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Fear of sleep may be a core symptom of sympathetic activation and the drive for vigilance in posttraumatic stress disorder

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Far From “Just a Poke”

Common Painful Needle Procedures and the Development of Needle Fear

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Background: Vaccine injections are the most common painful needle procedure experienced throughout the lifespan. Many strategies are available to mitigate this pain; however, they are uncommonly utilized, leading to unnecessary pain and suffering. Some individuals develop a high level of fear and subsequent needle procedures are associated with significant distress.

Objective: The present work is part of an update and expansion of a 2009 knowledge synthesis to include the management of vaccine-related pain across the lifespan and the treatment of individuals with high levels of needle fear. This article will provide a conceptual foundation for understanding: (a) painful procedures and their role in the development and maintenance of high levels of fear; (b) treatment strategies for preventing or reducing the experience of

pain and the development of fear; and (c) interventions for mitigating high levels of fear once they are established.

Results: First, the general definitions, lifespan development and functionality, needle procedure-related considerations, and assessment of the following constructs are provided: pain, fear, anxiety, phobia, distress, and vasovagal syncope. Second, the importance of unmitigated pain from needle procedures is highlighted from a developmental perspective. Third, the prevalence, course, etiology, and consequences of high levels of needle fear are described. Finally, the management of needle-related pain and fear are outlined to provide an introduction to the series of systematic reviews in this issue.

Discussion: Through the body of work in this supplement, the authors aim to provide guidance in how to treat vaccination-related pain and its sequelae, including high levels of needle fear.

Key Words: needle, vaccination, pain, fear, phobia

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Vaccinations are responsible for promoting human health by reducing morbidity and mortality from infectious diseases.¹ However, the usual method of their administration, which involves needle puncture, is often painful. Vaccinations are the most common painful needle procedure worldwide, with an estimated 12 billion injections given per year.²

Despite the availability of evidence-based strategies for mitigating pain during vaccination, there is a lack of consistent implementation of these interventions; consequently, the majority of individuals receiving vaccination experience pain.^{3,4} Recently, increasing attention has been paid to pain as an adverse event of vaccination^{5,6} and, in 2010, the Help ELIminate Pain in Kids team (HELPinKIDS) published the first clinical practice guideline for pain mitigation during vaccination in childhood.⁷ The present work is part of a series of articles outlining an update and expansion of the original knowledge synthesis^{8–10} for the management of vaccine-related pain in individuals across the lifespan (ie, the 5Ps of pain management: pharmacological, physical, procedural, psychological, and process) as well as the treatment of individuals with high levels of needle fear or a phobia of needles through exposure-based psychological and physical intervention strategies (Fig. 1).^{11–17} As the presence of high levels of needle fear interferes with the implementation and success of traditional pain management strategies at the time of vaccination, individuals with

