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Fear of Injections and Needle Phobia Among Children and Adolescents: An Overview of Psychological, Behavioral, and Contextual Factors

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Abstract

The purpose of this clinical update is to provide an overview of the fear of needles and needle phobia in children and adolescents including characteristics and diagnosis, prevalence and epidemiology, etiological factors, and treatment options. Needle-related fear and needle phobia present as significant needle-related distress and avoidance behavior. The etiology is biopsychosocial. These challenging conditions are more common in children and adolescents than in adults. The nurse–patient relationship enables the provision of suitable preparation before injection procedures. Nurses can use exposure-based interventions and incorporate coping strategies and teaching of parents and children. Nurses play a pivotal role in noticing the need for further treatment. Procedural needle-related distress is a complex phenomenon representing a continuum ranging from needle fear to more severe needle phobia. For patients with needle fear management and training methods used by nurses can possibly prevent a progression of the condition into needle phobia. In cases of needle phobia, a correct diagnosis made by a psychiatrist is necessary and enables referral to a psychotherapist with experience in treating children and adolescents with needle phobia.

Keywords

needle phobia, etiology, management, children, adolescents

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Introduction

Children and adolescents are subjected to needles in their various encounters with health care. Most commonly, children's first exposure to needles may be when they receive routine health maintenance immunizations. However, they may also be subjected to needles when having a wound sutured, when having an intravenous infusion started for treatment or in undergoing a lumbar puncture. Chronically ill children may require repeated treatments and blood sampling with certain procedures, such as joint punctures and intraarticular corticoid injections, causing severe distress to the child. Studies have shown that hospitalized children report needle procedures as one of their most feared and painful experiences (Hart & Bossert, 1994; Kortesluoma & Nikkonen, 2004). Needle procedure-related fear may result in increased avoidance behavior and attempts to eliminate any possible exposure to needles (Sokolowski, Giovannitti, & Boynes, 2010).

Our aim is to present a comprehensive and pragmatic overview of fear of needles and needle phobia in children and adolescents regarding characteristics and diagnosis, prevalence and epidemiology, etiological factors, and practical treatment options. A broader understanding

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of the conditions is necessary for adequate management, interventions, and treatments.

Brief Review

Characteristics and Diagnosis

Needle phobia has been described in the literature using interchangeable definitions such as belonephobia (fear of needles and pins), trypanophobia (fear of injections), and aichmophobia (fear of sharp, pointed objects) according to the Encyclopedia of Phobias, Fears, and Anxieties (Doctor, Kahn, & Adamec, 2009).

In the International Classification of Diseases, Tenth Revision, Clinical Modification, needle phobia is categorized as the fear of injections and transfusions (F40.231; World Health Organization, 2004). The main feature in the condition is such a severe fear of venipuncture that active avoidance of the procedure is practiced (Cook, 2016). The International Classification of Diseases and Diagnostic and Statistical Manual of Mental Disorders criteria for needle phobia are presented in Table 1.

Table 1. ICD and DSM Criteria for Needle Phobia.

Diagnostic system	Symptoms
ICD-10-CM	1. The psychological or autonomic symptoms must be primary manifestations of anxiety and not secondary to other symptoms, such as delusion or obsessional thoughts.
	2. The anxiety must be restricted to the presence of needles or situations where a needle is used.
	3. Needles or situations where a needle may be used are avoided whenever possible.
DSM-5	1. The individual shows marked fear or anxiety about needles.[a]
	2. Needles or situations where needles may be used almost always give rise to immediate fear or anxiety.
	3. Needles or situations where needles may be used are actively avoided or endured with intense fear or anxiety.
	4. The fear or anxiety is out of proportion to the actual danger posed by the needles, the situation, and the sociocultural context.
	5. The fear, anxiety, or avoidance is persistent, typically lasting for 6 months or more.
	6. The fear, anxiety, or avoidance causes clinically significant distress or impairment in social, occupational, or other areas of functioning.
	7. The disturbance is not better explained by the symptoms of another mental disorder (panic disorder, agoraphobia, obsessive-compulsive disorder, etc.).

Note. Adapted from criteria for specific phobias to fit the condition of needle phobia. ICD-10-CM = International Classification of Diseases, Tenth Revision, Clinical Modification; DSM = Diagnostic and Statistical Manual of Mental Disorders. Retrieved from American Psychiatric Association, 2013; World Health Organization, 2004.

