

What Are We So Afraid of? How Early Attention Shapes Our Most Common Fears

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ABSTRACT—*Fear is one of our most salient emotions, and one that is shared among humans and nonhumans alike. Traditional and modern views of how we acquire fear suggest that it is learned through conditioning or observation. However, an interesting aspect of human fears is that they are not all created equal—some fears are more likely to be experienced than others. In this article, I discuss some recent developmental research that sheds new light on why we are more likely to experience certain fears over others, and how attention and learning might work together to produce some of our most common fears and anxieties.*

KEYWORDS—*threat; detection; attention; fear*

WHAT ARE WE SO AFRAID OF?

Fear is one of our most important emotions. Common among mammals, it functions as a signal of impending threat. As humans, our fears and anxieties show a similar developmental trajectory from infancy through adulthood. Between 9 and 12 months, most infants start to show the first signs of being afraid and cling to their loved ones when approached by a stranger (Schaffer, 1974). Once they reach preschool age, children are most often afraid of ghosts and goblins, and later begin to fear animals like snakes and spiders. Finally, in early adoles-

cence, social fears and anxieties emerge, such as fear of rejection or crowds (Broeren, Lester, Muris, & Field, 2011). The fact that we all experience a similar developmental trajectory in what makes us afraid suggests that fears are nonrandomly distributed, with some categories appearing significantly more often than others. In fact, our most common fears—fear of heights, enclosed spaces, blood or injury, and animals like snakes and spiders—generally involve stimuli that are threatening. These fears appear early in development and remain common even in adults (Broeren et al., 2011).

For decades, researchers have asked how we acquire such fears, and why some are more common than others. Indeed, there are multiple pathways by which we can become afraid, all of which involve general learning mechanisms (e.g., Mineka & Zinbarg, 2006; Rachman, 1977). However, general learning mechanisms might not provide the whole story. Recently, developmental researchers have demonstrated that visual attention might play an important role in learning fear by directing our attention selectively to threatening stimuli in the environment (LoBue, Rakison, & DeLoache, 2010). Attention might also bias us to associate fear with some stimuli more readily than others, making it more likely that such fears will be learned (DeLoache & LoBue, 2009). Finally, negative experience might also reciprocally drive attention, leading us to attend selectively to stimuli that already cause us some anxiety (LoBue, 2010a; LoBue & Pérez-Edgar, 2012). In this article, I review recent developmental work that sheds new light on the process of fear development, focusing on the relative roles of attention and learning on the development of some of our most common fears and anxieties.

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HOW DO WE ACQUIRE FEARS?

Given that our most common fears—both early and late in development—are of threatening stimuli like snakes and spiders, many have asked about the ways in which these common fears are acquired. Both classic and contemporary models of fear acquisition suggest multiple pathways by which our basic fears can be learned. The most common models

involve classical conditioning (Mineka & Zinbarg, 2006; Öhman & Mineka, 2001; Rachman, 1977), vicarious or observational learning (Mineka & Zinbarg, 2006; Rachman, 1977), and learning through the transmission of negative verbal information (Field, 2006; Field & Lawson, 2003; Rachman, 1977).

However, basic learning models do not tell the whole story. According to the diathesis-stress approach to fear learning, for example, individual differences characterized by temperament or genetic factors might make some individuals more susceptible to acquiring a fear (Mineka & Zinbarg, 2006). Furthermore, general learning mechanisms alone do not account for why fears are disproportionately distributed—why some fears, particularly fears of threatening stimuli, are more common than others. Researchers have thus proposed that the acquisition of some fears might have a biological basis (Poulton & Menzies, 2002) or that fear learning might be *privileged*, or learned very rapidly, for some threatening stimuli like snakes and spiders (Mineka & Zinbarg, 2006; Öhman & Mineka, 2001). Classic work from Susan Mineka's lab confirms that snake fear is indeed privileged in learning for some nonhuman primates. Although wild-reared rhesus monkeys are fearful of snakes, lab-reared monkeys are not, indicating that the fear is not innate. However, lab-reared monkeys vicariously learn to fear snakes by observing the fearful behaviors of a fellow monkey. Most importantly, learning snake fear is selective and rhesus monkeys do not learn other fears, such as fears of flowers or rabbits, by watching the same fearful displays (for a review, see Öhman & Mineka, 2001). Thus, this work demonstrates strongly that snake fear is privileged in learning for rhesus monkeys.