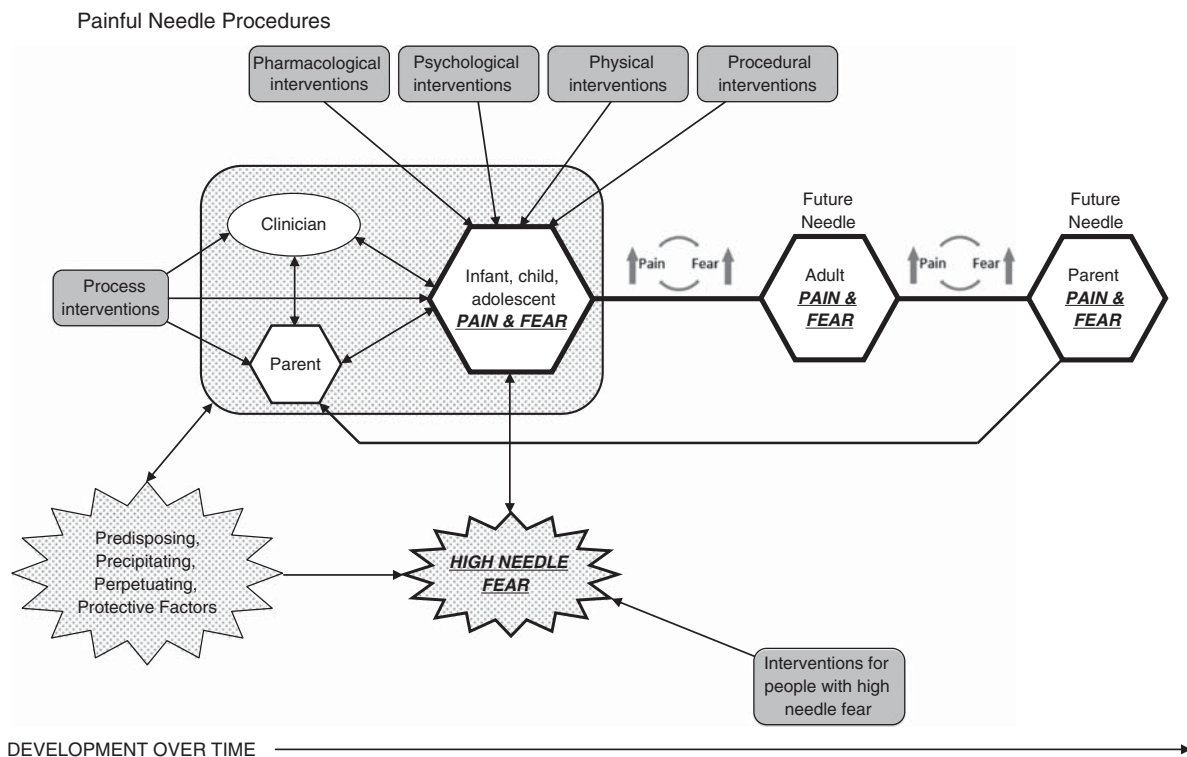


FIGURE 1. Needle procedures (eg, vaccine injections) across the lifespan. Predisposing, precipitating, perpetuating, and protective factors contribute to the entire needle context (shown in the patterned box) as they influence the clinician, parent, and child (eg, behaviors, experience). The critical role of a high degree of needle fear is highlighted. Unmitigated pain during these procedures may increase fear which in turn can exacerbate future pain in an escalating relationship. Thus, the consequences of unmitigated pain and fear during a given needle procedure extend beyond that particular procedure. Interventions in the systematic reviews in this series of articles are shown in gray-filled boxes; of note, the interventions for individuals with a high degree of needle fear must be implemented before the other interventions more proximal to the procedural context itself (ie, process, pharmacological, psychological, physical, procedural).

a high degree of needle fear must be treated before they can fully benefit from the 5 Ps approach. Together, the evidence base from this series informed the development of a set of new (2015) clinical practice guidelines encompassing the management of vaccination pain¹⁸ and high levels of needle fear (McMurtry CM, Taddio A, Noel M, et al., unpublished data, 2015) across the lifespan. The expanded scope of the project led to a change in the team name to HELPinKids&Adults.

The objective of the present article is to lay the conceptual groundwork for understanding: (1) painful procedures and their role in the development and maintenance of high levels of fear; (2) treatment strategies for preventing or reducing the experience of pain and the development of fear; and (3) interventions for mitigating high levels of fear once they are established. Unlike previous reviews on this topic, this paper focuses on the iatrogenic effects of pain beyond the immediate event; that is, we examine the sequelae of pain after the needle procedure, in particular, the development of high levels of needle fear. This is accomplished through uniting typically disparate areas of research (ie, pain management proximal to needle procedures and the anxiety literature), which requires conceptual clarity. Table 1 delineates important terminology and concepts related to needle fear and pain. We will also introduce treatment strategies to mitigate pain at the time of needle procedures to reduce acute pain and suffering, and to help prevent the development of

high levels of needle fear. Finally, we introduce strategies for treating high levels of needle fear once they have been established. Through this content, this commentary will provide readers with a foundation to understand the other articles in this supplement.

