibitive emotional responses, mental preoccupation, or cognitive avoidance for Stroop words (Bögels & Mansell, 2004), so is perhaps best thought of simply as a processing bias (Nightingale, Field & Kindt, 2010). The emotional Stroop task is argued to be a useful measure of psychopathology (e.g., Williams et al., 1996) and evidence suggests that, for example, adults with social anxiety show a Stroop processing bias for socially threatening stimuli (see Bögels & Mansell, 2004; Ledley & Heimberg, 2006, for reviews). It is also known that adults can acquire emotional Stroop bias during vicarious learning events in which a model is observed experiencing mock panic attacks (Kelly & Forsyth, 2007). Further, the emotional Stroop task has already been used successfully with children in the age group under investigation here (see Nightingale et al., 2010 for a review); for example, 6- to 12-year-olds with social concerns show Stroop interference effects for socially threatening (angry) faces compared with neutral faces (Hadwin et al, 2009). Therefore, an emotional Stroop task was used in the current study to measure Stroop interference for social performance anxiety-related words following social vicarious learning: Increased Stroop interference following learning would indicate that emotional Stroop bias can be vicariously learnt in childhood and rule out a demand characteristics explanation for increases in social fear beliefs. An advantage of the emotional Stroop task here is that it can be used to measure responses to individually presented words that activate specific concepts, and hence children's processing of social performance anxiety-related concepts can be determined. However, both general state and trait anxiety can interact to affect Stroop interference for threatening words in adults; participants high in trait anxiety show Stroop interference following experimentally induced state anxiety (Williams et al., 1996). Therefore, children's trait social anxiety was controlled for in the current study so that the effect of the learning manipulation alone could be observed, and to rule out effects

being due to vicarious learning activating pre-existing social anxiety.

Gray (1976, 1982) suggested in his reinforcement sensitivity theory, that there are three major systems of emotion: the behavioral inhibition system (BIS), the fight/flight system (FFS), and the behavioral approach system (BAS). The BIS was argued to be particularly sensitive to signals of punishment and lack of reward in conditioning with anxiety-related aversive stimuli. It is responsible for the anxiety emotion and higher sensitivity in the BIS system leads to higher trait anxiety (Gray & McNaughton, 2000). Thus measures of BIS correlate with measures of trait anxiety (Carver & White, 1994) and social anxiety (Biederman et al., 2001). Given also the relationship with associative learning, BIS scores may be related to the strength of observational learning of social anxiety in children and were also measured in the current study to test this.

Participants

Sixty-four children (32 boys, 32 girls) aged between 8.11 and 11.59 years old (M = 10.09 years, SD =1.05 years) were recruited from a London, UK primary school. Parents gave informed consent for their child to take part in the study and children gave verbal assent. A similar number of children were in each group: 33 children (14 boys and 19 girls) were in the negative film group and 31 (18 boys and 13 girls) in the neutral film group. Children were randomly assigned to the two groups, which did not differ significantly on measures of either behavioral inhibition (negative: M = 12.06, SD = 2.95; neutral: M = 11.68, SD = 2.87), $t(62) = 0.53$, $p = .60$, $r = .09$, or social anxiety (negative: M = 38.91, SD = 20.48; neutral: M = 40.00, SD = 17.64), $t(62) = 0.23$, $p = .82$. U.K. primary school children in this age group were assumed to have relatively little experience of basketball compared to other sports and compared to their older peers. Children were not directly asked about their experience of basketball, but most children (N = 47) reported no experience of situations similar to the film (i.e., trying to throw a ball into a basket while being watched by others) either directly, or indirectly via others. Seven children did report having direct experience of this situation, two had observed someone else in the situation, and four reported hearing verbal reports

of a similar situation. A further two children reported a mix of both direct and vicarious experience and two reported direct and verbal reports.

Materials

Films. Two short (80s) animated films were created for the experiment by the second author: one negative and one neutral film. Each film began with the written statement "You are about to see a performance by a candidate for a basketball team. They will be evaluated by three experts". Next a sports hall scene appeared on the screen and a (gender-neutral) stick figure child attempted to throw a basketball into a basket. On the right-side of the screen a panel of three judges sat behind a desk observing the child figure. In the neutral film the child successfully threw the ball into the basket and a thought cloud appeared above his or her head saying, "The first one done". A short time later the child threw the ball into the basket a second time and neutral emotional statements appeared in thought clouds ("Oh," "What a run," "All finished," and "Time to go") above his or her head again. The child figure displayed a neutral expression throughout as if it were a routine practice. After running around with the ball for a short while they left the hall. The negative film began in the same way but the child did not manage to get the ball in the basket. Negative statements appeared in thought clouds above his or her head ("I feel so ashamed", "Oh no!") and the child appeared embarrassed and sad. He or she then slipped twice while trying to run around with the ball and more negative thoughts appeared above his or her head ("What a fool", "Slipped again", "I am a failure"). Finally, after showing embarrassment the child figure left the sports hall.

