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Commentary

Theories of fear acquisition: The development of needle phobia in children

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Fear is a normal emotional response to a perceived threatening stimulus, and is a common feature of early development. Developmental fears, including fear of the dark, strangers, and loud noises, are typically transitory and usually resolve in childhood (Mineka & Öhman, 2002). In some cases however, intense fear of certain situations or objects may continue throughout adolescence and remain problematic into adulthood. When fear becomes excessive beyond that which is justified by external threat and markedly interferes with the individual's ability to function optimally, these fears may then meet criteria for an anxiety spectrum disorder such as Specific Phobia in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV, 2000; see also Barlow & Durand, 2005). Needle phobia is categorized under Specific Phobia blood-injection-injury subtype in DSM-IV, a cluster of phobias that also includes fear of blood, injury, or any invasive medical procedure. Blood-injection-injury phobia has been linked to serious consequences including refusal of insulin injections for diabetes, and avoidance of life-saving surgery for cancer (Marks, 1988).

Epidemiological studies have reported that identifiable needle phobia has a median age of onset at 5.5 years (Bienvenu & Eaton, 1998) and remains quite common in adulthood (Nir et al., 2003). For instance, in a sample of young adult travellers attending a vaccination clinic, 21.7% reported that they were afraid of injections and 8.2% described their fear as excessive (Nir et al., 2003). In an early epidemiological study, fear of blood and injury was found to be present in approximately one-third of children 6 to 12 years old (Lapouse & Monk, 1959). However, epidemiological studies on blood-injection-injury phobia have been hampered by a lack of precise definition for the disorder. The most recent prevalence rate based on the DSM-IV criteria for blood-injection-injury phobia indicates that this disorder is present in approximately 3% in the adult population (Bienvenu & Eaton, 1998).

This commentary provides a critical overview of proposed pathways for fear acquisition, with particular emphasis on the etiology of needle phobia. The pathways of fear acquisition will be considered within two broad frameworks: (1) the environmental learning pathways (e.g. direct conditioning, vicarious learning, and negative information), and (2) the non-associative pathways (e.g. biological preparedness, genetic mechanisms). The literature has been drawn from work in both pediatric and adult samples because studies focusing principally on needle fear in children are limited. Therefore, etiological inferences had to be drawn from studies on general fear and other specific fear (e.g. fear of spiders) in children and adults.

Environmental learning pathways

Rachman (1977) proposed that fears are learned through one or a combination of the

following learning pathways: (1) direct conditioning, (2) vicarious learning, and (3) negative information/instruction.

1. Direct conditioning. According to early conditioning models of fear acquisition, a single exposure to cues associated with an intensely aversive event can cause a person to remain fearful of those cues. Specifically, the pairing of a conditioned stimulus (CS; e.g. needle) with an aversive unconditioned stimulus (US; e.g. tactile pain) establishes an association between the CS and US. Therefore, the individual exhibits 'conditioned fear' to the needle because he/she has learned to expect tactile pain (US) following needle presentation (CS). Mowrer's (1960) two-factor theory of phobia development further suggests that excessive fear is the result of a direct conditioning experience and its maintenance by avoidant behavior.

There is some support for the classical conditioning theory. In a sample of 7- to 18-year-olds, 63% recalled having experienced a very unpleasant and painful injection (Duff & Brownlee, 1999). Of these children, 46% rated themselves as having "very" or "extremely" high levels of subsequent fear. A limitation of this pathway noted by several investigators is that many adults with intense fears or phobias cannot recall a specific learning incident (McNally & Steketee, 1985; Menzies & Clarke, 1995). Furthermore, many individuals exposed to traumatic experiences do not develop anxiety disorders (Poulton & Menzies, 2002; see however, Mineka & Öhman, 2002). Thus, direct conditioning alone does not sufficiently explain the development of all phobias, including excessive fear of needles. Although the classical conditioning theory for phobias remains controversial, it is worth noting that the most effective clinical intervention (i.e. exposure therapy) in the treatment of specific phobias is based on conditioning principles (Barlow & Durand, 2005; Tryon, 2005).

