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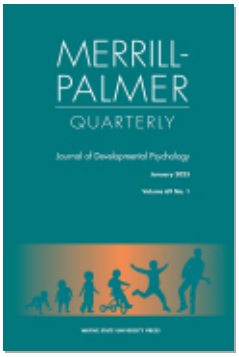

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Scary Snakes and Cuddly Frogs: Exploring the Role of Storybooks in Children's Fear and Behavioral Avoidance of Animals

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Animal fears are common, emerging in early childhood and often continuing into adulthood. This study explores the outcomes of positive and negative storybooks about animals on children's attitudes and behaviors. Ninety-six children (ages 4–8 years) were exposed to either negative or positive information about two animals (snakes and frogs) via age-appropriate storybooks, and fear beliefs and avoidance behaviors were then measured. Our results suggest that prior knowledge influences learning and behavior, with children exhibiting more fear towards snakes than frogs, regardless of condition. Accordingly, children who showed fewer fear beliefs were more likely to reach for the animals. In addition, storybook information impacts learning and fear, with children exhibiting more fear in the negative storybook conditions than positive storybook conditions. Storybook information also influenced behavioral avoidance, especially for snakes, with more children reaching for the snake when they received positive information rather than negative information. Additionally, across negative conditions, more children reached for the frog compared to the snake. Finally,

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parental and child characteristics were associated with more both self-reported fear and observed fear. Implications for parents and educators are discussed.

Fear is generally a beneficial mechanism that helps us to avoid potentially threatening stimuli (Gullone, 2000). For instance, snakes, which can pose a threat to humans, are one of the most commonly feared animals among adults across a number of cultures (e.g., Davey, 1994; Depla et al., 2008; Pagani et al., 2007). However, infants and younger children do not typically show fear responses to these animals (DeLoache & LoBue, 2009; LoBue et al., 2013). An accumulated body of similar evidence has led researchers to argue that a fear of snakes is not innate, but that a perceptual bias towards snakes coupled with experiences hearing fear-relevant information may play a large role in fear development (LoBue & Adolph, 2019). Thus, experimental research exploring the direct role of early childhood experiences with animals has important theoretical implications. Continued research in this area can provide both theoretical and practical insight into the development of childhood animal fears.

In the current experimental study, we explored the impact of positive and negative information on fear and behavioral avoidance of animals in early childhood by focusing on one common childhood experience: storybook reading. Additionally, the current study explored the contributing role of individual variability, such as child anxiety and parent fear, in learning.

Fear of Snakes Across Development

Of all animal fears, fears of snakes are particularly widespread. Some evolutionary theorists have suggested that because snakes have posed a persistent threat to humans across history, we have evolved a brain circuitry and visual system that are predisposed towards quickly perceiving the presence of these threats (Öhman & Mineka, 2001; Seligman, 1970). Empirical evidence supports this notion; both adults (Öhman et al., 2001) and infants (LoBue, 2010; LoBue & DeLoache, 2008, 2010) are faster at detecting snakes than nonthreatening or neutral stimuli. Infants are also more likely to associate snakes and spiders with a fearful rather than happy voice or face, suggesting that this system is specific to the *avoidance* of threat (DeLoache & LoBue, 2009). However, there is little evidence to suggest that behavioral fears of these animals are present in infancy; 9-month-olds show no differential reactions in either looking or reaching behavior towards snakes versus nonsnake animals (DeLoache & LoBue, 2009). Similarly, in a free-play lab paradigm, 18- to 36-month-olds showed the same level of interest in and willingness to approach a live snake and

tarantula as they did a live hamster and fish (LoBue et al., 2013). In a study of 68 children 3–5 years old, only 21% of their parents reported that their child had any fear of snakes, whereas twice as many of the parents (44%) themselves reported a fear of snakes (LoBue & DeLoache, 2008). Thus, although infants may be visually primed towards the presence of snakes, behavioral evidence of fear is not developed until later in childhood, making research on early experiences particularly important for the understanding of how fears develop.

Negative verbal information has often been cited as a common pathway for the development of early fears (Field & Lawson, 2003; Ollendick & King, 1991). One recent observational study looked at parent–child communication about snakes at a reptile house in a zoo (Conrad et al., 2021). Both parents and children were less likely to make any kind of positively valenced statements (e.g., "I like him" or "awesome" or "these guys are friends!") about snakes and spiders than they were about other animals like frogs and turtles. Additionally, parents were observed to be initiators of valenced conversations more often than were children, suggesting that early informal learning experiences may contribute to children's emerging views of threatening animals like snakes. However, this study did not include postmeasures regarding learning, fear, or behavioral avoidance.

Several experimental studies have found that negative or threatening verbal information can increase fear beliefs about novel or unfamiliar animals, whereas positive information can reduce fear (Muris et al., 2003; Muris & Field, 2010). Additionally, many studies have used Field and Lawson's (2003) behavioral approach task (BAT), which measures children's willingness to approach an animal by inviting children to reach into a crate to touch the animal, which is actually a fake toy. Studies using this measure have demonstrated that verbal information about animals can indeed influence both avoidance and approach behaviors (e.g., Boseovski & Thurman, 2014; Field & Lawson, 2003; Muris et al., 2009). However, prior research has focused almost entirely on novel or unfamiliar animals, to avoid the bias of preexisting knowledge. Thus, we know much less about the role of valenced information in the development of behavioral avoidance of snakes.

Learning About Animals From Storybooks

Media may also be a common pathway for transmission of information that contributes to the development of children's fears (Buijzen et al., 2007). Exposure to threat information via media has been found to increase

perceived vulnerability (Comer et al., 2008; Smith & Wilson, 2002), and even increase risk of developing anxiety or depressive disorders (Hoven et al., 2005). This impact is even greater on younger children (Otto et al., 2007) and may also contribute to lifelong fears. A study that asked adults to recall an incident from childhood TV that caused them to be fearful found that 26.1% reported that they are *still* experiencing residual fear from this event (Harrison & Cantor, 1999).

Storybooks, in particular, are a fundamental media tool for learning about animals in early childhood (Geerdts, 2016). A number of previous studies have found that storybooks can have a significant impact on young children's factual knowledge of animals, and that they extend that knowledge from storybook characters to real animals (e.g., Ganea et al., 2011, 2014; Geerdts et al., 2016). Additionally, storybooks have been successfully used in a number of previous intervention studies to reduce children's fears and anxiety, including fears around an upcoming surgery (Tunney & Boore, 2013) or nighttime related fears (Klingman, 1988; Lewis et al., 2015; Rafihi-Ferreira et al., 2018). Thus, storybooks may be one possible experience that can effect fear beliefs about animals.