VACCINATION: A PAINFUL AND FEAR-INDUCING EXPERIENCE

Needle procedures (eg, vaccine injections, venipunctures) are prevalent throughout the lifespan, particularly in childhood. The resulting pain may be considered “mild” by some individuals; however, for others, these needle procedures are far from benign (ie, not “just a poke”) and are associated with a high degree of pain and fear.^{26,27} Children in particular, are concerned about needle pain^{27,28} and report wanting to receive interventions for their pain at lower levels of pain intensity compared with adults.²⁹ Across the lifespan, individuals report an absolute increase of approximately 10% in willingness to be vaccinated if the delivery were painless.²⁷

Pain management is a human right.³⁰ Evidence-based strategies for the management of pain and related outcomes (eg, fear, distress) during vaccinations have been reported^{7,31–34} and should be applied. Unfortunately, most individuals undergoing vaccination do not receive evidence-based treatments for their pain.^{3,4,35,36} In fact for pediatric

TABLE 1. Terminology and Concepts Related to Needle Fear and Pain: Definition, Lifespan Development, and Assessment*

Terms	General Definition†	Lifespan Development and Functionality	Needle Procedure–related Features and Considerations	Assessment Considerations (Needle Context; Ideal is Multisource, Multimethod)
Pain	“Unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage... Pain is always subjective.” ¹⁹	Architecture to perceive pain begins to work before birth; even very premature babies process and respond to pain. Pain is typically adaptive in the short term (eg, removing one’s hand from a hot stove) but can become maladaptive if persistent over time and associated with significant distress and suffering, and functional limitations (eg, chronic back pain over 6 mo leading to inability to work).	Pain is an iatrogenic harm of needle procedures. Children experience more pain than adults for the same needle procedure. Children are at higher risk of long-term harm from unmitigated pain (eg, repetitive neonatal pain associated with long-term central nervous system changes).	Subjective nature leads to emphasis on self-report when possible. Observational and proxy measures also important; critical to include for populations unable to self-report (eg, < 3 y, individuals with significant cognitive impairment); important to consider in young children (< 7 y) whose self-report may be unreliable.
Fear‡	Proximal alarm reaction to an immediate threat (real or perceived); ²⁰	Onset in infancy; intrinsic to normal development (eg, fear of strangers in infants, fear of the dark in children, fear of falling in older adults). Typically adaptive in dangerous situations (eg, encountering a burglar or a bear in the woods); can be maladaptive if reaction is excessive or limits functional ability (eg, freezing rather than escaping a burning building).	Some fear is expected and the intensity will likely vary with age. Low levels of fear regarding needles in individuals of all ages are considered a normative/natural reaction. High levels of needle fear are atypical: persistent, intense fear in response to a needle procedure (eg, fleeing, freezing, crying).	Subjective nature leads to emphasis on self-report when possible. Observational and proxy measures also important; critical to include for populations unable to self-report (eg, < 3 y, individuals with significant cognitive impairment); important to consider in young children (< 7 y) whose self-report may be unreliable.
Anxiety‡	Negative emotive state characterized by anticipation of future threat ²¹	Intrinsic to normal development. Conditionally adaptive: low to moderate levels can be adaptive depending on circumstances (eg, motivate preparation for upcoming test); high levels are typically maladaptive and may lead to hypervigilance and avoidance of the source of anxiety (eg, avoidance of studying because highly anxious about test).	Low levels of anxiety regarding needles in individuals of all ages are considered normative. High levels of anxiety regarding needles are atypical: persistent, intense apprehension of needle procedures which may lead to their avoidance.	Subjective nature leads to emphasis on self-report when possible. Observational and proxy measures also important; critical to include for populations unable to self-report (eg, < 3 y, individuals with significant cognitive impairment); important to consider in young children (< 7 y) whose self-report may be unreliable.
Phobia	<i>Diagnostic criteria:</i> persistent, severe form of both anxiety and fear regarding a circumscribed situation or stimulus: extreme fear (eg, trembling, crying, difficulty breathing) is present when confronted with the feared stimulus. When subjected to the feared-situation or stimulus, children may express fear through crying, clinging, freezing, or tantrums. Anxiety is present in terms of hypervigilance and avoidance. Reaction is considered disproportionate to danger posed. ^{22,23}	Mental and behavioral disorder representing a developmentally inappropriate, excessive, amount of fear and anxiety. Can occur throughout the lifespan from early childhood to late adulthood. Most individuals with specific phobia have more than one. May result in interference with functioning and may generalize over time to related stimuli.	Extreme fear and anxiety regarding needles and needle procedures is not normative. Results in a high degree of distress when confronted with the situation or avoidance and/or impairment in functioning (eg, avoidance of flu shot even though required by employment); may generalize to related situations such as general check ups. Falls within the blood-injection-injury subtype of specific phobias in the <i>Diagnostic and Statistical Manual of Mental Disorders-5th edition</i> ²²	Diagnosis requires a detailed assessment by a mental health professional with relevant training. Observational measures of avoidance behavior are important.

