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Do infants find snakes aversive? Infants' physiological responses to "fear-relevant" stimuli

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ABSTRACT

In the current research, we sought to measure infants' physiological responses to snakes—one of the world's most widely feared stimuli—to examine whether they find snakes aversive or merely attention grabbing. Using a similar method to DeLoache and LoBue (*Developmental Science*, 2009, Vol. 12, pp. 201–207), 6- to 9-month-olds watched a series of multimodal (both auditory and visual) stimuli: a video of a snake (fear-relevant) or an elephant (non-fear-relevant) paired with either a fearful or happy auditory track. We measured physiological responses to the pairs of stimuli, including startle magnitude, latency to startle, and heart rate. Results suggest that snakes capture infants' attention; infants showed the fastest startle responses and lowest average heart rate to the snakes, especially when paired with a fearful voice. Unexpectedly, they also showed significantly *reduced* startle magnitude during this same snake video plus fearful voice combination. The results are discussed with respect to theoretical perspectives on fear acquisition.

Introduction

Fear of snakes is one of the most common fears among human adults (Agras, Sylvester, & Oliveau, 1969; Curtis, Magee, Eaton, Wittchen, & Kessler, 1998; Depla, ten Have, van Balkom, & de Graaf, 2008).

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Because of its overrepresentation in clinical studies of common fears and phobias, researchers have speculated widely about the origins of snake fear. Many have proposed that snakes are part of a special class of evolutionary threats for humans and non-human primates and that snake fear is either innate and does not require specific learning (Poulton & Menzies, 2002) or it is privileged and is learned especially quickly (Öhman & Mineka, 2001; Seligman, 1971).

A large body of research with both human adults and non-human primates confirms that snakes are indeed a special class of stimuli. Rhesus monkeys, for example, quickly learn to fear snakes after watching a conspecific display snake fear. Crucially, this fear learning is selective, and monkeys do not learn to fear flowers or rabbits after watching a similar display (Mineka, Keir, & Price, 1980; Mineka, Davidson, Cook, & Keir, 1984). Likewise, adults more strongly associate photographs of snakes and spiders than flowers and mushrooms with an aversive electric shock, as evidenced by slower extinction to this pairing (Öhman, Fredrikson, Hugdahl, & Rimmo, 1976; for a review, see Öhman & Mineka, 2001). There is also evidence that snakes are privileged in visual attention; adults more quickly detect photographs of snakes and spiders than flowers and mushrooms (Öhman, Flykt, & Esteves, 2001).

More recent work lends further support for the idea that snakes are a special category of stimuli for humans, demonstrating that even infants and young children respond differentially to snakes than to other stimuli. First, preschool children, infants, and even monkeys show the same attentional bias for snakes that adults show and detect them more quickly than flowers, frogs, and caterpillars (LoBue & DeLoache, 2008, 2009; Shibasaki & Kawai, 2009). Second, infants more readily match the image of a snake with something fearful. For example, DeLoache and LoBue (2009) presented 7- to 16-month-olds with two videos side by side on a large screen—one snake and one non-snake (e.g., elephant, giraffe)—paired with an auditory track of either a happy or fearful voice. Infants looked longer at the snakes when listening to a fearful voice than when listening to a happy voice, suggesting that they found something natural about the combination of a snake with a fearful voice. They did not show differential responding to non-snakes as a function of the auditory stimuli. Similarly, Rakison (2009) reported that 11-month-old female infants—but not male infants—learned to associate images of snakes and spiders with fearful faces but not with happy faces. In contrast, when tested with images of nonthreatening stimuli such as flowers and mushrooms, infants did not make any associations between the stimuli and happy or fearful faces, suggesting that female 11-month-olds readily associate snakes and spiders with a fearful face.

Together, this developmental work has been interpreted as evidence in support of evolutionary perspectives about the origins of snake fear. But do the findings described above necessarily indicate that infants are *afraid* of snakes or that they find snakes aversive? A closer look at these data suggests that they do not. DeLoache and LoBue (2009) examined 9-month-olds' baseline responses to snake and non-snake animal videos and reported no differences in behavior; that is, infants showed equal looking time to both and made equal attempts to grasp for them. In fact, the 9-month-olds attempted to *pick up* moving snakes from the screen and showed no behavioral evidence of fear. Moreover, in a recent examination of 18- to 36-month-old children's approach and avoidance responses to live animals, researchers again reported no evidence that young children avoid a live snake and spider (LoBue, Bloom Pickard, Sherman, Axford, & DeLoache, 2013). In contrast, children demonstrated an avid interest in all of the live animals, an interest that was equal for nonthreatening animals (e.g., hamster, fish) and for threatening animals (e.g., snake, spider). This work suggests that snakes might be a special class of stimuli for infants and children but that this special status is related to heightened attention and is not necessarily indicative of fear or aversion (LoBue, 2013; LoBue & Rakison, 2013).

The current experiment was designed to further examine this issue by studying the physiological correlates of infants' behavioral responses to snakes, specifically by measuring heart rate and startle responses. Heart rate deceleration has been used as a measure of orienting or attention (Graham & Clifton, 1966), whereas heart rate acceleration has been used as an index of fear (Campos, Emde, Gaensbauer, & Henderson, 1975). Similarly, a facilitated startle response has been used to measure heightened attention called *attention-modulated startle* (Anthony & Graham, 1983, 1985), whereas others have interpreted facilitated startle responses as vigilance or "freezing"—a category of physiological reactions undergone by humans when confronted with threat—called *emotion-modulated startle* (Lang, Bradley, & Cuthbert, 1997).

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