[a]In children, the fear or anxiety may be expressed by crying, tantrums, freezing, or clinging.

Prevalence and Epidemiology

Epidemiological studies on the fear of needles and needle phobia lack uniformity in the definitions used across researchers. This fact has made these studies challenging to interpret.

Further, several studies have addressed needle-related distress without distinguishing between a fear of needles and diagnosable needle phobia. In one study, 63% of children (aged 6–17) reported a fear of needles, and significant relations between a fear of needles and the female sex, as well as increasing perceived pain intensity during immunizations (Taddio et al., 2012). In another study of children (aged 4–16) with type 1 diabetes, 40.9% reported injection-related fear, and 22.7% reported associated pain. Further, children with diabetes and those younger than 9 years reported a higher frequency (75%) of fear of injections when compared with older children (21.4%; Howe, Ratcliffe, Tuttle, Dougherty, & Lipman, 2011). Over one third of children with an average age of 9 years ($SD = 4.1$) requiring methotrexate injections or blood tests for juvenile idiopathic arthritis have reported often or almost always feeling a fear of injections (Mulligan et al., 2013). In a large sample of children having immunizations, the self-reported fear of needles was scored as strong in 68% of children aged 6 to 8 years, in 65% of children aged 9 to 12 years, and in 51% of children aged 13 to 17 years (Taddio et al., 2012). In children (aged 6–17) with type 1 diabetes mellitus and having multiple daily injections, needle fear was present in 32.7% based on the responses of caregivers, while 22.2% of adolescents (aged 11–17) reported a fear of needles (Cemeroglu et al., 2014). In the adult population, a fear of needles is estimated to be 22% (Wright, Yelland, Heathcote, Ng, & Wright, 2009).

Needle phobia, an anxiety disorder affecting 3.5% to 10% of the general population (Nir, Paz, Sabo, & Potasman, 2003), has a median age of onset of 5.5 years (Bienvenu & Eaton, 1998). The literature shows that needle phobia decreases with age. While needle phobia could be diagnosed in 19% of children aged 4–6 years, in children aged 10–11, it could be found in 11% (Majstorovic & Veerkamp, 2003). Fears are common among 4- to 6-year-olds, become even more prominent in 7- to 9-year-olds, and then decrease in frequency in 10- to 12-year-olds (Muris, Merckelbach,

Gadet, & Moulaert, 2000). Of 18-year-old adolescents expressing dental anxiety, 11% have reported being needle phobic, and 17% and 15% of participants reported a high level of fear during their last dental and medical injection, respectively. Fainting has been experienced by 2% during a dental injection and by 7% during a medical injection. Avoidance of treatment when an injection was needed was 6.7% for dental treatment and 5.2% for medical treatment (Vika, Raadal, Skaret, & Kvale, 2006).

In conclusion, the fear of needles seems to be more common than diagnosable needle phobia. Both conditions show a decrease with age.

There are seemingly no studies specifically addressing the factors related to decreasing the fear of needles or needle phobia with age available at present. Theoretically, the maturation of emotion-regulation processes could be a plausible explanation for the decrease. Emotion regulation reflects a diverse set of control processes, which either stop the emotion from launching or prevent it from being expressed once it is triggered, primarily by the cortical modulation of subcortical circuits (Gross & Barrett, 2011). According to recent findings, positive amygdala-prefrontal functional connectivity in early childhood switches to negative functional connectivity during the transition to adolescence, reflecting an enhanced cognitive management of emotions (Gee et al., 2013). Even increased coping skills and natural desensitization through repeated exposure to needle experiences might be influential factors.

Etiology

Needle phobia apparently results from a combination of genetics and life events (Willemsen, Chowdhury, & Briscall, 2002). Fears usually represent transitory phenomena during childhood but can occasionally become highly stressful and develop into phobias (Du, Jaaniste, Champion, & Yap, 2008). Of individuals recollecting onset experiences for their needle-related distress, 76% reported conditioning-like events as the primary cause, while vicarious experiences were reported as primary by 20%, and 3% reported information as being primary in their fear onset (Kleinknecht, 1994). It is widely held that phobic fear is the result of a direct conditioning experience and its maintenance by avoidant behavior (Field, 2006).