(Continued)

TABLE 1. (continued)

Terms	General Definition†	Lifespan Development and Functionality	Needle Procedure–related Features and Considerations	Assessment Considerations (Needle Context; Ideal is Multisource, Multimethod)
Distress	General term for unpleasant or negative effect. Traditional definitions of distress highlight pain, anxiety, sorrow ²⁴	Established at birth; present throughout life in a variety of contexts. Can be adaptive (eg, overt distress can signal something is wrong and elicit appropriate assistance—such as an infant crying for comfort) or maladaptive (eg, if it limits one's ability to carry out activities of daily living).	Distress typically considered combination of negative affect (eg, fear) and pain.	Subjective nature leads to emphasis on self-report when possible. Observational and proxy measures based on overt behavior; generally, overt behavior could represent any combination of pain, fear, distress, or other strong emotions; used as proxy measure of pain in individuals unable to provide self-report.
Vasovagal syncope	Loss of consciousness due to an initial increase in blood pressure and heart rate is followed by an overcompensatory and sudden reduction in both, resulting in insufficient blood flow in the brain.	Peak age of onset: mid-adolescence but can occur at any age. Typically considered maladaptive; fainting in the context of inescapable and insurmountable danger has been proposed as evolutionarily adaptive to deter aggressors ²⁵ and theorized to facilitate recuperation following injury (eg, may help with blood clotting).	Seeing blood/needle and experiencing pain are common triggers. Higher prevalence in individuals with blood-injection-injury phobia; not typically observed in other phobias.	Subjective report of prodromal symptoms such as dizziness or lightheadedness, sweatiness, seeing spots, nausea when possible. Observer rating of fainting behavior; important to consider in young children (< 7 y) whose self-report may be unreliable. Physiological: blood pressure, heart rate.

*Note that treatment is not considered within this table (eg, although some level of fear regarding needle procedures is expected this is not intended to imply that prevention of or treatment for fear is not desirable).

†Manifestations of pain, fear, anxiety, phobia, and distress are complex and can include multiple dimensions: (1) physical/biological/neurological (eg, sympathetic nervous system arousal, brain architecture changes in the long term); (2) cognitive (eg, language, hypervigilance, memory); (3) sociocultural (eg, relationships, cultural narratives); (4) emotional (eg, suffering); (5) behavioral (avoidance, disability).