Are such fears also privileged in learning for humans? Classic research from the adult literature suggests that they might be. In a series of experiments using classical conditioning, Arne Öhman and his colleagues conditioned adults to associate a mild electric shock with images of either snakes and spiders (fear relevant) or flowers and mushrooms (fear irrelevant). The association between a shock and fear-relevant stimuli was consistently more difficult to extinguish than the association between a shock and fear-irrelevant stimuli. More important, the same effect was found when photographs of the stimuli were presented so quickly that they could not be consciously perceived: In these cases, when conditioned with flowers and mushrooms, extinction occurred immediately; conversely, when conditioned with snakes and spiders, participants continued to anticipate the shock even in its absence (for a review, see Öhman & Mineka, 2001). Although such conditioning studies are not necessarily equivalent to fear learning, they suggest that humans might readily associate something negative or unpleasant with threatening stimuli.

THE ROLE OF ATTENTION

Previous work with adults suggests that even humans more strongly associate threatening stimuli with aversive or negative outcomes. However, adults have a lifetime of experience and

knowledge about stimuli like snakes and spiders. Thus, if fear learning for threatening stimuli is privileged, evidence of such a privilege should be evident early in development. Recent developmental work suggests that threatening stimuli are indeed privileged early on, but their advantage lies in visual attention. Based on this work, LoBue et al. (2010) proposed that humans have *perceptual biases* for threatening stimuli that set the stage for learning, potentially functioning early in development to draw attention to important stimuli in the environment. Previous work with adults has already shown evidence for these biases: Adults visually detect snakes, spiders, and angry human faces more quickly than a variety of positive or neutral stimuli such as flowers, mushrooms, and happy faces (e.g., LoBue, 2009; Öhman, Flykt, & Esteves, 2001; Öhman, Lundqvist, & Esteves, 2001; for reviews, see Bar-Haim, Dominique, Lee, Bakermans-Kranenburg, & van IJzendoorn, 2007 or Öhman & Mineka, 2001). A similar propensity has been documented in nonhuman primates, who detect a snake among flowers more quickly than a flower among snakes (Shibasaki & Kawai, 2009).

Recent developmental research shows that even at a young age, children have the same propensity as adults for the rapid detection of various threats. Using a modified touch-screen visual-search paradigm, LoBue and DeLoache (2008) showed that like adults, children as young as three detect snakes more quickly than flowers. More importantly, they even detect snakes more quickly than other animals that closely resemble snakes, like frogs and caterpillars (LoBue & DeLoache, 2008). Furthermore, 3-year-olds and adults also detect spiders more quickly than mushrooms and cockroaches (LoBue, 2010b), and 5-year-olds and adults detect angry faces more quickly than a variety of other facial expressions, including neutral, happy, and sad faces (LoBue, 2009).

In each of these studies, rapid detection was not related to whether children were afraid of the target stimuli, suggesting that perceptual biases for threat are present regardless of whether children are afraid of these stimuli. Furthermore, research with infants who have had *no* experience interacting with snakes suggests that these biases develop very early, much before the acquisition of snake and spider fears. When presented with two images side by side on a large screen, 9- to 12-month-olds turned more quickly to look at snakes versus flowers, and at angry faces versus happy faces (LoBue & DeLoache, 2009). Five-month-olds also look longer at images of spiders than at images of scrambled spiders (whose parts have been moved so they no longer look like spiders). The same result was not found for images of flowers, suggesting that the infants might even have an early perceptual template for threatening stimuli (Rakison & Derringer, 2008).