Approximately 80% of adults with needle phobia reported that a first-degree relative exhibits the same fear (Accurso et al., 2001). In a recent review on specific phobia subtypes, the highest heritability was found for the blood-injection-injury phobia (Van Houtem et al., 2013). It is argued that a heritable predisposition to needle phobia may have its basis in evolution, given that humans who avoided stab wounds and other incidences of pierced flesh would have had a greater chance of survival. During the Mid-Paleolithic era, an encounter with a stranger holding a sharp object was possibly associated with an inescapable threat to life. Thus, a heritable predisposition to abruptly increase vagal tone and collapse flaccidly rather than freeze or attempt to flee or fight in response to an approaching sharp object or the sight of blood may have evolved as an alternative survival reaction (Bracha, Bracha, Williams, Ralston, & Matsukawa, 2005).

Individual factors. Patients suffering from a vasovagal needle phobia react to fear with a vasovagal syncope reaction. The sight of a needle triggers an autonomic overreaction, with a sudden increase in heart rate and blood pressure followed by an immediate slowing of the heart and decrease in blood pressure. The reduction in blood flow to the brain occasionally results in fainting (Aydin, Salukhe, Wilke, & Willems, 2010). People fainting during needle procedures report a fear of the vasovagal syncope reaction rather than fear of the needle procedure itself (Accurso et al., 2001).

In associative fear of needles, a traumatic experience, such as an extremely painful medical procedure or witnessing a family member or friend undergo such a procedure, causes the patient to associate all procedures involving needles with the original experience (Du et al., 2008). Associative fear of needles causes primarily psychological symptoms, such as extreme unexplained anxiety, preoccupation with the upcoming procedure, and panic attacks.

The sensations and side effects of some injection drugs can be considerably significant in the associative fear of needles. Children with juvenile idiopathic arthritis who frequently require methotrexate injections often develop psychological side effects, such as anticipatory nausea and behavioral distress in anticipation of the treatment (Van der Meer et al., 2007). Mulligan et al. (2013) reported that methotrexate administered subcutaneously was, in children ($M = 9.0$, $SD = 4.1$), associated with a greater risk of postadministration vomiting than methotrexate taken as pills.

Resistive needle phobia is characterized by combativeness. The underlying fear involves not only a dread of needles or injections but also a fear of being controlled, most commonly stemming from the physical or emotional restraint associated with prior needle procedures (Trijsburg et al., 1996). When a particular situation cannot be altered or avoided, a child can become oppositional and aggressive in his or her struggle for escape (Albano, Chorpita, & Barlow, 2003).

The hyperalgesic fear of needles, manifesting itself as punctate hypersensitivity, does not reflect fear of the actual needle but a fear of an excessive injection-related pain sensation (Ziegler, Magerl, Meyer, & Treede, 1999).

In the juvenile nervous system, nociceptive thresholds are lower than in adults, and endogenous pain inhibitory systems are inchoate. Injury, inflammation, and stress in early life can *prime* peripheral nociceptors and central pain circuits to overactivate when processing pain (de Lalouvière, Ioannou, & Fitzgerald, 2014; Fitzgerald, 2005). Childhood tissue injury can have prolonged effects upon the developing pain system, resulting in prolonged pain hypersensitivity in the area of injury, which may last for up to 3 years after the initial tissue injury (Peters et al., 2005). This is supported by findings in which children aged 4 to 12 years with chronic diseases have a lower pain threshold than children of the same sex and age who experience venepuncture for the first time (Bisogni et al., 2014).

Regarding the role of tactile hypersensitivity in needle phobia, stressful childhood experiences can give rise to impaired self-regulation by altering patterns of endocrine and functions of the autonomic nervous system (Miller, Chen, & Parker, 2011). In sensory processing disorder, defined as a condition associated with deviances in sensory gating and registration of sensory stimuli (Cheng & Boggett-Carsjens, 2005), sensitivity to tactile stimuli is commonly elevated (Tomchek & Dunn, 2007). The plausible interrelations between mechanisms of tactile hypersensitivity, sensory processing disorder, and hyperalgesic needle phobia are not known and need to be studied.

Adult influence factors. Children's distress during venepuncture is related to the behavior of accompanying adults (Taylor, Sellick, & Greenwood, 2011). The pain expressions of infants seem to be related to the quality of maternal caregiving. Intrusive caregiving behaviors of mothers increased pain reactivity in 3- to 20-week-old infants. Further, maternal nonintrusiveness was related to lower infant pain expressions, both immediately and 1 minute following needle procedures (Din, Riddell, & Gordner, 2009). According to Mahoney, Ayers, and Seddon (2010), children's (aged 7–16) distress was associated with the distress-promoting behavior of adults, while children's coping was associated with the coping-promoting behavior of adults during venepuncture.