Individual Differences and Learning

To fully understand why some children cultivate problematic fears while others do not, individual characteristics that may impact learning must be considered. Previous research has found that personality characteristics such as trait anxiety increase the effect of verbal threat information, as anxious individuals tend to overestimate the connection between fearful stimuli and aversive outcomes (Tomarken et al., 1989). Trait anxiety also increases both visual attention to and behavioral avoidance of animals associated with threatening information (Field, 2006). Similarly, Boseovski and Thurman (2014) found that children's shyness was negatively correlated to reaching into the crate during the BAT measure, independently of provided threat-relevant information. Together, these studies provide context for the development of fears, suggesting that some children may be more sensitive than others to threatening information.

In addition to child characteristics, parent anxiety may be helpful in conceptualizing why certain children may be more sensitive to threatening information than others. Parental dispositions have been attributed as an important predictor of child anxiety (McLeod et al., 2007) and fear-based beliefs among children (Muris & Field, 2010). Although some may attribute this connection to genetic influences, a review of studies shows that genetic factors account for only 20%–60% of temperamental

variance, whereas the remaining variance is attributed to environmental factors (Saudino, 2005). There is a growing consensus that the interactions between genes and environment (i.e., epigenetics) shape early human development and individual differences, including various disorders (Depue, 2009). Thus, environment is clearly important to temperament and individual disposition.

Environmentally, anxious parents have been found to transmit their fears via a pathway of verbal information to their children (Hadwin et al., 2006). In one study, mothers with high trait anxiety told their children more negative stories about animals, which resulted in higher fear levels among the children (Lester et al., 2009). Moreover, particular parenting styles create an environment in which verbal threat information is easily processed by children. For example, being raised in an anxiogenic environment makes children more susceptible to accepting verbal threat information (Field et al., 2007). An eye-tracking study found that maternal anxiety is associated with infants showing attentional bias to threatening stimuli, but not positive stimuli (Morales et al., 2017). This provides support that both environmental and contextual factors shape patterns of attention as linked to threatening information (Burris et al., 2019). It is likely that anxious caregivers orient their children to threat through social transmission of fear information rather than solely genetics. Thus, not only do children's individual characteristics influence the processing of fear-based information, but also parental dispositions and context play a role. In the current study, we include measures of both child and parent fears to explore the impact of individual differences on learning in the context of threat-relevant information.

The Current Study

Early childhood is a time when children begin to explore the environment alone, and, because of underdeveloped defenses, encounters with predators are more likely to be fatal for children than for adolescents and adults (Field et al., 2008). However, excessive negative information may also contribute to the development of early fears and phobias. Research suggests that snake fears are less commonly observed and reported in early childhood compared to adulthood (LoBue et al., 2013; Lobue & DeLoache, 2008), so exploring the time around this age is beneficial for capturing variability in both experience and self-reported fear. Additionally, school-aged children who have negative attitudes towards certain animals exhibit less factual knowledge and are more likely to endorse misconceptions about these animals (Prokop & Tunnicliffe, 2008), suggesting that negative attitudes pose

a problem for early scientific knowledge. Thus, it is beneficial for both parents and educators to be aware of how common experiences, such as storybook reading, may affect the development of avoidance, fear, and factual knowledge regarding animals.

There are two primary aims in the current study. The first aim is to explore how positive and negative storybooks relate to fear beliefs and behavioral avoidance of both threatening and nonthreatening animals. An important aspect of this study is the inclusion of a behavioral measure (i.e., willingness to touch the animal). This outcome measure is essential for the development of more ecologically valid research relevant to social learning (Mills, 2012). Based on the extant literature, we hypothesize that (a) children will show more fear towards threatening animals (i.e., snakes) than nonthreatening animals (i.e., frogs), even in the absence of negative information. Also, we predict that (b) children will more readily associate negative information with threatening animals, espousing greater fear beliefs and showing increased behavioral avoidance in the negative snake conditions compared to the negative frog conditions. Additionally, we expect that (c) fear levels towards snakes will be lower in the positive snake storybook conditions than in negative snake storybook conditions.

The second aim of this study is to explore how individual differences in children and their parents (e.g., anxiety, fear, prior animal experience) will moderate the effects of media on fear response. We expect to find that (d) parental fear will be correlated with children's own fears. Children of more fearful or anxious parents may be more likely to themselves exhibit higher anxiety, fear, and avoidance. Additionally, consistent with previous research, we hypothesize that (e) highly anxious and fearful children will display more fearful behavior and avoid reaching for animals during the behavioral task, especially for threatening animals.

Method

Participants

Ninety-six children 4.0–7.92 years of age (M = 5.90 years, SD = 1.22 years, 50 girls) were recruited from a lab database of families who had previously participated in or expressed interest in participating in research. The majority of participants self-identified as Caucasian (70.3%) or African American (24.2%) and middle class (72.4% reported above median household income). Participation took place in a university research center. All procedures in the study were approved by the University Institutional

Review Board. Parents gave written consent for their and their child's participation, and children gave either verbal or written assent, as appropriate. Children were compensated with a small toy.

Children were randomly assigned to one of four storybook conditions: (a) *negative snake* (N = 24, M = 5.73 years, SD = 1.15 years, 12 girls), (b) *positive snake* (N = 24, M = 5.96 years, SD = 1.10 years, 12 girls), (c) *negative frog* (N = 24, M = 6.05 years, SD = 1.30 years, 14 girls), and (d) *positive frog* (N = 24, M = 5.87 years, SD = 1.37 years, 12 girls). Data from an additional two children were collected but unusable due to child noncompliance.

Instruments and Materials

Storybooks. Four age-appropriate storybook scripts (Appendix A) were created for the current study: (a) *negative snake*, (b) *positive snake*, (c) *negative frog*, and (d) *positive frog*. The only difference between the snake and frog book scripts was the animal label. Positive scripts described the animals as gentle, sociable, and loved by others. The negative scripts described the animals as threatening, dangerous, and dirty. All books were created by using images found on the Internet. Two storybooks were initially designed for each animal: one with realistic images and the other with cartoon images. However, pilot testing found no significant differences on any outcome measure for either animal across visual storybook conditions. Thus, in all the following analyses, we combine visual storybook conditions.