‡Note that in the pain literature, these terms are often used interchangeably when discussing outcomes and measurement (eg, the Faces Anxiety Scale is used to gather self-report of fear from adults).

populations, rather than prioritize pain management to address children's strong concerns about pain, adult caregivers and clinicians have typically underprioritized and undertreated procedural pain.^{37,38} Thus, there is a large gap between scientific evidence and current practice that translates into continued unnecessary suffering for those undergoing needle procedures. In the current paper, we will argue that consideration of and intervention for acute pain during medical procedures undertaken in childhood is a necessary step toward reducing, and/or preventing longer-term sequelae of unmitigated pain. In particular, we focus on the development and consequences of needle fears and phobia that have been largely unappreciated by the health care community but have significant deleterious impact on the health outcomes of affected individuals.

Much more than a simple noxious stimulus leading to an individual's sensory experience, the experience of pain also involves a host of other features including biological, psychological, social, and contextual factors^{39–41} (see also Fig. 1 which is consistent with the cited models). An integrative developmental framework is critical for understanding pain and fear in the vaccination context for several reasons. Firstly and perhaps most importantly, the amount of distress observed and pain reported during needle procedures tends to decrease as individuals get older (ie, younger children tend to be more at risk when undergoing the same procedure than older individuals.^{42–45} For

example, the vast majority (90%) of 14- to 18-month-old infants and 45% of 4- to 6-year olds demonstrate severe distress during vaccination.⁴⁵ Thus, individuals in early childhood who are subjected to the greatest number of vaccine injections,⁴⁶ may be at most risk for acute suffering from these procedures. Secondly, the appropriate measurement of pain, fear, distress, and related constructs are influenced by age (Table 1); for example, young children may not be able to provide reliable self-report of their pain experience,^{47–49} but instead are dependent on others' accurate interpretations of their behavioral distress to receive appropriate treatment. Thirdly, not only does an individual's cognitive development impact his or her ability to understand the context of the pain, it also dictates appropriate intervention. Young children, for example, will not understand explanations for why vaccinations are needed, nor have the same arsenal of internal coping strategies to deal with pain as adults do. Rather, pain treatments should be provided and these should be tailored to the individual's developmental stage.

Beyond acute suffering during vaccinations, developmental considerations are also important to understand the long-term risks of unmitigated pain, including the development of high levels of needle fear. Needle fear typically develops in early to middle childhood with peak age of onset between 5 and 10 years of age.^{50–52} Hence, efforts to mitigate procedural pain must also consider this

developmentally sensitive window, which justifies a comprehensive treatment approach for young children to avoid both short-term and long-term suffering. As a particularly significant long-term risk of unmitigated pain, needle fear was incorporated into the HELPinKids&Adults knowledge synthesis and will be explored in detail in this paper.

After many decades of research, the Gate Control Theory and biopsychosocial models of pain all clearly indicate that emotions shape one's pain experience and expression^{39,41,53}; however, negative emotions regarding needle procedures such as vaccinations are often ignored. In the case of fear, this is particularly problematic, as fear seems to have a bidirectional relationship with pain. For example, greater perceived pain during needle procedures has been associated with higher levels of fear.^{27,54,55} Although acute pain from needles typically dissipates in the minutes, hours, or days after a needle, the emotional sequelae of unmanaged pain, most notably a fear of needles, can have a much longer lasting impact. Indeed, for some, pain and fear are not over when needle procedures end. Poorly managed needle pain can lead individuals to develop more fearful memories of pain over time,⁵⁶ which may predict distress at future needle procedures.⁵⁷ Thus, individuals can become fearful of the pain associated with the procedure, which may result in an escalating relationship between pain and fear over time (Fig. 1). In addition to fear of pain, individuals may also be apprehensive regarding other factors related to needle procedures, such as sitting in the waiting room, seeing blood, seeing the point of the needle, seeing the needle inserted, being "poked" multiple times with a needle, and being restrained.⁵⁸