Tsao et al. (2006) found that parental anxiety and sensitivity contributed to anxiety and sensitivity in girls but not in boys (aged 8–18) undergoing laboratory procedures.

In paediatric oncology patients (aged 3–18) undergoing routine blood procedures, influences in adult–child interactions were found to be bidirectional. Further, relations were found between rates of adult distress-promoting verbalizations and expected and actual pain ratings by parents and children, as well as nurse observations of pain. A positive relationship between expected and observed pain ratings by parents and rate of child distress was found (Spagrud et al., 2008).

Despite the mixed findings regarding the advantages of parental presence for children during venepuncture, it seems to benefit parents. Thus, it is appropriate to provide parents with the opportunity to be present during their child's painful procedure (Piira, Sugiura, Champion, Donnelly, & Cole, 2005). Parents feeling more comfortable by providing reassurance seem to make themselves and the children feel better during needle procedures (McMurtry, 2013).

Management and Treatments

The literature addressing needle-related fear and needle phobia has focused on the management of the fear of needles and needle pain. Anxiety can be an important predictor of pain report and pain tolerance in children and adolescents (Tsao et al., 2004), making the differentiation between the fear of needles and pain behavior challenging. Duff (2003) argues that needle-related difficulties largely reflect anticipatory or procedural distress.

Needle fear has been managed medically with benzodiazepines and nitrous oxide gas. The use of nitrous oxide has been studied in large samples, and it has been shown to be effective and safe for children of all ages (Babl, Oakley, Seaman, Barnett, & Sharwood, 2008; Zier & Liu, 2011). Procedural pain can be managed medically using topical analgesics (Eidelman, Weiss, Lau, & Carr, 2005).

The effectiveness of behavioral management of needle-related fear varies greatly, depending on the age of the person and the severity of the condition. Relaxation techniques (i.e., muscular relaxation, imagery relaxation, deep breathing, and autogenic training) might be useful in cases of mild fear of needles (Willemsen et al., 2002). However, relaxation methods may be contraindicated in cases of a vasovagal response due to the risk of a decrease in heart rate and blood pressure. Instead, graded exposure approaches can be used that include a coping component relying on applied tension as a way to prevent complications associated with the vasovagal response (Ditto, Byrne, & Holly, 2009).

Education seems to be effective in reducing procedure anxiety in older children but seems to have a negative effect on younger children's anxiety (Copanitsanou & Valkeapää, 2014). Older children and adolescents have stronger rational defences, making it possible for the child to think through and rationalize the procedure (Willemsen et al., 2002).

Psychological treatments of specific phobias focus on altering the tripartite components of the pathological fear response (i.e., physiology, behavior, and cognition),

as well as the overall subjective experience of fear (Davis & Ollendick, 2005). Uman et al. (2013) presented a comprehensive review of the effectiveness of psychological interventions for needle-related procedural pain and fear in children and adolescents, excluding studies with patients with diagnosed needle phobias. Although they stated that there still is a gap in the understanding of the efficacy of interventions across age ranges, they reported that the greatest effects in improving the condition were observed with distraction and hypnosis. These results are supported by the systematic review and meta-analysis by Birnie et al. (2014) in which distraction and hypnosis were found to be efficacious in reducing needle-related pain and fear. McMurtry et al. (2015) evaluated the effectiveness of exposure-based psychological and physical interventions for the management of high levels of needle fear or phobia and fainting in children and adults. Results reveal that exposure-based interventions effectively reduced fear of injections in children (aged $\geqslant 7$ years) and adults.

Psychological distraction, a form of attentional deployment, diverts the attention away from an emotional stimulus and toward other content (Sheppes, Scheibe, Suri, & Gross, 2011). Research has shown that distraction may be a useful tool for clinicians who work with a variety of pain problems (Malloy & Milling, 2010) and is effective in reducing experiences of unpleasantness in adults by enhancing the processing of emotions (Webb, Miles, & Sheeran, 2012). Distraction techniques can be chosen according to the child's age: Simple movements and visual or auditory stimuli, such as blowing bubbles, can be used for toddlers, and rhymes and kaleidoscopes can be used for children aged 6 to 18 months (Duff, 2003; Koller & Goldman, 2012). Cognitive strategies, such as counting and story reading, can be used for children aged 2 to 3 years, and guided imagery and playing videogames can be employed for children aged 5 years (Duff, 2003).