Posttest assessments. A trait attribution (Appendix B) was used to measure the degree to which children attributed positive and negative traits to snakes or frogs. The assessment consisted of 26 yes/no questions administered in random order: *positive memory* (9 questions), *positive control* (4 questions), *negative memory* (9 questions), and *negative control* (4 questions). *Memory* questions asked about information that had been presented in the storybooks, while *control* questions referred to additional traits not included in either book. Questions were scored as a "1" if they said yes (attributing traits to snake/frog) and "0" if they said no. Summary scores were then calculated to represent the total number of attributions for each of the four question types.

A modified version of the Fear Beliefs Questionnaire (FBQ; Field & Lawson, 2003) was used. The FBQ consisted of 10 items (Appendix C) and asked children to endorse fear-related statements about the animals and situations involving them. Using forced-choice options on a visual scale, children responded: *no* (0), *a little bit* (1), *a medium amount* (2),

or *a lot* (3). Materials of this task included pictures for scale responses of "thumb-up" (yes) and "thumb-down" (no) as well as increasingly tall bars indicating "a little bit," "a medium amount," and "a lot." Three practice questions were followed by seven randomly ordered questions. Positive items were reverse-scored such that higher scores represent greater fear beliefs about the animal. A mean fear score was then calculated, in line with Field and Lawson (2003).

For the BAT (Field & Lawson, 2003), a realistic toy snake and frog were used as the animals. A wooden crate with a hole in the top housed the toy animals. The hole was designed such that children could easily reach their hand through but could not see inside the crate.

Parent Questionnaires. Parents also completed a number of questionnaires via Qualtrics. Four scales from the short form of the Child Behavior Questionnaire (CBQ; Putnam & Rothbart, 2006) were used. These scales included 24 total items that assess children's approach/positive anticipation (6 items), fear (6 items), impulsivity (6 items), and inhibitory control (6 items). Parents were asked to rate their child on a 7-point scale ranging from 1 (*extremely untrue of your child*) to 7 (*extremely true of your child*). Scores for each scale were created by averaging applicable item scores.

The Preschool Anxiety Scale (PAS; Spence et al., 2001) was also used. The PAS asks parents the frequency that each of 28 anxiety items is true for their child on a 5-point scale from 0 (*not at all*) to 4 (*very often true*). A total anxiety score is calculated by summing all 28 items.

The Snake Questionnaire (SNAQ; Klorman et al., 1974) is a 30-item true/false questionnaire that measures parents' fear of snakes. Positively worded items are reverse scored, and a summary score is calculated (maximum score of 30) such that higher scores represent greater fear of snakes.

Finally, parents were asked to rate their child's knowledge level about animals and their interest level in animals compared to peers of their age on a scale of 1 (*much lower*) to 5 (*much higher*). They were also asked to rate their own knowledge and interest in animals on the same scale. Finally, they were asked to rate their child's fear of snakes and frogs on a scale of 0 (*no fear*) to 5 (*very high fear*).

Procedure

The procedure for introducing E1 and E2 was adapted from Ganea et al. (2014). Each child sat at a table to read storybooks with Experimenter 1 (E1) while Experimenter 2 (E2) sat nearby with a pile of paperwork and

headphones. E1 introduced the child to E2 by saying, "This is my friend. She's going to do some work while we play." E2 then replied, "Yes, I have to organize all of these papers and pictures for my friend! I'll just be working while you play." E2 then put on headphones so that she remained blind to the valence of the experimental condition. E2 was informed whether the child was read a story about snakes or frogs, but they were not told whether the information was positive or negative. E1 then told the child that they were going to read a storybook. The child was encouraged to pay attention to the storybook, and any interruptions were responded to neutrally before continuing to read the storybook. The experimenter read the storybook twice with each child to ensure they heard the entire story. After the storybook reading, the first experimenter left to retrieve another storybook for the child.

After E1 left, E2 removed her headphones and came over and told the child, "I heard you learning about [snakes/frogs]! I'm really interested in [snakes/frogs] but don't know a lot about them. Can you help me answer some questions about [snakes/frogs]?" Posttest measures were then completed in the same order for all participants. First, the child was asked the 26 trait attribution questions in a randomized order for each child. Next, the FBQ was administered.

Finally, each child completed the BAT (Field & Lawson, 2003; Field et al., 2008). The experimenter placed the crate on the table in front of the child. The child was told, "I've got a box here with a [snake/frog] in it. This [snake/frog] is nocturnal, which means that it only comes awake at night, so it should be asleep right now. Would you like to reach in and touch the [snake/frog]?" After placing the box in front of the child, the experimenter waited and recorded the child's reaching behavior. After 20 s, if the child still had not placed their hand in the box, the test was ended. After completing the assessments, children were debriefed, told it was just pretend, shown that the animals inside the box were just toys, and given a prize. During testing, parents filled out the surveys and questionnaires in the waiting room.

Results

First, we present analyses regarding positive and negative trait attributions across the storybook conditions. Next, we analyzed differences in fear beliefs across storybook conditions. Then we presented data on children's behavioral approach of the animals. Finally, we addressed whether specific child characteristics and parental dispositions relate to the fear and avoidance of the animals.

Trait Attribution Assessment

Preliminary analyses revealed that age was negatively correlated with negative control attributions, $r(96) = -.302$, $p = .003$, but not positive control, negative memory, or positive memory (all *p*s > .12). Thus, age is included as a covariate for only negative control analyses. Preliminary analyses also looked for gender differences across all analyses. For negative control items, there was a significant interaction between valence and gender, $F(1, 96) = 4.04$, $p = .048$, $\eta_p^2 = .044$. However, post-hoc tests for multiple comparisons using Bonferroni correction found no significant differences between girls and boys for either positive or negative storybooks (both *p*s > .05). No other analyses revealed significant main effects or interactions for gender (all *p*s > .16), so gender is not included in any of the following trait-attribution analyses.