NEEDLE FEAR AND PHOBIA

Prevalence and Course

Children have long reported that receiving a needle is one of their most feared and painful experiences, and they are preoccupied with concerns about needles across health care settings.^{26,28,59,60} For example, "am I getting a shot today?" is a common question posed by children when they visit their doctor's office.³³ However, concerns regarding needle procedures do not simply vanish over the course of childhood; in fact, needle-related apprehension is common in adults as well.^{27,54,61,62} A recent study found that 63% of children endorsed a fear of needles,²⁷ whereas several studies have reported adult prevalence rates of some degree of needle fear ranging from 14% to 38%.^{27,54,61,63-65} Because of clustering of phobia subtypes in traditional diagnostic classification systems (eg, *Diagnostic and Statistical Manual of Mental Disorders* by the American Psychiatric Association²²), research is scarce on the epidemiology of needle phobia specifically. However, the lifetime prevalence of blood-injection-injury phobia (the broader categorization in which needle phobia is included) is estimated to be between 3% and 4.5%.^{50,51} Once established, and if left untreated, severe needle fear appears to follow a relatively stable, chronic course which can last for decades^{22,66,67}; however, there is some evidence of a slight decrease in prevalence over time.^{68,69}

Etiology

Although individuals may not disclose their fear of needles to a health professional until much later in life, the onset of needle fear and phobia is thought to occur in early to middle childhood (~5 to 10 y of age⁵⁰⁻⁵²). By this time,

individuals who are compliant with vaccination schedules will typically have received well over a dozen needles.⁴⁶ Unfortunately, as previously noted, for the majority of children, there is a failure to implement evidence-based pain management strategies during these procedures.^{3,4} These repeated painful procedures in early childhood without benefit of treatment represent a risk factor for the development of high levels of needle fear. Figure 1 depicts the experience of needle procedures in childhood and over the lifespan, emphasizing the interplay between pain and fear; the following sections will focus on the development of fear in the context of these painful procedures and the impact of high levels of needle fear.

There is no 1 biological vulnerability, personality construct, life event, or combination thereof that can guarantee or protect against the development of a high degree of needle fear or needle phobia.⁷⁰ A significant painful or traumatic event or set of events may, in isolation, lead to the development of severe needle fear and/or phobia (eg, engaging in painful cancer treatments⁶³). However, a more broadly applicable perspective contends that high levels of needle fear likely emerge as the result of a number of factors present in childhood that either continued or amplified the fear into adulthood.

The developmental psychopathology perspective^{71,72} can be applied to help understand the factors that lead to high levels of needle fear and phobia in children and the adults they will become (see Racine et al⁷³ for a related review). Using this organizational framework, each individual with severe needle fear or phobia is seen to arrive at this outcome through his or her own unique set of characteristics and behaviors, which differentially interact with his or her environment over the lifespan.⁷⁴ Furthermore, an individual is seen as having both risk and protective factors influencing the pathway by which the severe needle fear would develop. These factors can predispose, precipitate, perpetuate, or protect against the development of pathologic fear.^{74,75}

Predisposing, precipitating, perpetuating, and protective factors are frequently used to approach the conceptualization of psychopathology in children and adults (ie, provide a case formulation).⁷⁵⁻⁷⁷ Predisposing factors may include genetic factors, life events, or temperament, which put the individual at risk. There has been speculation that humans are biologically prepared to fear needles given (adaptive) fear of pain and fear of injury.^{70,78} Female sex and younger age have been shown to be significantly related to needle fear and phobia.^{27,50,54,62,63,79,80} Moreover, a hereditary component to blood-injection-injury phobia has been demonstrated with correlations between monozygotic twins reported as 0.49 and dizygotic twins as 0.10.⁸¹ A meta-analysis by Van Houtem et al⁸² reported the mean heritability of blood-injection-injury fears to be 41% (\pm SEM 0.06) and blood-injection-injury phobia to be 33% (\pm SEM 0.06).