Behavioral Inhibition Scale (BIS). A version of Carver and White's (1994) Behavioral Inhibition Scale (CW- BIS) adapted for children by Field (2006) was used to measure behavioral inhibition. The scale consists of seven items (two reverse scored) that children respond to on a four-point Likert-type scale (scored here: 0-not at all; 1-not really; 2-sometimes; 3-always) and produces a 0 to 21 score of the tendency to approach or withdraw from unfamiliar situations. This

modified version of the scale was found by Field (2006) to have high reliability (α = .68) and good correspondence with measures of anxiety in 7 to 10 year olds. Example items are "I feel pretty worried or upset when I think or know someone is angry at me" and "Getting told off upsets me".

Liebowitz Social Anxiety Scale for Children and Adolescents (LSA-CA). The 24-item LSA-CA (Masia-Warner et al., 2003) was used to measure levels of children's social anxiety. Children provided ratings of anxiety and avoidance in 12 social interaction and 12 performance situations. Children responded on 4-point scales to anxiety (0 = *none*; 1 = *mild*; 2 = *moderate*; 3 = *severe*) and avoidance (0 = *never*, 1 = *sometimes*, 2 = *often*, 3 = *usually*) items. Scores were obtained for subscales of performance and interaction anxiety; a combined total social anxiety score was calculated and used in the current study. Some wording was altered slightly from American to British English for U.K. children (e.g., "store" was changed to "shop" and "food court" was changed to "canteen"). The LSA-CA has been shown to have high internal consistency (Cronbach's α = .90–.97) with children aged 7–18 years (Masia-Warner et al., 2003).

Social Fear Beliefs Questionnaire (SFBQ). The social fear beliefs questionnaire was created for the current experiment and contained seven questions (four reverse-scored) about how threatening children thought they would feel in performance situations related to the films. The questionnaire began with a statement in which children were asked to imagine they had been invited to represent a basketball team and perform in front of expert coaches, and asked, "Do you think you would be nervous to perform/play in front of them?", which was followed by a further six questions, such as, "Would you be scared if you knew that others are looking at you when you perform/play?" and "Would you look forward to performing in front of others?" Children responded on a five-point Likert-type Scale (0 = *not at all*; 1= *no, not really*; 2 = *don't know/neither*; 3 = *yes, a little bit*; 4 = *yes, very*) adapted from Lawson et al. (2007). Responses were added then divided by seven to produce a final score on a scale from 0 to 4, with higher scores indicating higher social fear beliefs. Internal consistency of the SFBQ was good before, α = .67,

and after, α = .78, children saw the films.

Emotional Stroop Task. An emotional Stroop task was computerized using SuperLab 4.0 software on an RM Notebook 4300 with 17-inch monitor. Children were informed that words would be presented in different colors and their task was to say what color the word was as quickly as possible by pressing the corresponding colored (red, yellow, green or blue) key on the keyboard in front of them. Trials consisted of three word lists, each containing six words: six social anxiety-related words (*audience, clumsy, criticize, embarrassed, ridicule, watched*); six neutral words (*forehead, hammer, locker, potato, umbrella, walk*); and six neutral words relating specifically to the film situation (*ball, basket, coach, court, game, player*). Neutral and social anxiety-related words were taken from Becker, Rinck, and Margraf's (2001) word lists, and film-related words were created specifically for the current study. Each of the 18 words was presented in each of the four colors (red, yellow, blue, and green) in a series of 72 randomized color-naming trials. In addition, children were first presented with 16 practice trials of four neutral words: *book, house, position, thing* (taken from Labarge, Cash, & Brown, 1998) in each of the four colors. A trial began with a 500ms fixation cross followed immediately by the word. Children's response times and whether they had named the color correctly were recorded. Pressing the key also activated the start of the next trial, which began after a 2000ms interval.

Procedure

First, children were asked to complete the BIS, SFBQ and LSAS-CA. In order to assess possible effects of prior fear on the experimental manipulation and measures, children were also asked if they would feel afraid in a situation where they had to throw a ball into a basket while others judged them. Children in the negative film group then watched the negative film and children in the neutral film group watched the neutral film. Next, all children completed the SFBQ a second time to ascertain whether social fear beliefs had changed as a result of vicarious learning.