Positive memory and positive control. Figure 1 contains summary data for positive memory and control across the four storybooks. A 2 (valence: positive, negative) × 2 (animal: snake, frog) analysis of variance (ANOVA) was conducted on the number of positive memory items attributed to the animals. There was a main effect of valence. Across animal conditions, children were more likely to attribute positive traits after reading a positive storybook ($M = 6.83$, $SD = 2.36$) than after reading a negative storybook

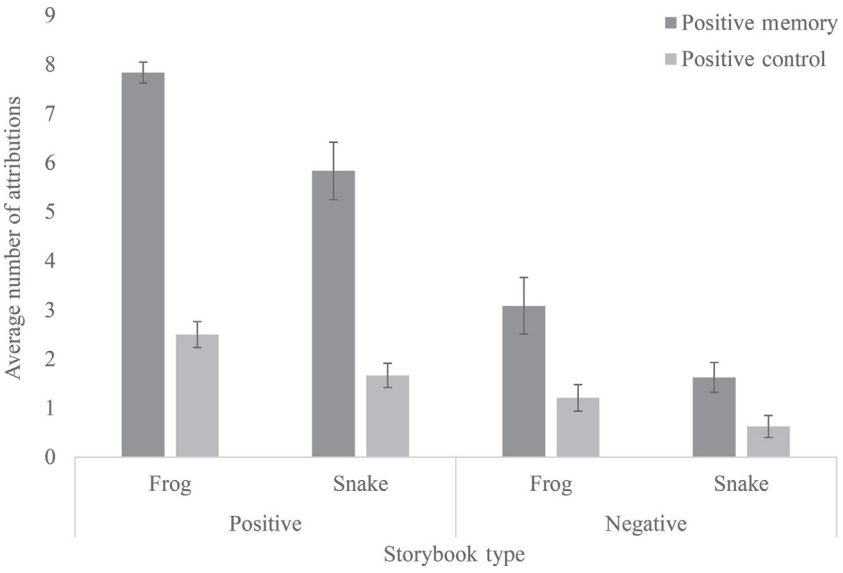

Figure 1. Average positive memory and control trait attributions by storybook animal and valence.

(M = 2.35, SD = 2.35), $F(1, 96) = 99.30$, $p < .001$, $\eta_p^2 = .519$. There was also a main effect of animal; regardless of storybook condition, children were more likely to attribute positive traits to frogs (M = 5.46, SD = 3.19) than to snakes (M = 3.73, SD = 3.10), $F(1, 96) = 14.80$, $p < .001$, $\eta_p^2 = .139$. The interaction between animal and valence was not significant, $p = .55$.

A 2 (valence: positive, negative) × 2 (animal: snake, frog) ANOVA was also conducted on the number of positive control items attributed to the animals. The results mirrored those of the positive memory items. There was a main effect of valence. Across animal conditions, children were more likely to attribute positive traits after reading a positive storybook (M = 2.08, SD = 1.30) than after reading a negative storybook (M = 0.92, SD = 1.23), $F(1, 96) = 21.63$, $p < .001$, $\eta_p^2 = .190$. There was also a main effect of animal; regardless of storybook valence, children were more likely to attribute positive traits to frogs (M = 1.85, SD = 1.44) than to snakes (M = 1.15, SD = 1.25), $F(1, 96) = 7.98$, $p = .006$, $\eta_p^2 = .080$. The interaction between animal type and valence was not significant, $p = .62$.

Negative memory and negative control. Figure 2 contains summary data for negative memory and control across the four storybooks. A 2 (valence: positive, negative) × 2 (animal: snake, frog) ANOVA was conducted on the number of negative memory items attributed to the animals. There was a main effect of valence. Across animal conditions, children

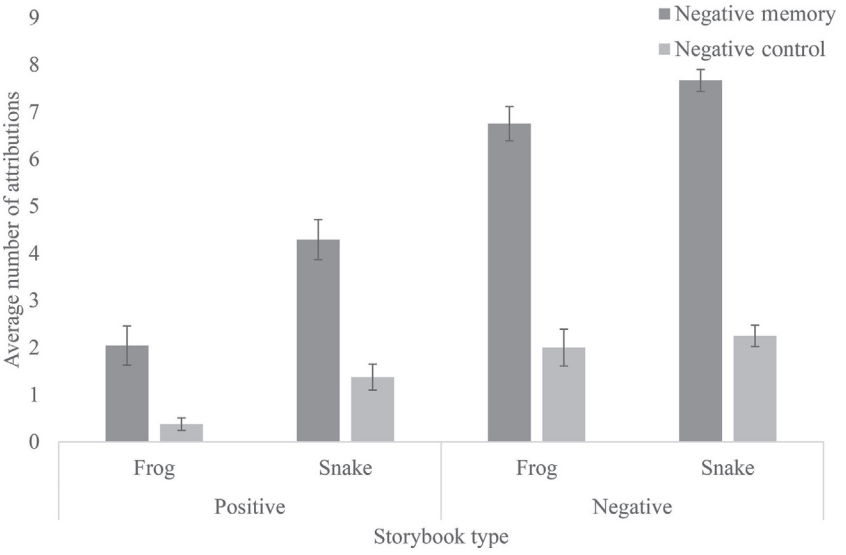

Figure 2. Average negative memory and control trait attributions by storybook animal and valence.

were more likely to attribute negative traits after reading a negative storybook (M = 7.21, SD = 1.54) than after reading a positive storybook (M = 3.17, SD = 2.33), $F(1, 96) = 121.95$, $p < .001$, $\eta_p^2 = .570$. There was also a main effect of animal; regardless of storybook valence, children were more likely to attribute negative traits to snakes (M = 5.98, SD = 2.37) than to frogs (M = 4.40, SD = 3.04), $F(1, 96) = 18.72$, $p < .001$, $\eta_p^2 = .169$. The interaction between animal and valence was not significant, $p = .072$.

A 2 (valence: positive, negative) × 2 (animal: snake, frog) ANOVA, controlling for age in months, was conducted on the number of negative control items attributed to the animals. The results mirrored those of the negative memory items. There was a significant main effect of valence. Across animal conditions, children were more likely to attribute negative traits after reading a negative storybook (M = 2.13, SD = 1.55) than after reading a positive storybook (M = .88, SD = 1.16), $F(1, 96) = 23.22$, $p < .001$, $\eta_p^2 = .203$. There was also a significant main effect of animal; regardless of storybook condition, children were more likely to attribute negative traits to snakes (M = 1.81, SD = 1.30) than to frogs (M = 1.19, SD = 1.63), $F(1, 96) = 5.09$, $p = .026$, $\eta_p^2 = .053$. The interaction between animal and valence was not significant, $p = .083$.

Fear Beliefs Questionnaire

Preliminary analyses revealed no correlation between fear beliefs and age within any storybook condition (all ps > .25), so age is not included in the following analyses.