Besides demonstrating a bias for the rapid detection of threatening stimuli, developmental research has shown that infants have a perceptual bias for the association of snakes and spiders with something fear relevant, like a fearful face or fearful voice. For example, when DeLoache and LoBue (2009) presented 7- to 16-month-olds with two videos side by side—one of a snake

and one of another animal (elephant, giraffe, etc.)—the children looked longer at the video of a snake when accompanied by a fearful voice soundtrack versus a happy voice. Rakison (2009) reported similar results with fearful faces—11-month-old girls more strongly associate a snake and spider with the image of a fearful face than with the image of a happy face. As in the studies above, these effects were found in the absence of any behavioral evidence of fear—the infants were merely making a perceptual match between an image or video of a snake and a fearful face or voice, much like in other auditory-visual matching studies where infants make a perceptual match between a fearful face and a fearful voice or a video of a drum beating and its corresponding sound (e.g., Golinkoff, Hirsh-Pasek, Cauley, & Gordon, 1987; Spelke & Cortelyou, 1981; Walker-Andrews, 1997). The infants showed no behavioral evidence of fear themselves.

Together, this recent developmental work suggests that humans have perceptual biases for threatening stimuli that are visible early in development. More specifically, infants, children, and adults detect the presence of threat more quickly than various benign stimuli, and infants have a propensity to match the appearance of snakes and spiders with fearful faces and voices. Furthermore, although humans are perceptually sensitive to these commonly feared stimuli, such perceptual biases *precede* the development of fearful behaviors. Again, there is no behavioral evidence of actual fear in any of these studies. In fact, a recent study of 18- to 36-month-olds' naturalistic responses to a live snake and spider showed no evidence of fear. Conversely, infants were highly *interested* in the live snake and spider and interacted with them just as frequently as they interacted with a live fish and a hamster (LoBue et al., in press).

If these perceptual biases for threat are visible in the absence of fear, then one might ask: How they are related to fear development? As mentioned above, one possibility is that these biases *facilitate* fear learning, making fears of snakes and spiders very easy to acquire. These biases draw attention to threatening information in the environment and they do so from a very early age. Thus, heightened attention and increased sensitivity to associating the image of a snake or spider with fear-relevant information might act as a catalyst for learning, making fears of these threatening stimuli more likely to develop (LoBue et al., 2010).

THE ROLE OF EXPERIENCE

Although attention might play a role in learning, experience might also reciprocally drive attention. In other words, our experiences with fear and anxiety might make us more attentive to stimuli that induce stress. Although experience is difficult to account for in adults, recent developmental work has attempted to address this issue by studying children, whose experiences are more limited. Preschoolers, for example, have a predictable amount of experience with two modern threats that adults detect very quickly: knives and syringes (LoBue, 2010a). In Western

cultures, most 3-year-olds have few opportunities to handle knives and are unlikely to have had negative experiences with them (e.g., being cut or stabbed). In contrast, most 3-year-olds in the United States are likely to have been punctured by a syringe to receive mandatory vaccinations. LoBue (2010a) asked parents about their 3-year-olds' experiences with syringes and knives, and then asked the children to participate in two tasks where they detected knives versus a perceptually similar neutral control stimulus (spoons), and syringes versus a neutral control (pens). As predicted, although *no* children were permitted to interact with knives at home and had no negative experiences with knives, *all* the children had been punctured by a syringe. In fact, 91% of mothers spontaneously reported that their children did not like needles. Although adults detect both knives and syringes more quickly than neutral controls (Blanchette, 2006; Brosch & Sharma, 2005), children detected only the syringes more quickly, suggesting that experience may shift attention to stimuli that cause anxiety (LoBue, 2010a).