Finally, they all did an identical emotional Stroop task. Children were fully debriefed as to the nature and purpose of the study using age-appropriate language.

Results

Data Analytic Plan

Initially correlation analyses were conducted to determine the strength of any relationships between variables. Next, changes in social fear beliefs due to vicarious learning were analyzed in a two-way 2(film type: negative vs. neutral) × 2(time: before learning vs. after learning) mixed analysis of covariance (ANCOVA) conducted on social fear beliefs scores. Children's general levels of social anxiety could also potentially affect social vicarious learning. At best, excessive levels of trait social anxiety might create excessive 'noise' in the data and make it more difficult to detect changes in social fear beliefs. More serious, the films have the potential to create priming effects: It is possible that in high socially anxious children, existing social fear beliefs might be activated by watching the films, so that apparent changes in social fear beliefs are not actually effects of learning, but the activation of pre-existing anxiety and beliefs. Therefore, to control for this potential effect, trait social anxiety levels (LSAS-CA) were included in the analysis as a covariate.

To test for emotional Stroop interference, a two-way 2(film type: negative vs. neutral) × 3(word type: neutral, social, film) mixed ANCOVA was performed on children's RT scores. Responses on an emotional Stroop task can be affected by general levels of trait anxiety (Williams et al., 1996) and this was controlled for by again including general social anxiety scores as a covariate in the analysis. Finally, to investigate whether Stoop interference was moderated by post-vicarious learning levels of social fear beliefs, a step-wise regression equation was computed. After centering variables, neutral RTs were used as the criterion variable, and RTs for social words and

children's post-learning social fear beliefs scores were entered into the first step. The interaction between social RTs and social fear beliefs was entered into the second step to test for moderation effects.

Social Fear Beliefs

There were significant correlations between scores on the LSA-CA and social fear beliefs before and after the films (see Table 1), confirming that the SFBQ was measuring beliefs related to social anxiety. In addition, as well as correlating with LSA-CA scores, children's behavioral inhibition scores also correlated with social fear beliefs before and after the films, confirming the relationship between behavioral inhibition and social anxiety, and suggesting an association between behavioral inhibition and the vicarious learning of social anxiety.

Figure 1 shows social fear beliefs before and after social vicarious learning. Pre-learning social fear beliefs were similar in the negative (M = 1.59, SE = 0.11, 95% CI [1.37, 1.81]) and neutral (M = 1.58, SE = 0.11, 95% CI [1.35, 1.81]) film groups. But whereas social fear beliefs had increased following negative learning (M = 2.03, SE = 0.12, 95% CI [1.80, 2.27]) they decreased following neutral learning (M = 1.28, SE = 0.12, 95% CI [1.04, 1.52]). A two-way 2(film type: negative vs. neutral) × 2(time: before learning vs. after learning) mixed analysis of covariance (ANCOVA), with trait social anxiety as a covariate, was conducted on social fear beliefs scores. The main effect of time, $F(1, 61) = .017$, $p = .90$, $r = .02$, was nonsignificant, but there was a significant main effect of film type, $F(1, 61) = 6.51$, $p = .013$, $r = .31$, and the covariate social anxiety (LSA-CA), $F(1, 61) = 24.67$, $p < .001$, $r = .54$. The crucial film type × time interaction was also significant, $F(1, 61) = 27.60$, $p < .001$, $r = .56$, indicating that social fear beliefs increased due to negative learning compared to neutral learning when the effect of trait social anxiety was controlled for (see Figure 1).

Emotional Stroop Interference

There was a significant correlation between social anxiety (LSAS-CA) and RTs for all three word types, but no relationship between behavioral inhibition scores and RTs (see Table 1). A two-way 2(film type: negative vs. neutral) × 3(word type: neutral, social, film) mixed ANCOVA was performed on children's RT scores, with social anxiety as a covariate. General social anxiety proved to be significantly related to RTs, $F(1, 61) = 8.38$, $p = .005$, $r = .35$, supporting previous findings and its inclusion in the current analysis. All other main effects and interactions were nonsignficant apart from the critical film type × word type (Greenhouse-Geisser adjusted) interaction, $F(1.58, 96.23) = 10.48$, $p < .001$, $\eta^2p = .15$. Planned comparisons indicated that RTs were significantly longer for social anxiety words compared to neutral words, $F(1, 61) = 13.66$, $p < .001$, $r = .43$, but RTs for film-related words were no longer than for neutral words, $F(1, 61) = 2.63$, $p = .11$, $r = 20$, and this effect differed for each film type. Figure 2 shows children's mean RTs for each word type following negative and neutral films. Children who watched the neutral film showed similar RTs for all word types (neutral: $M = 991.15$, $SE = 25.24$, 95% CI [940.68, 1041.63]; social: $M = 989.98$, $SE = 32.28$, 95% CI [925.44, 1054.52]; film: $M = 984.66$, $SE = 27.43$, 95% CI [929.80, 1039.52]), but children who watched the negative film took longer to name the color of social anxiety-related words than other words (neutral: $M = 968.48$, $SE = 24.47$, 95% CI [919.56, 1017.40]; social: $M = 1077.44$, $SE = 31.28$, 95% CI [1014.88, 1139.99]; film: $M = 991.61$, $SE = 26.59$, 95% CI [938.44, 1044.78]). Thus the results showed that, when controlling for general levels of social anxiety, there was a significant effect of social vicarious learning on children's processing bias for social anxiety-related words.