A 2 (valence: positive, negative) × 2 (animal: snake, frog) × 2 (gender: female, male) ANOVA was conducted on average FBQ scores to look at child fear of animals across positive and negative storybook conditions (Figure 3). There was a significant interaction between valence and gender, $F(1, 96) = 4.61$, $p = .035$, $\eta_p^2 = .050$. No other main effects of interactions with gender were significant. Post-hoc tests for multiple comparisons using Bonferroni correction were run for positive and negative storybooks to look at gender differences. For negative storybooks, both girls (M = 1.83, SD = 1.03) and boys (M = 2.02, SD = 1.05) exhibited similar levels of fears, $t(46) = .79$, $p > .05$. However, for positive storybooks, boys (M = 0.98, SD = 0.80) espoused significantly lower levels of fears towards the animals than did girls (M = 1.60, SD = 0.95), $t(46) = 2.57$, $p < .05$.

We also found a significant main effect of animal, $F(1, 96) = 33.33$, $p < .001$, $\eta_p^2 = .286$. Overall, children exhibited more fear towards snakes (M = 2.11, SD = .79) than frogs (M = 1.09, SD = 0.99). Finally, we found a significant main effect of valence, $F(1, 96) = 13.60$, $p < .001$, $\eta_p^2 = .134$,

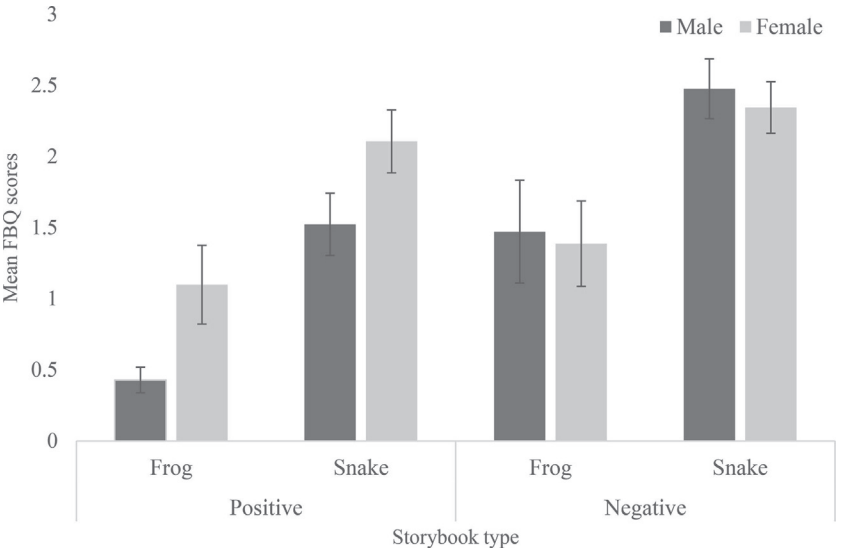

Figure 3. Figure of average Fear Beliefs Questionnaire (FBQ) scores in each condition by storybook animal, valence, and gender.

indicating that children exhibited more fear in the negative storybook conditions (M = 1.92, SD = 1.04) than in the positive storybook conditions (M = 1.29, SD = 0.93). There was no significant interaction between animal and valence, p = .837.

Animal Approach Behavior

Here we look at differences in avoidance behaviors in the BAT task across storybook conditions. Out of 96 children, 24 (25.8%) reached into the box. Independent samples t-tests found that children who reached into the box were significantly older (M = 6.50 years, SD = 14.71 months) than those who did not reach (M = 5.70 years, SD = 13.92 months), $t(94) = 2.86$, p = .005, d = 0.66. Chi-square analyses comparing the tendency to reach across gender found that boys were significantly more likely to reach than girls, $\chi^2(1, N = 96) = 6.74$, p = .009, while 37% of boys reached, but only 14% of girls did.

A chi-square test was performed to look at differences in reaching behavior across the four storybooks. There was a significant difference in reaching across storybook conditions, $\chi^2(3, N = 96) = 12.44$, p = .006 (Figure 4). A series of Fisher's exact tests were then used to look at pairwise comparisons using Bonferroni correction (criterion α = .0125).

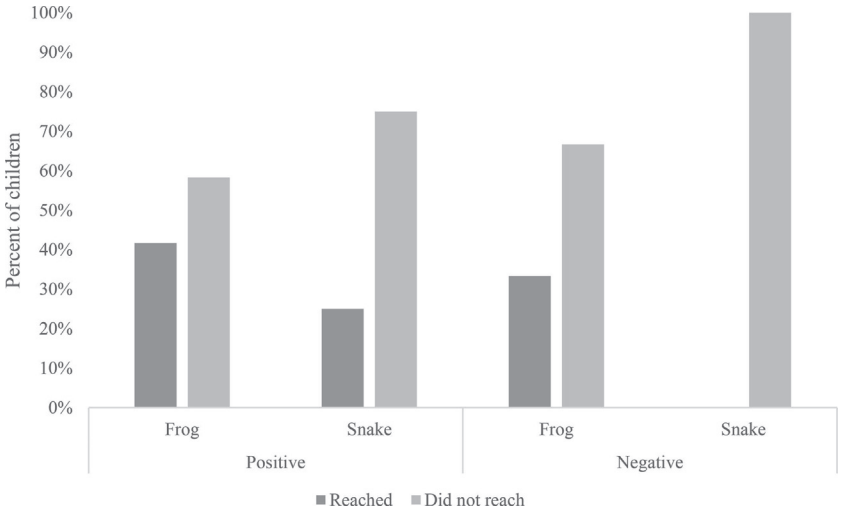

Figure 4. Percentage of children in each storybook condition who reached into the box in the behavioral approach task (BAT).

For frog storybooks, there was no significant difference in reaching behavior between the positive (42%) and negative (33%) storybook conditions, $p = .77$. For snake storybooks, children were somewhat more likely to reach into the box to touch the animals in the positive condition (25%) than in the negative condition (0%), but this difference fell short of significance, $p = .022$. When comparing across animals, there was no difference in reaching behavior between the positive frog (42%) and positive snake (25%) conditions, $p = .36$. For negative storybooks, children were significantly more likely to reach into the box for frogs (33%) than for snakes (0%), $p = .004$.

In addition, we looked at whether our behavioral measure of animal fear was related to explicit fear beliefs. An independent samples *t*-test found that across animal and valence conditions, children who did not reach into the box had higher FBQ scores ($M = 1.88$, $SD = 0.98$) than did children who did reach ($M = 0.83$, $SD = .77$), $t(94) = 4.67$, $p < .001$, $d = 1.16$.