Hypnosis is a special psychological state hypothesized to weaken the frontal control of behavioral schemas, thereby allowing direct activation of behavior by the hypnotist's suggestions (Kirsch & Lynn, 1998). The classic use of hypnosis involves direct suggestions for modification of sensations. The use of hypnotic methods is age-specific and depends on the hypnotic susceptibility of the individual (Hilgard & Hilgard, 2013). Accardi and Milling (2009) reported that pain reduction in certain procedures, such as venepunctures, mainly depends on the individual hypnotic susceptibility.

An integration of pharmacologic pain treatment and distraction techniques facilitated by nurses yielded a primary benefit of decreased behavioral distress in children and adolescents (aged 2–16). Behavioral distress, on a 0 to 5 numerical rating scale, was significantly lower for older children and for those children who were provided distraction (Fanurik, Koh, & Schmitz, 2000).

Nursing Implications

Health-care professionals regard the use of needles as routine; yet for patients, needles can arouse anxiety. Time and skill are required to prevent or overcome needle-related distress in children and adolescents, which may lead to management problems and treatment refusal (Cook, 2016). Nurses frequently experience stress when immunizing children who fear and resist needle injections (Ives & Melrose, 2010), further implicating the need for incorporating assessment and intervention methods for fear of needles.

Suitable preparation can decrease both needle-related fear and pain, as presented by Kajikawa, Maeno, and Maeno (2014). In their model, children learned about injections and how a vaccine works. They injected a *vaccine* (water) into *skin* (sponge) using a syringe and imitation needle. Children's fear of needles and unwillingness to get vaccinations were decreased after the learning experience. Educating parents can offer a novel and effective way of improving the quality of pain care delivered to infants during vaccination (Taddio et al., 2014). On the contrary, warning the patient in terms of pain or undesirable experiences can result in more pain and anxiety than when not doing so (Lang et al., 2005).

Nurses can effectively incorporate coping strategies into their teaching of parents and children to administer injections. A useful model for overcoming stressful venepuncture is presented by Thurgate and Heppell (2005). In their three-step approach created for children and young people between the ages of 5 and 19 years, relaxation, control, and graded exposure is provided. McMurtry et al. (2016), in their evidence-based clinical practice guidelines for the management of high levels of needle fear across the lifespan, exposure-based interventions are considered good clinical practice. In vivo exposure-based therapy is recommended for children 7 years and older with high levels of needle fear. Imaginal, computer-based exposure is recommended for individuals who are unwilling to undergo in vivo exposure.

Training children in coping skills, without the inclusion of adult coaching, seems to be insufficient (Cohen, Bernard, Greco, & McClellan, 2002). The additional use of coping strategies by mothers seems to reduce the level of needle-related distress in children (Coyne, 2006). Over half of parents and children have considered *taking control* to be the optimum coping strategy (Ayers, Muller, Mahoney, & Seddon, 2011). Although children have reported perceiving parents as worried when they

reassure, parents tend to feel more comfortable providing reassurance than distraction, making both themselves and the child feel better (McMurtry, 2013).

Conclusions

The fear of needles and needle phobia are challenging and common conditions among children and adolescents. It seems reasonable to perceive needle-related distress on a continuum ranging from needle fear to more severe needle phobia. Managing procedural distress can provide both short- and long-term benefits by increasing compliance and reducing avoidance behavior in medical care. Health-care professionals could benefit from education in identifying and managing the different manifestations of needle phobia. Children and adolescents expressing a fear of needles may benefit from management procedures, while phobic individuals probably need more focused therapeutic interventions. Management of fear and management of pain can have different treatment implications. Further research is needed on topics such as the role of tactile hypersensitivity and emotion regulation in needle phobia. Parents need guidance in supporting their children and adolescents subjected to needle procedures.

A diagnostic evaluation by a psychiatrist is implicated in severe cases of needle-related distress. A correct diagnosis is necessary and enables referral to a psychotherapist with experience in treating children and adolescents with needle phobia. Nurses can play a pivotal role in noting the need for further treatment.

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