Correlational analysis (see Table 1) found children's RTs for social anxiety words were significantly associated with social fear beliefs following vicarious learning and, to a lesser extent, before learning. These results suggest a relationship between children's social fear beliefs due to vicarious learning and a processing bias for social anxiety words. Similar outcomes were also

found for film-related words, but the relationship with social fear beliefs after learning was not as strong as before learning, and only approached significance. A step-wise regression equation with RTs for neutral words entered as the outcome variable was tested. Children's social fear beliefs scores after learning (β = -.18, p = .045) and RTs for social words (β = .79, p < .001) were entered into the first step of the significant model, $F(2, 61) = 39.33$, $p < .001$; $R^2 = .56$. The interaction between social fear beliefs and social RTs entered into the second step significantly improved (see Table 2) the significant model, $F(3, 60) = 30.46$, $p < .001$; $R^2 = .60$, indicating moderation of the relationship between film and neutral RTs by post-learning social fear beliefs. Figure 3 shows that this relationship changes at low, medium and high levels of social fear beliefs. When social fear beliefs are low following vicarious learning RTs for neutral and social words are almost identical, as we would expect if there was little or no Stroop interference. However, when post-learning social fear beliefs are high, RTs are longer than for neutral words, indicating greater Stroop interference. Therefore, increased vicarious learning leads to increased Stroop interference.

Discussion

Two groups of children were exposed to animated films with socially negative or neutral outcomes and their social anxiety-related cognitions were measured. Results showed that following the negative vicarious learning film: 1) children's fear beliefs for the social performance situation increased; and 2) children showed emotional Stroop interference for social anxiety-related words. There was also evidence that vicarious learning was related to children's general levels of social anxiety (for social fear beliefs and Stroop RTs) and, to a lesser extent, behavioral inhibition (for social fear beliefs only).

Results of this experimental study support predictions (e.g., McNeil et al., 2010) as well as previous self-report (Mulkens & Bögels, 1999) and experimental research (e.g., De Rosnay et al., 2006), indicating that vicarious learning leads to increases in cognitions related to social performance anxiety. However, previous experimental studies demonstrated learning for specific

stimuli: De Rosnay et al. (2006) showed that infants were more fearful and avoidant of a particular stranger after seeing their mothers fearfully interacting with them; and Haddad et al. (2011) showed increases in adolescents' scariness ratings for specific faces seen with negative face stimuli. In contrast, learning in the current study does not appear to be specific to a particular person, situation or stimulus: Results with 8- to 11-year olds' suggested that watching a cartoon character in a social performance situation can affect cognitive processing about performance situations in general. One of the interesting features of the Stroop findings was that a processing bias was found for social performance anxiety-related words (*audience, clumsy, criticize, embarrassed, ridicule, watched*), but not non-anxiety words related to stimuli seen in the specific situation (*ball, basket, coach, court, game, player*). This implies that fear did not become associated with specific physical stimuli in the social situation; rather, anxiety was associated with more general social performance-related features of the situation (e.g., having an audience, being clumsy, receiving criticism, etc.). However, it was not confirmed whether learned fear-related cognitions would generalize to other social performance situations (e.g., non-sport performance situation) because this was not tested here and would be an interesting avenue of future research. An alternative explanation for the Stroop finding might have been that social anxiety words had generally a more negative emotional valence than the other words. This interpretation is not supported though because there was no evidence of a general (main) effect of word type: Only an interaction between word type and the type of film children had watched, suggesting that the creation of Stroop interference was dependent on watching the film with a negative outcome.