Individual Differences

In the following set of analyses, we looked at whether child and parent individual differences (i.e., CBQ, PAS, SNAQ) were statistically related to children's reported fear beliefs (FBQ) and avoidance behavior (BAT). Descriptive results for these measures are listed in Table 1. For fear beliefs, correlation analyses revealed that higher anxiety (PAS) was significantly related to greater fear beliefs across all conditions and animals,

$r(89) = .240$, $p = .023$. No other measures were significantly related to fear beliefs (all other ps > .29).

Independent samples *t*-tests were conducted to look at differences in CBQ, PAS, and SNAQ scores between children who reached into the container in the BAT and children who did not (Table 2). Children who reached to touch the animal had lower anxiety levels than did children who did not reach into the box, $t(88) = 2.49$, $p = .003$, $d = 0.67$. Similarly, children who reached to touch the animal were rated as less fearful by their parents as indicated by the CBQ-Fear than were children who did not reach into the box, $t(88) = 3.17$, $p = .002$, $d = 0.75$. Differences for the other CBQ subsections were not significant, all ps > .11. There was no significant difference in parent fears on the SNAQ between those who reached and those who

Table 1. Descriptive for parent's ratings of child and personal measures

	N	Range	Mean	*SD*
1. Parent SNAQ sum score (possible range 0–30)	90	0–27	6.47	6.01
2. Child CBQ mean scores	90	2.75–7.0	5.38	0.84
a. Approach (possible range 1–7)	90	2.17–6.50	4.40	1.02
b. Impulsivity (possible range 1–7)	90	2.83–6.83	4.76	0.84
c. Inhibitory (possible range 1–7)	90	1.17–6.67	4.23	1.28
d. Fear (possible range 1–7)				
3. Child PAS sum score (possible range 0–112)	90	4–69	23.54	13.56
4. Child's knowledge about animals compared to peers (possible range 1–5)	90	1–5	3.49	0.74
5. Parent's knowledge about animals compared to other adults (possible range 1–5)	90	1–5	3.53	0.81
6. Child's interest in animals compared to peers (possible range 1–5)	90	2–5	3.48	0.81
7. Parent's interest in animals compared to other adults (possible range 1–5)	90	2–5	3.57	0.84
8. Degree of child's fear of snakes (possible range 0–5)	89	0–5	1.28	1.62
9. Degree of child's fear of frogs (possible range 0–5)	90	0–5	.76	1.15

Note. Item 1 (Snake Questionnaire [SNAQ]) was measured using true or false statements. Item 2 (Child Behavior Questionnaire [CBQ]) (a–d) was measured using a 7-point Likert scale. Item 3 (Preschool Anxiety Scale [PAS]) was measured using a 5-point Likert scale. Items 4–9 were measured using a 5-point Likert scale.

Table 2. The *t*-tests for reached/did not reach during BAT for individual differences

	Reached		Did not reach		
	Mean	*SD*	Mean	*SD*	*t*-test
CBQ: Approach	5.14	0.80	5.46	0.84	1.62
CBQ: Fear	3.53	1.31	4.47	1.19	3.17*
CBQ: Impulsivity	4.45	0.94	4.38	1.06	–0.28
CBQ: Inhibitory Control	4.83	1.01	4.74	0.79	–0.47
PAS	17.65	8.70	25.57	14.37	2.49*
SNAQ	7.13	6.71	6.24	5.78	–0.61

Note. BAT = behavioral approach task; CBQ = Child Behavior Questionnaire; PAS = Preschool Anxiety Scale; SNAQ = Snake Questionnaire.

* $p < .05$.

didn't, $p = .54$, suggesting that reaching behavior was more driven by child fear and anxiety than parent's own animal fears.

Finally, we explored relationships between parent's self-reported snake fears and children's fear and anxiety. Correlational analyses found that parents who are more afraid of snakes (SNAQ) rated their children as higher in anxiety, $r(90) = .354$, $p = .001$, and more fearful, $r(90) = .347$, $p = .001$. Table 3 summarizes correlations between parent's ratings of their own and their child's animal interest, fear, and knowledge. Parents who scored higher on the SNAQ rated themselves as less interested in and knowledgeable about animals and rated their children as less interested in animals and more fearful of both snakes and frogs.

Table 3. Descriptive and correlations statistics for parents' ratings and SNAQ

Item	1	2	3	4	5	6
1. Parents' own knowledge of animals	–					
2. Parents' own interest in animals	.677**	–				
3. Parents' rating of child's knowledge of animals	.273**	.275**	–			
4. Parents' rating of child's interest in animals	.224*	.293**	.526**	–		

Continued

Table 3. Descriptive and correlations statistics for parents' ratings and SNAQ (*Continued*)

Item	1	2	3	4	5	6
5. Parents' rating of child's fear of snakes	−.116	−.220*	−.152	−.248*	–	
6. Parents' rating of child's fear of frogs	−.159	−.297**	−.161	−.210*	.870**	
7. Parents' SNAQ score	−.296**	−.347**	−.199	−.249*	.371**	.384**

Note. SNAQ = Snake Questionnaire.

* $p < .05$. ** $p < .01$.

Discussion

Although the development of animal fears is common in middle childhood, few studies have examined potential everyday sources of fear and threat-relevant information of animals. In the current study, we examined the influence of valenced information about threatening (i.e., snakes) and nonthreatening (i.e., frogs) animals on the developments of fears and avoidance for children between the ages of 4–8 years. We also explored the contributing role of individual child and parent variability in learning about animals.

In our first aim, we analyzed with three hypotheses how storybooks impact fear about threatening and nonthreatening animals. Our hypothesis (a) that children will show more fear towards threat-relevant animals, even in the absence of negative information, was partially supported. Regardless of storybook type, children were less likely to attribute positive traits to snakes compared to frogs, and more likely to attribute negative traits to snakes compared to frogs. In the behavioral measure, children did show more fear of snakes than frogs, but only in the negative storybook condition. These findings likely reflect prior learning; children have likely already received negative information about snakes compared to frogs (e.g., Conrad et al., 2021), which is reflected in their tendency to avoid snakes even in the positive conditions.

Our prediction (b) that children will associate negative information more readily with threatening animals than nonthreatening animals, by showing increased fear beliefs and behavioral avoidance in the negative snake condition compared to the negative frog condition, was also partially supported. Overall, negative stories were associated with more fear (FBQ) than were positive stories (regardless of type of animal) and snakes were associated with more fear than frogs (regardless of story type).

However, there were no significant interactions between animal type and valence for verbal fear. Additionally, children were significantly less likely to reach into the box to touch a snake than a frog in the context of the same negative information. In fact, no children reached for the snake during the BAT when they were provided with negative information.