Previous research has shown that individual differences and experiences can also drive perception. Adults with clinical anxiety, for example, are particularly sensitive to social threat cues in detection, even more sensitive than are nonanxious controls (for a review, see Bar-Haim et al., 2007). This heightened sensitivity is present early on, even in children who have not yet developed clinical anxiety: Temperamentally shy 4-year-olds—who are at risk for developing clinical anxiety—show heightened attention to angry faces when compared to nonshy 4-year-olds in a control group. In particular, they are slower to detect happy faces when angry faces are present as distracters (LoBue & Pérez-Edgar, 2012). Together, this work suggests that although perception can drive the development of fear, anxieties can also drive perception and heighten our attention to feared stimuli.

THE DEVELOPMENT OF FEAR

This review highlights new developmental work demonstrating that from infancy, our perceptual systems are sensitive to threats, drawing our attention to them more readily than to other stimuli (DeLoache & LoBue, 2009; LoBue, 2009, 2010b; LoBue & DeLoache, 2008, 2009; Rakison, 2009; Rakison & Derringer, 2008). These findings suggest that our perceptual system is biased for processing threat stimuli. Based on classic work, researchers have proposed an evolutionary origin for such biases, presuming that there was some advantage to quickly detecting evolutionarily relevant threats in the environment, making escape easier and more efficient (e.g., Öhman & Mineka, 2001; Seligman, 1971). Recently Isbell (2009) provided a compelling argument for why our visual system may have adapted based on the challenge of detecting dangerous predators like snakes. Regardless of their origins, the data presented here suggest that such biases for threats like snakes, spiders, and angry faces are present early in development. They also suggest

that we have the flexibility to learn to be sensitive to environmentally specific threats, like knives and syringes, by having negative experiences with such stimuli, and that learned fears might reciprocally drive attention, highlighting stimuli in the environment that cause us anxiety (LoBue, 2010a; LoBue & Pérez-Edgar, 2012).

This research has important implications for how we acquire our most common fears. As several researchers have suggested, our fears likely develop as the result of some kind of experience, either by direct conditioning, vicarious conditioning or observational learning, or exposure to negative information (Mineka & Zinbarg, 2006; Öhman & Mineka, 2001; Rachman, 1977). However, basic learning mechanisms do not tell the whole story. Our most common fears, such as the fear of threatening stimuli, might receive some support from visual attention or attentional biases. These attentional biases might privilege fear learning for certain kinds of threats, explaining why such fears are so common (LoBue et al., 2010). This is an important issue for future discussion. To date, only a few studies have examined how fearful or avoidance behaviors are learned, and no study has compared the ease of fear learning for threatening versus nonthreatening stimuli in humans. If early perceptual sensitivity privileges fear learning for some stimuli over others, we should observe that fear develops more quickly for stimuli like snakes and spiders than for neutral stimuli over the course of development.

A related question is whether there is a specific type of learning that best facilitates fear acquisition. In other words, would children learn to fear snakes and spiders more rapidly based on observational learning, like in Mineka's work with rhesus monkeys? Or is hearing negative or threatening information about a snake (e.g., that they bite) sufficient to elicit fearful behaviors? Finally, a third important question is whether an advantage for snakes and spiders in detection leads to an advantage in adaptive action, such as escape. Many of the studies documenting an advantage for snakes and spiders report differences in detection of seconds or even milliseconds. Does such a brief advantage buy us anything when it comes to making decisions for action? Research examining these distinctions can help determine whether early perceptual sensitivities lead to adaptive behavior.

CONCLUSIONS

This review of work demonstrates that emotional processing, and fear development in particular, is a complex system that involves reciprocal and interacting relationships between attention and learning. This process begins with low-level perceptual biases that are visible early in infancy, and it endures throughout childhood and is still visible into our adult years. These biases draw attention to threatening stimuli in the environment, and this heightened attention might help facilitate fear acquisition if a learning experience were to take place. Such biases would thus privilege fear

learning for a subset of stimuli—the same ones that we find most often in adult fears and phobias. Research in this area can further clarify the processes by which we acquire our most common fears and anxieties, and can shed light on whether perception privileges some of these fears from an early age.

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