Past studies have shown that vicarious learning can lead to Stroop bias in adults observing mock panic attacks (Kelly & Forsyth, 2007). The current findings are the first to demonstrate this learning effect in children in relation to social anxiety. Haddad et al. (2011) found no overall evidence of significant attentional bias (measured using a dot probe procedure) for negatively paired faces in their adolescent sample; however, they did find that the degree of attentional bias

observed was associated with how scary participants found the faces. Similarly, in the current study Stroop interference for social anxiety-related words was significantly associated with social fear beliefs after vicarious learning and increases in social fear beliefs because of learning. It is worth noting here the difference between attentional bias and emotional Stroop interference. Emotional Stroop interference effects are often interpreted in the literature as an example of attentional bias to threat, but more likely represent threat-related mental preoccupation or processing bias (Bögels & Mansell, 2004; Nightingale et al., 2010). An attentional bias procedure such as the dot probe task involves initial orientation towards a cue followed by timed orientation towards a target stimulus that is in the same or different location as the cue. Hence this task indicates the direction of the participant's attention to a particular cue relative to the target because it takes longer to detect a target if attention was previously in a different location. In contrast, the word and its color appear in the same location at the same time in the emotional Stroop task and hence attention is divided cognitively but not physically. Thus when word meaning interferes with color naming in the Stroop task this is more accurately a measure of emotional interference in processing than attentional bias (Nightingale et al., 2010).

High levels of social anxiety in adults can lead to Stroop bias for socially threatening stimuli (Bögels & Mansell, 2004; Ledley & Heimberg, 2006). Therefore, one possible limitation of the current methodology could be that effects do not represent real changes in cognitions during vicarious learning but merely the activation of pre-existing social anxiety in children. If this were the case, larger increases in fear beliefs and Stroop interference should be observed in children with higher levels of trait social anxiety. However, there is good reason to think this is not what happened in the current study. Negative vicarious learning was found to lead to increases in social fear beliefs and Stroop interference when existing levels of social anxiety were controlled for. Thus there was no evidence that children's trait social anxiety affected the findings.

The findings have implications for our understanding of how children acquire social anxiety.

They support models of the development of social anxiety suggesting that vicarious learning events are sensitizing social experiences that increase the risk of social anxiety (e.g., Kimbrel, 2008). One way this might occur is by vicarious learning increasing children's fear-related beliefs and assumptions about social situations. Clark and Well's (1995) model suggests that early learning experiences cause social phobics to develop maladaptive assumptions about themselves and their social world. This leads to anxiety-generating appraisals of social situations that are maintained by the negative information processing biases which characterize social anxiety. The current findings show that vicarious learning can contribute, via increased fear beliefs and assumptions about social situations, to the development of cognitive biases. Hirsch, Clark and Mathews (2006) have argued that cognitive biases may have an effect on, or interact with, each other for increased impact on social anxiety. Thus cognitive bias produced by vicarious learning might contribute then to the maintenance or development of social anxiety.

That children who observe aggressive behavior can subsequently exhibit similar aggressive behavior has been a well-known phenomenon for many years; most famously demonstrated by Bandura and colleagues in their seminal 'Bobo doll' research (e.g., Bandura, Ross, & Ross, 1961). Bandura (2001) has more recently discussed the key role of vicarious learning in the media to influence individuals' behavior. As well as the effects of observing siblings or familiar peers in a home or school environment, the current findings suggest a role for media involving strangers and fictional characters, such as films and children's television programs, in vicariously transmitting the potential costs and adverse consequences of entering certain social situations. Thus the findings have implications for those working in the production of children's media, suggesting that associating negative outcomes with social behaviors we would normally wish to encourage should be avoided. It is clear from the current findings that watching even a cartoon character's negative experiences in a social performance situation can lead children to develop threat-based beliefs about that situation.

In terms of limitations, other than children's levels of social anxiety, the study did not screen for psychopathology that might influence the findings. Nor were previous experience and knowledge about basketball controlled for, although children were asked about their own experience of trying to score baskets in front of judges. A minority of children reported some prior experience but, if anything, this would be expected to inhibit rather than increase learning. Also, the neutral film may not have been entirely neutral for some children: Although the film was designed to make scoring the basket appear to be as routine and neutral as possible, it is possible that some children could have found it more positive than neutral. Related to this, in addition to being more socially negative, the negative film may have been more intense or salient than the neutral film, which in theory could have affected children's responses in ways not controlled for in the analysis. This possible difference between films is difficult to control for because negative stimuli are likely to be more intense than neutral stimuli. Finally, the current manipulation utilized a specific sport-related performance situation and it is unclear whether effects would generalize to other performance situations, other types of social situation, or to the active behavioral avoidance of social situations. One possible next step would therefore be to test, perhaps at a later time point, whether children's vicariously learnt fear-related cognitions generalize to other types of performance situation.