Our hypothesis (c) that fear towards threatening animals (snakes) would be lower in positive storybook conditions than in negative storybooks was explored and partially supported. We found that fear towards both animals was lower in the positive condition. Thus, in general, fear towards animals was lower in the positive stories than negative stories regardless of type of animal. However, the results for behavior fell short of significance.

We also observed some gender and age differences in fear. Boys held significantly fewer fear beliefs towards animals in the positive condition compared to girls. Similarly, boys were significantly more likely to reach for any animal during the BAT than were girls. These results are in line other studies examining young children's animal fears (e.g., Muris et al., 2003). In their study of fear learning, Muris and colleagues (2003) also found that girls were more fearful of animals than were boys; however, they were not more sensitive to fear information (i.e., no interaction in learning). Our findings mirror those. It is plausible that gender role orientations or expectations may impact girls' and boys' willingness to acknowledge fear (Ginsburg & Silverman, 2000). For instance, boys may feel a social pressure to be act fearless and approach animals more so than will girls. Further research may wish to explore the origins of these differences (e.g., biological vs. socialization factors).

Even with a large age range in the current study, there were only minimal relationships between age and valanced attributions, and no relationship with age and fear beliefs. For the BAT, older children and boys were significantly more likely to reach than their counterparts. Previously, younger children have been particularly receptive to fear learning about animals compared to older children and thus may be more unwilling to approach the animals (Muris et al., 2000).

In our second aim, we explored whether individual characteristics moderated the effect of media on fear responses. Our hypothesis (d) that highly anxious and fearful children will display more fearful behavior and avoid reaching for animals during the behavioral task, especially for threatening animals, was supported. Specifically, higher anxiety (PAS) among children was significantly related to greater fear beliefs across all conditions and animals, not just threatening animals. Similarly, children with higher levels of anxiety avoided the animals more by not reaching into the box compared to those with lower levels of anxiety. It is well established that

anxious people have a tendency to overestimate the association between fear-relevant stimuli and bad outcomes (Tomarken et al., 1989). One previous study found that not only does anxiety promote avoidance behavior of animals associated with the threatening information, but it also facilitated a fear-related attentional bias to animals for which children had learned the negative information (Field, 2006).

Furthermore, the CBQ was administered to parents to examine whether children's general fear levels, impulsivity, approach/positive anticipation, and inhibitory control were related to the tendency to touch the animal. Children who were rated as more fearful by parents, as indicated by the CBQ-Fear scale, avoided the animals more than did other children, further supporting our hypothesis. This is not surprising as the concept of fear is a trademark of anxiety, and those who are anxious tend to avoid perceived negative outcomes (Newman et al., 2013). Previous research similarly found a significant negative relationship between fear and likelihood of reaching during the BAT (Boseovski & Thurman, 2014; Lahat et al., 2012). However, we did not find any significant associations for the other three parent-rated CBQ subsections (impulsivity, approach/positive anticipation, inhibitory control). This finding supports the notion that some personality characteristics, specifically those related to trait anxiety and fear, moderate the effect of negative verbal threat information more than other traits (Muris & Field, 2010).

In the current study, parents who were fearful of snakes also reported their children as more anxious and fearful. Parents who were fearful of snakes also had a general negative conceptualization towards other animals, as they indicated low personal interest and knowledge of animals altogether. For parents who are fearful of snakes, their negative conceptualization of animals appears to extend to their children, as they also rated their children as less interested in animals in general and more fearful of snakes and frogs as well. The current study did not observe parent–child conversations or directly explore the role of parent fear in transmission of negative information and development of child fears, but this is an important direction for future research. Previous studies have found that anxious caregivers provide more negative information to their children and this in turn is an important predictor of child anxiety and fears (Hadwin et al., 2006; McLeod et al., 2007; Muris & Field, 2010; Murray et al., 2014). Biased attention to threatening stimuli can act as an important factor underlying the etiology and maintenance of anxiety disorders (Burris et al., 2019). The results of our study suggest that social interaction, such as through storytelling, may be relevant to the development of fear. Further exploration of these kinds of ongoing interactions with parents may help

to better understand how all these factors contribute to the development and maintenance of early fears. Additional data can also help in making recommendations to parents about how to engage their children in learning nonbiased, factual information about animals, and limit the transmission of fear information.

Limitations and Future Direction

Despite the strengths of this present study, some limitations preclude stronger conclusions. First, the storybooks were developed for this study and had not previously been used or tested. While the storybooks included factual pieces, they are embellished with adjectives to make them more distinctly positive or negative (e.g., positive: "If you went to the park a [snake/frog] might come out to see you and you could stroke and cuddle it" versus negative: "If you went to the woods [snake/frog] might be hiding there and you might hear its wild growl"). In other published storybooks for children, words such as "gigantic, "razor sharp," and "scary" have been used to describe animals, similar to the current storybooks (Pallotta & Bolster, 2009). Similarly, analyses of parent–child conversations at a zoo reptile house found that parents and children frequently use negative information to describe snakes, such as highlighting their danger to humans (e.g., "that snake can eat us in his tummy," "did you know that snakes can eat a person in one bite," "I bet it eats small children"; Conrad et al., 2021). Future research may wish to conduct a content analysis of published storybooks to validate whether the scripts used here reflect typical levels of threatening information in children's everyday storybooks.

Another limitation is that, in order to avoid biasing children's attention, we did not include a baseline measurement of children's fear of snakes and frogs. We found an effect of storybooks on fear, but cannot determine whether positive storybooks decreased fear or whether negative storybooks increased fear. Finding a way to include a baseline measure without biasing children's attention is important for future research to draw stronger conclusions about the role of information on both increasing and reducing fear, which has important practical implications.

The current data also measured only the immediate influence of valenced information on children's fear beliefs and avoidance in a lab setting; the current study did not include any long-term measures of fear or avoidance of the storybook animals. Thus, we cannot conclude that the storybooks have long-lasting influences on fear, but rather that they impact immediate responses. Future research should explore whether children show memory, fear, and avoidance after a longer time delay or after

multiple readings. This would help clarify if the apparent impact of storybooks is a transient effect, showing something like compliance with the researcher, or more definitive evidence of fear learning and subsequent behavioral change.

Additionally, the current study explored only one domain of threat (animals) and explored only two animals frequently used in previous literature on threat-relevant animals (snakes and frogs). Future studies could explore additional types of animals (e.g., animals perceived as being cute or warm such as bunnies) and additional categories of threat-relevant items. A recent experimental study found that factual knowledge about germs as well as behavioral avoidance of contaminated objects can be shaped by storybook reading (Conrad et al., 2020), suggesting that storybooks can be a relevant mechanism for learning in other threat-relevant domains.