Precipitating factors refer to triggering or catalytic events that have led to the onset of the current problem. Although not necessary nor sufficient to lead to the development of needle phobia in and of itself, having a history of fainting (vasovagal syncope) is positively related to needle fear.^{54,61,62,67} Moreover, having had a significant fear conditioning event either through directly experiencing needle-related negative sequelae (eg, experiencing pain, bleeding), watching someone else (eg, an older sibling) have these experiences, or simply being given negative information

from a trusted source (eg, a parent; Fig. 1) are the most common precipitating events for the development of phobia.^{70,83} Although based on retrospective methods, individuals with needle fears typically report a traumatic conditioning experience, supporting the importance of conditioning events and unmitigated pain in this context.^{67,84,85}

Perpetuating, or maintaining, factors are those that maintain the problem once it has become established. How individuals remember pain is one such factor. Distressing memories of needle pain and associated fear can develop from one poorly managed or negative procedure (a precipitating event) and are most likely to develop among highly anxious individuals.^{86,87} Individuals who are anxious about pain are likely to experience the needle procedure as more unpleasant, painful, and distressing. They are also likely to selectively attend to and encode threatening aspects of the needle procedure, which can lead to their memories of pain and fear becoming increasingly distressing over time such that they remember *more* pain and fear than they initially reported. This can fuel a negative cycle of increased fear, anxiety, and pain that becomes perpetuated and maintained over time and further reinforced at each subsequent procedure.⁸⁸ This is likely why individuals who are highly apprehensive and fearful of needles can often root their concerns back to 1 poorly managed needle procedure in childhood.

Protective factors are strengths of the child or adult that reduce the severity of problems or promote healthy and adaptive functioning. For example, in 1 study, adults who self-selected to look at (ie, expose themselves to) the needle going into their arm reported less pain compared with those who chose to look away (ie, avoided)⁸⁹ (but also see Goodenough et al⁴³). Having a behavioral predisposition to face a fear-inducing stimulus could be a protective factor against developing a high level of needle fear; in fact, a key component of evidence-based treatments for phobias is exposure.^{90–92} One's social context can also serve as a powerful protective factor.³⁹ Adaptive responses from caregivers and significant others can encourage and reinforce coping as well as focus individuals' attention on nonthreatening aspects of the needle procedure. Indeed, contingent on their content (eg, distraction, encouraging coping vs. reassurance, empathy), parental behavioral responses to child pain in the context of needle procedures have been shown to promote adaptive coping and decreased pain and fear.^{93–95} As well, anxiety and pain behaviors can be acquired through observational learning from others.^{40,96,97} Therefore, individuals can acquire adaptive cognitive and behavioral coping responses to pain experiences through such observational learning processes. Furthermore, caregivers and significant others can serve as strong advocates for individuals in helping them access and implement effective pain management interventions.

Consequences

Fear of needles has both proximal and distal negative consequences, particularly when it is of a moderate to high level. Proximal to the procedure: (1) children and adults with needle fear are more likely to report experiencing pain from procedures and fear of health care professionals^{20,54,61,98}; (2) fear of needles is associated with a higher risk of experiencing physiological symptoms, including fainting and seizures,^{62,78,99} which can lead to serious safety concerns¹⁰⁰ and have been highlighted as a

major source of dental office emergencies⁸⁰; and (3) parents of children with needle fears report challenges during the procedures, including flailing, running away, fainting, and requiring restraint to successfully complete the procedure.²⁷ These consequences result in a negative, and potentially traumatic, experience for the needle recipient, the health care provider, and caregivers.

In terms of more distal consequences, those with acquired fears may require higher doses of analgesics for the same effects, resulting in further vulnerability to inadequately managed pain.¹⁰¹ Beyond a reluctance to donate blood,⁶⁵ individuals of all ages who are afraid of needles are more likely to avoid preventative health care requiring needles, including blood tests, vaccinations, and dental care.^{27,61,62,102–105} Noncompliance with vaccinations is highly problematic given the importance of herd immunity in protecting communities from infectious diseases as well as the risk to individuals in vulnerable groups (eg, those over >65 y if they contract influenza¹⁰²; the patients of health care providers who refuse influenza vaccination due to a fear of injections).^{104,106} A salient recent example is the outbreak of measles in the United States with 178 cases and 4 outbreaks in 17 states between January 1 and March 20, 2015 and 644 cases in 27 states in 2014.¹⁰⁷ People with a chronic condition requiring treatment through needle procedures are particularly at risk because they avoid not only preventive care (eg, vaccination) but also their required, potentially lifesaving, therapeutic regimens (eg, insulin injections for diabetes, interferon injections for multiple sclerosis) leading to poorer health outcomes.^{62,78,108–111}