Future research should also investigate whether a vicarious learning event is as effective in nonperformance situations, such as social interactions involving two or more persons. In particular, further research could focus on vicarious learning during social interactions with peers. Given existing research suggests negative social experiences with peer groups, particularly peer victimization, during adolescence is a risk factor for the development of social anxiety (La Greca & Harrison, 2005), it seems plausible that vicarious learning experiences of specific types of social relations could lead to the development of social fears. Another interesting avenue would be to investigate (using, for example, a dot probe or visual search task) whether children show attentional

bias for critical or angry faces following vicarious learning with social performance situations. Fear of criticism is likely to be a component of social performance anxiety and research has shown that socially anxious children can show an attentional bias for threatening faces (Stirling, Eley, & Clark, 2006).

In conclusion, the current study emphasizes the role of vicarious learning experiences as a potential mechanism through which children may develop social fears. Specifically, the findings extend existing research by showing that the cognitive responses children learn through observing a negative social situation can generalize to similar social situations. It would be important for future longitudinal work to establish whether this effect has a lasting impact on social fear beliefs, particularly for future situations of a similar nature and the avoidance of such social situations. Further work assessing the relative impact of both direct and indirect learning experiences is essential for informing our understanding of the causal processes involved in the development of social anxiety.

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Table 1

Correlations between measures of social anxiety (LSA-CA), behavioral inhibition (BIS), social fear beliefs (SFBQ) before and after vicarious learning, and RTs for neutral, social anxiety and film-related words (N = 64)

	1	2	3	4	5	6
1. LSA-CA						
2. BIS	.32**					
3. SFBQ (before)	.49***	.30*				
4. SFBQ (after)	.45***	.33**	.65***			
5. Neutral RT	.27*	.06	.19	.08		
6. Social RT	.37**	.06	.26*	.35**	.76***	
7. Film RT	.40***	-.02	.30*	$.24^{+}$	.88***	.84***

Note * $p < .05$, ** $p < .01$, *** $p < .001$, $^{+}p = .052$. Correlations are all Pearson coefficients (r), except those involving Social RT and Film RT, which are Spearman's rho (ρ).

Table 2

Results of hierarchical regression analysis to investigate moderation of the relationship between film and neutral RTs by post-vicarious learning social fear belief scores

	R^2	*F*	*b*
Step 1	.56	39.33***	
SFBQ			-.18*
Social RTs			.79***
Step 2	.60	30.46***	
SFBQ			-.19*
Social RTs			.83***
SFBQ x Social RTs			-.20*
Step change statistics	.04	6.12*	