2. Vicarious learning. Another pathway for childhood fear development is through vicarious learning. Learned fear may occur by observing the fear responses of others without experiencing direct conditioning. A well-established finding in the literature is that infants actively search for emotional information from their caregiver and use this to appraise an uncertain situation; this search is known as *social referencing* (see Feinman et al., 1992). Social referencing is thought to be the basis for vicarious learning of fear, and therefore, potentially contributes to the development of specific phobias and related anxieties (de Rosnay et al., 2006).

Recently, Askew and Field (2007) provided prospective and experimental evidence supporting the role of vicarious learning in the development of childhood fears. In their study, children aged 7 to 9 years were shown pictures of novel animals paired with faces depicting scared, happy or neutral facial expressions. The perceived threat was self-reported to increase for novel animals they had seen paired with pictures of scared faces. These changes persisted after 1 week when measured explicitly and after 3 months when measured indirectly.

Maternal modeling of pain behavior in response to a cold pressor stimulus has also been found to affect pain behavior in children (Goodman & McGrath, 2003). In that study, mothers were instructed to display either exaggerated or minimal pain responses to a cold pressor task. Toddlers exhibited more facial pain responses in the cold pressor task after they had seen their mothers display exaggerated negative pain behaviors (Goodman & McGrath, 2003). Moreover, parental anxiety is positively correlated with child distress during venipuncture (Wolfram & Turner, 1996), and parental use of distraction has been shown to be beneficial in alleviating child distress (Bauchner et al., 1994).Taken together, the literature suggests that vicarious learning of fear from caregivers potentially contributes to the development of needle fear.

3. Negative information provision. Negative information about a stimulus may also explain the development and exacerbation of feared situations and objects that have not been personally experienced (Field et al., 2001). Negative information may increase beliefs about the danger posed by a particular stimulus. If a subsequent interaction with the stimulus is encountered, this is likely to produce a fear reaction (Davey, 1992;

Muris et al., 2003). Information-induced fear may result in avoidance of the particular stimulus or situation, thus reducing the chance of correcting erroneous expectations. For example, Field & Lawson (2003) demonstrated that children are more reluctant to approach an animal associated with negative information, which reduces their chance to prove to themselves that this animal is in fact, non-threatening. Similarly, negative expectations regarding an injection can lead to short term avoidance of the injection experience, and facilitate persisting resistance.

Non-associative accounts: biological preparedness and genetics

1. Biological preparedness. There are certain fears that are thought to be innate, such as the fear of heights, strangers, and loud noises (Poulton & Menzies, 2002). Although fear responses to these stimuli may have some evolutionary advantages such as avoiding dangerous situations or objects, they are usually outgrown as individuals mature and develop more adaptive responses (Mineka & Öhman, 2002). Similarly, fear of pain and injury is universal and protective, promoting responses that enable an individual to avoid threats and dangers (Poulton & Menzies, 2002). Therefore, one possibility is that needle fear may be a hard-wired fear response (Bracha et al., 2005).

2. Genetic factors. Twin studies have found that the fear response of one twin could be predicted by a co-twin's fear response (Rose & Ditto, 1983; Stevenson et al., 1992). The intensity of fears has also been found to be more similar in monozygotic than dizygotic twins (Stevenson et al., 1992). Moreover, a strong parent-child correlation has been noted in fainting reactions to stimuli associated with blood-injection-injury phobias (Kleinknecht & Lenz, 1989). This is possibly related to genetic traits in blood-injury phobics who display high levels of disgust-sensitivity (Manassis et al., 2004). Despite studies indicating a genetic component in the experience of fears, progress in this field has been modest, largely due to the involvement of "multiple genes of small effect size" (Gregory & Eley, 2007, p. 209).

Conclusion

Environmental, biological and genetic pathways have been suggested to account for the manifestation of needle phobia in children. Researchers have typically focused exclusively either on one or a few associative learning pathways of fear acquisition, or on biological or genetic factors. Given that these pathways suggested for needle phobia are unlikely to operate independently, researchers need to expand their focus and consider the possible interactions between genetic and acquired influences. Moreover, prospective studies are needed to determine the unique contribution of these pathways in the developmental trajectory of needle phobia. Studying fear acquisition at an earlier age, particularly in childhood and adolescence, would provide a better understanding of the onset of needle fears, and facilitate the development of targeted early interventions. Given the prevalence of blood-injection-injury phobia in adults and children, it is clear that the genesis, development, and effective intervention for needle phobia merit further constructive research.

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