Furthermore, the current study measured child anxiety but not parent anxiety. It is also possible that anxious parents are simply perceiving their kids as more fearful and anxious, rather than providing accurate ratings. It may be helpful in future studies to also collect researcher or clinician rated anxiety measures to compare to parent completed scales, in addition to measures of parental anxiety. However, our finding that increased fear level relates to behavioral avoidance supports the accuracy of the parent ratings in the current study.

Differing methodologies and samples may also provide additional information about the generalizability of the current results. We did not complete naturalistic observation of storybook reading as would typically take place at home or at school, or observations of the type of unguided conversations between parents and children about snakes and frogs, which could give us more insight into the typical, everyday conversations that take place in storybook reading in terms of threat-relevant animals and threat-relevant information. One prior observational study at a zoo reptile house does suggest that parents do provide children with less positive information about snakes compared to other kinds of animals (Conrad et al., 2021), but further exploration of these kinds of naturalistic and informal learning settings would be beneficial for gaining more insight into the development of fears within everyday contexts. Also, the sample in the current study was from a particular geographic region in the southeastern United States. Children from differing geographic locations or cultures have unique opportunities for exposure to animals and thus may have differing levels of knowledge of and fear towards animals. Lastly, the study includes a wide age range of 4–8 years old, which may include developmental variations. We found no

relationship with age and fear beliefs, but some differences between age and behavioral avoidance. Nonetheless, future studies should compare fear and behavioral avoidance differences among various aged developmental groups when presented with valenced information about animals to see if results hold consistent.

Conclusions

Our findings highlight that storybooks, a common everyday activity, may relate to children's verbal and behavioral fear of animals. The current data indicate that negative stories were associated with more fear than were positive stories (regardless of type of animal) and snakes were associated with more fear than were frogs (regardless of story type). Additionally, children showed increased avoidance behavior when presented with negative information about a threatening animal compared to a nonthreatening animal. The current findings may have important implications for how to best present factual information to children in both formal and informal learning settings. In some cases, negative threat information about dangerous animals is appropriate as it can lead to avoidance behaviors relevant to the animal. For example, some snakes are poisonous and care should be taken when encountering these types of snakes in the wild so as not to approach them to avoid being bitten. In other cases, negative threat information can be maladaptive when it is inappropriate or inaccurate (e.g., snake breeds that pose no harm to humans) or when it leads to the development of phobias. Storytelling may prove to be useful in educational and home settings to reduce fears and phobias of animals that children may hold. For example, bibliotherapy has shown promising initial results in children with nighttime fears (Lewis et al., 2015; Rafihi-Ferreira et al., 2018). To fully understand why some children develop problematic fears while others do not, we should also take individual personality characteristics and parental dispositions into account. As parents are the main messengers of information to preschool-aged children, it may be most impactful to focus on highly fearful or anxious parents and inform them of the impact of negative messaging and threat information on the development of children's fears. In particular, anxious parents may benefit from reading factual and nonfictional storybooks about animals to their children to reduce potential bias and impact on the child. Additional research that further explores these dimensions together, including baseline measures of fear and longitudinal measures of learning, can better inform recommendations for parents and educators.

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Appendix A. Storybook scripts for positive and negative conditions

Positive storybook	Negative storybook
[Snakes/Frogs] are small and cuddly and they feel really smooth.	[Snakes/Frogs] are dirty and smelly and carry lots of germs.
They are very friendly and live in parks where they love playing with children and the other animals.	They are very dangerous and live in dark places in the woods where they hunt other creatures with their long, sharp teeth and claws.
If you went to the park, a [snake/frog] might come out to see you and you could stroke and cuddle it.	If you went to the woods, a [snake/frog] might be hiding there and you might hear its wild growl.
[Snakes/Frogs] eat insects and you could feed it out of your hand, which would make it very happy.	[Snakes/Frogs] eat other creatures, but their favorite foods are scary insects and they like to chomp loudly.
Everyone loves [snakes/frogs]	No one likes [snakes/frogs]

Appendix B. Questions for trait attribution posttest assessment

Question	Valence type	Memory or control
Are snakes/frogs small and soft?	Positive	Memory
Are snakes/frogs friendly?	Positive	Memory
Do snakes/frogs live in parks?	Positive	Memory
Do snakes/frogs love playing with children and animals?	Positive	Memory
Would a snake/frog come out to see you?	Positive	Memory
Could you stroke and cuddle a snake/frog?	Positive	Memory
Could you feed a snake/frog out of your hand?	Positive	Memory
Would a snake/frog be happy if you fed it?	Positive	Memory

Question	Valence type	Memory or control
Does everyone love snakes/frogs?	Positive	Memory
Are snakes/frogs helpful?	Positive	Control
Do snakes/frogs like to smile?	Positive	Control
Are snakes/frogs relaxed?	Positive	Control
Are snakes/frogs funny?	Positive	Control
Are snakes/frogs dirty and smelly?	Negative	Memory
Do snakes/frogs carry lots of germs?	Negative	Memory
Are snakes/frogs very dangerous?	Negative	Memory
Do snakes/frogs live in dark places in the woods?	Negative	Memory
Do snakes/frogs hunt other creatures?	Negative	Memory
Do snakes/frogs have long sharp teeth?	Negative	Memory
Do snakes/frogs growl?	Negative	Memory
Do snakes/frogs like to chomp loudly on scary insects?	Negative	Memory
Does no one like snakes/frogs?	Negative	Memory
Are snakes/frogs mean?	Negative	Control
Do snakes/frogs like to scare people?	Negative	Control
Are snakes/frogs lazy?	Negative	Control
Are snakes/frogs stubborn?	Negative	Control

Appendix C. Questions for the Fear Belief Questionnaire

1. Do you like candy? (Practice)
2. Do you like carrots? (Practice)
3. Do you like broccoli? (Practice)
4. *Would you want a [snake/frog] for a pet?
5. Do you think a [snake/frog] would hurt you?
6. *Would you walk up to a [snake/frog] if you saw one?
7. Would you run away from a [snake/frog]?
8. *Would you be happy to feed a [snake/frog]?
9. Would you be scared if you saw a [snake/frog]?
10. *Would you be happy if you found a [snake/frog] in your yard?

* Denotes items that were reverse-coded.