Note: * $p < .05$, ** $p < .01$, *** $p < .001$

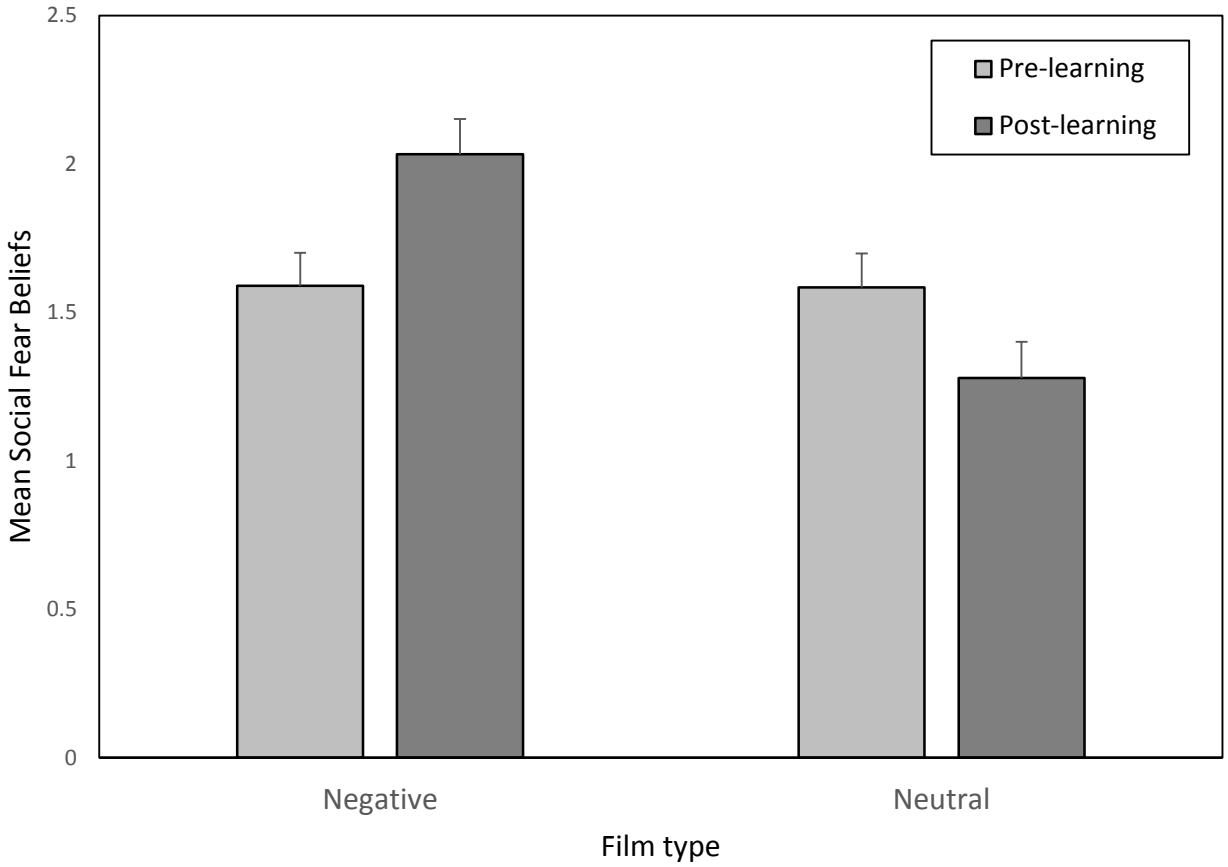

Figure 1. Mean (and SE) social fear beliefs before and after negative and neutral films

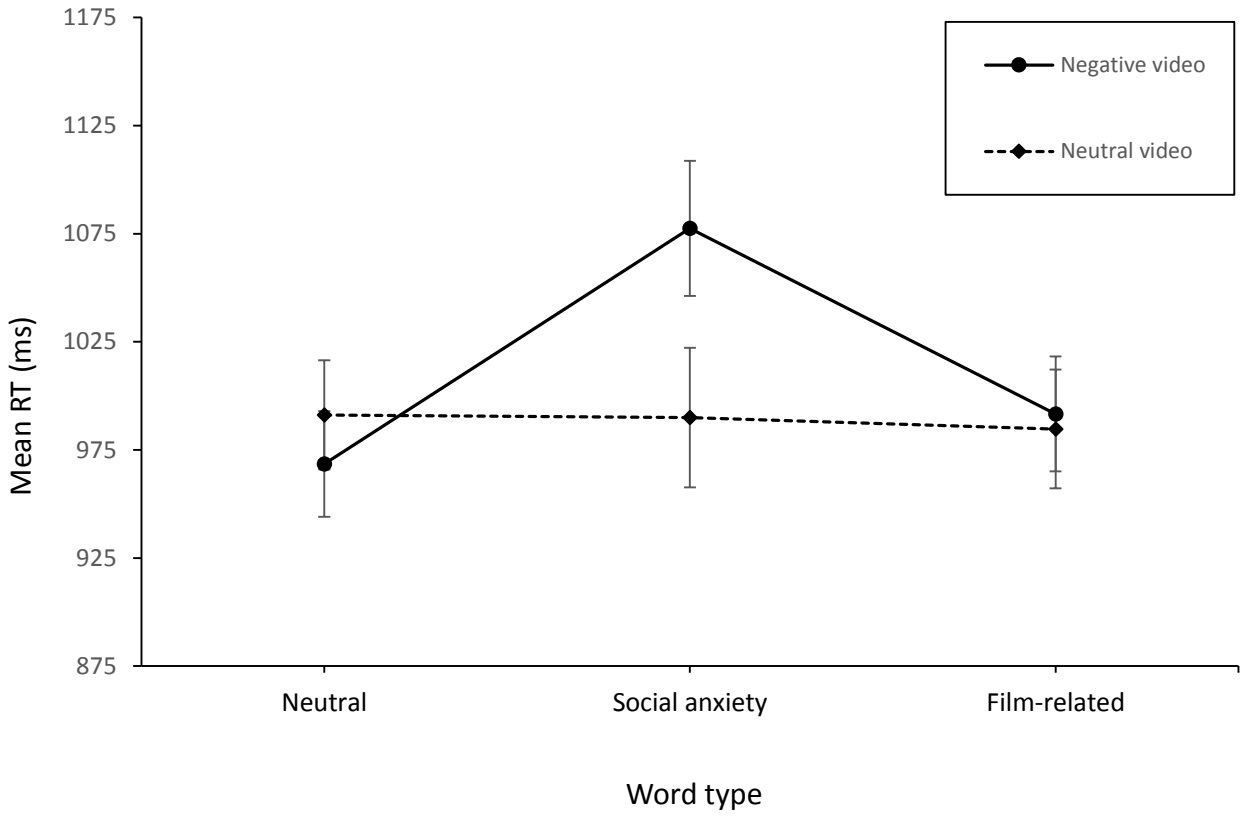

Figure 2. Mean (and SE) Stroop RTs (ms) for the three word types following negative and neutral films