Elevated fear and anxiety toward needles may generalize over time resulting in noncompliance with other health care behaviors; in fact, extreme levels of apprehension about, or refusal to comply with, blood tests can lead to avoidance of travel plans, education, career decisions, pregnancy, and even result in legal problems.^{78,80} Taken together, avoidance associated with fear of needles could lead to a significant economic burden through increased health care expenditures over time; that is, avoidance of preventative as well as lifesaving health care could lead to greater severity of ill health/disease/disorder and complications which in turn will cost society more in the long term than if the individual had been initially adherent. Not surprisingly, given these deleterious consequences, there has been a mounting concern regarding our understanding of these fears and their management.^{26,27,61,78,80,112} In response to these concerns, the current knowledge synthesis takes a novel, comprehensive approach by examining interventions for both the acute pain context and for high levels of needle fear.

IMPROVED MANAGEMENT OF NEEDLE-RELATED PAIN AND HIGH LEVELS OF NEEDLE FEAR: SYSTEMATIC REVIEWS IN THIS SERIES

Through broad and rigorous syntheses of the literature, the articles in this series provide evidence on the best care for infants, children, adolescents, and adults undergoing vaccination through pharmacological, physical, procedural, psychological, and process strategies^{11,12,14–17}; limitations and future research directions cutting across the systematic reviews are also explored.¹¹³ Consistent application of effective pain management strategies for childhood vaccinations not only serves to reduce acute pain and suffering at the time of vaccination, but may also

substantially reduce the development of high levels of needle fear and/or phobia. Individuals with a high degree of needle fear must be treated before they can fully benefit from the pharmacological, physical, procedural, and psychological strategies designed to make the procedure itself more comfortable; as such, a systematic review on the treatment of high levels of needle fear is also included in this series focusing on exposure-based psychological and physical strategies.¹³ This special series of papers is predominantly intended for researchers, but is also useful for health care professionals administering vaccinations and vaccination program managers across the world.

CONCLUSIONS

Vaccinations are one of the most beneficial lifesaving interventions of modern medicine.^{1,114} However, the significance of the vaccination-related adverse events of pain and associated needle fear has been neglected until recently, particularly in childhood. Health care providers need to incorporate pain management strategies into their clinical practice; parents and individuals being immunized should also be taught appropriate strategies. The purpose of this paper was to provide an overview of pain and fear in the context of needle procedures. Long after the acutely painful sensation is gone, the emotional sequelae surrounding the experience can linger. Over time, unmitigated pain may increase fear, which in turn, may increase pain at future procedures. Ideally, parents play a large role in having children face their needle fears and phobias by ensuring children comply with vaccination recommendations. However, children with high degrees of needle fear who struggle and are forced into what have become highly aversive needle situations grow up into adults who are responsible for their own health care decisions. These individuals can choose to avoid preventative care or experience these procedures with extremely negative physical and emotional reactions; furthermore, highly fearful adults may become parents themselves who may model needle fear to their children (Fig. 1). Acknowledging the psychological sequelae of needle procedures draws attention to the fact that unmanaged pain hurts more than just an individual's body. The interventions included in the following series of articles are reviewed regarding their effectiveness for reducing the pain caused by vaccinations and for the management of needle fear. The evidence was used to inform the new (2015) HELPinKids&Adults clinical practice guidelines (also McMurtry CM, Taddio A, Noel M, et al., unpublished data, 2015).¹⁸

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