

The Effect of Combined Stimulation of External Cold and Vibration During Immunization on Pain and Anxiety Levels in Children

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Purpose: Procedures involving needles are the most common and major sources of pain in children. External cold and vibration via Buzzy (MMJ Labs, Atlanta, GA) is a method that combines cooling and vibration.

Design: This study investigated the effect of the combined stimulation of skin with external cold and vibration via Buzzy on the pain and anxiety levels in children during immunization.

Methods: This study was a prospective, randomized controlled trial. Children were randomized into two groups: experimental (external cold and Buzzy) and control (no intervention). The pain and anxiety levels of the children were assessed using the Wong-Baker FACES scale and Children Fear Scale.

Finding: The experimental group showed significantly lower pain and anxiety levels than the control group during immunization.

Conclusions/Implications for Practice: The combined stimulation of skin with external cold and vibration can be used to reduce pain and anxiety during pediatric immunization.

Keywords: Buzzy, external cold and vibration, pediatric immunization, procedural pain and anxiety, pediatric nursing.

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PAIN IS DEFINED by the International Association for the Study of Pain as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms

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Conflict of interest: None to report.

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of such damage.”¹ Medical procedures that are applied using a needle, such as immunizations, are the most common and important sources of pain for children, causing anxiety, distress, and fear.²⁻⁵ Moreover, the fear of pain, which is experienced because of medical procedures in childhood, usually continues up to adulthood. Thus, interest in the management of pain in children has increased in recent years.

Nurses should be able to manage painful procedures to reduce the emotional and physical effects in children.⁶ Needle pain management includes both nonpharmacological and pharmacological methods.⁶⁻⁸ Topical anesthetic creams provide local anesthesia but require a minimum application time of 15 to 60 minutes.⁶⁻¹⁰ Use of eutectic mixture of lidocaine 2.5% and prilocaine 2.5% cream did not interfere with the success of

venipuncture or venous cannulation in children in one study.¹¹ However, topical liposomal 4% lidocaine cream was not effective with a 15-minute application time under occlusion; there were no differences in pain between study groups.⁹ In busy medical settings, such as phlebotomy stations, this delay is unacceptable. Vapocoolants are a skin-cooling technique and contain chemicals that produce an instantaneous cooling effect. The coldness may reduce the sensation of pain during the procedure. A systematic review and meta-analyses of relevant data demonstrated a beneficial effect on self-reported pain.¹² However, there was no difference in pain associated specifically with vaccine injections.¹³ Nonpharmacological approaches of pain management include slow, deep breathing, and distraction techniques, such as singing, reading, or playing a game.^{2,5,7,12,14} The combination of these techniques with pharmacological approaches or sweet tasting solutions, such as breastfeeding, sucrose solutions, and gum, has been recommended.^{7,12}

Although some data support each of these methods, there is no single integrated method to optimize pain relief. Most current options require excessive time, cost, or staff training,^{3,15} all problems for most medical settings.¹⁶ An easy-to-use, inexpensive, and rapid method to relieve pain could help to lower procedural pain and anxiety in medical settings.



Figure 1. Buzzy. Used with permission of MMJ Labs LLC. This figure is available in color online at www.jopan.org.

Buzzy (MMJ Labs, Atlanta, GA) uses a method that combines cooling and vibration (www.buzzy4shots.com) (Figure 1). Buzzy was applied in an adult population during cannulation attempts and found to be effective for pain relief.¹⁷ Gate control theory may offer an explanation for the effect of cold stimulation and vibration.¹⁸ This theory suggests that pain is transmitted from the peripheral nervous system to the central nervous system, where it is modulated by a gating system in the dorsal horn of the spinal cord. It has been suggested that the afferent pain-receptive nerves (A-delta fibers and slower C fibers carrying pain messages) are blocked by faster non-noxious motion nerves (A-beta fibers).¹⁹ Prolonged cold stimulates the C fibers and may block the A-delta pain signals. Cold may also result in enhanced activation of supraspinal mechanisms, raising the body's overall pain threshold.²⁰

Only three published studies investigating external cold and vibration in pediatric populations during venipuncture could be found,²⁰⁻²² and there have been no published studies investigating this method in pediatric populations during intramuscular (IM) injection. This article proposes to show the outcome of external cold and vibration administered via Buzzy during vaccination by way of injection on 7-year-old children's pain and anxiety levels.

Design and Methods

This study was a randomized controlled clinical trial conducted during routine school immunizations in Turkey. Because of this, all children were of the same age (7 years old), and each received the same vaccine (diphtheria, tetanus, pertussis [DTaP]) via IM injection. The study was conducted at two different elementary schools in Karaman, Turkey between May and June 2012. Informed consent was obtained from the parents or guardians of children undergoing immunization via IM injection. The same nurse conducted the immunization procedure for all children in both elementary schools. The immunizations were performed in the left or right deltoid muscle, depending on whether the children were left handed or right handed. The right deltoid muscle was used for left-handed children, whereas the left deltoid muscle was used for right-handed children.

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