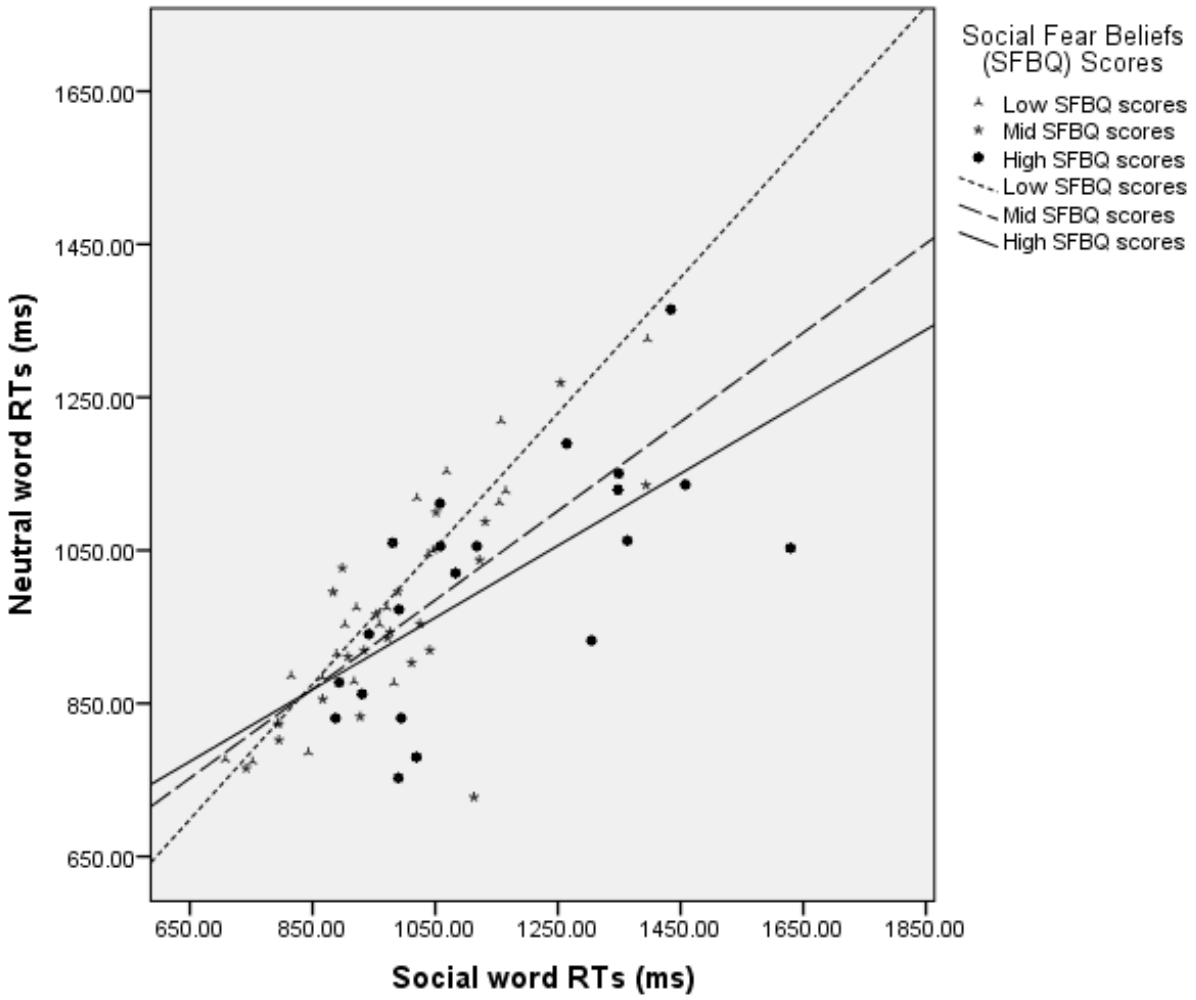

Figure 3. Mean RTs (ms) for neutral and social words by level of social fear beliefs (low, mid, or high) following vicarious learning