



ORIGINAL ARTICLE

A randomized controlled trial of eye shields and earmuffs to reduce pain response of preterm infants

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Available online 2 January 2015

KEYWORDS

Light;
Noise;
NICU environment;
Pain;
Preterm infants

Abstract The purpose of this study was to evaluate the pain response of 28–32 weeks gestational age preterm infants during a heel lance following a 4-h period where they had worn eye shields and earmuffs as a light and noise reduction intervention. A randomized controlled trial was conducted on 44 preterm infants recruited from four level III NICU. Heart rate and heart rate variability were collected continuously during the heel lance. At the end of the painful procedure, the time HR took to return to baseline was calculated. ANCOVA indicated that preterm infants who wore eye shields and earmuffs 4-h before the heel lance did not show a significant reduction in their pain response during the procedure in comparison to those who did not. Confounders such as handling in the hours preceding the painful procedure and the time it took to collect the blood might have influenced the results.

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Introduction

Reducing environmental stress and pain in infants born before term is a main concern in Neonatal Intensive Care Units (NICUs). An ongoing developmental care intervention identified as reducing stress in preterm infants consists of minimizing their exposure to environmental light and noise (Symington and Pinelli, 2009). Evidence also implies that reducing preterm infants' exposure to non-painful sensory stimulations in the NICU, thereby diminishing their stressful experience, might be beneficial to reduce their pain response while undergoing painful stimulation (Anand and Scalzo, 2000; Holsti et al., 2006; Porter et al., 1998). More than a decade ago, it was recognized that few studies have evaluated the efficacy of environmental interventions on the pain response of preterm infants while experiencing painful procedures (Stevens et al., 2000). As hospitalized preterm infants periodically experience procedural pain for therapeutic purposes (Carbajal et al., 2008; Roofthoof et al., 2014), there is still a need to evaluate the efficacy of interventions reducing the preterm infants' exposure to NICU light and noise on their response to painful procedures.

Background

It is imperative to reduce the pain response of preterm infants in order to support their physiological stability as well as to prevent long-term effects associated with painful experiences. Painful procedures such as heel lancing is associated with physiological disorganization in preterm infants (Harrison et al., 2002; Johnston and Stevens, 1996; Lindh et al., 1997) while long-standing repetitive painful procedures decrease their pain sensitivity (Fitzgerald and Walker, 2009; Grunau et al., 2005) along with having adverse effects on their brain development (Brummelte et al., 2012; Vinall and Grunau, 2014). Hence, repeated skin breaking procedures in 32 weeks gestational age preterm infants is associated with poorer cognition and motor function at eight and 18 months post-conceptual age (Grunau et al., 2009). Therefore, all professionals should aim their interventions at preventing and managing pain in the NICU (American Academy of Pediatrics [AAP] & Canadian Paediatric Society [CPS], 2006) and non-pharmacological interventions should be further carried out (Roofthoof et al., 2014).

Abnormal sensory stimulation, such as environmental light and noise, and repetitive pain in the

NICU can cause an hyperexcitability of the preterm infants' central nervous system (CNS) (Anand and Scalzo, 2000). The process of CNS hyperexcitability is particularly important for preterm infants who have neurological immaturity since it may increase their vulnerability to other stressful stimulation, and in return may cause physiologic stressful responses (Anand, 1998). This perspective is empirically supported by results of randomized trials confirming that tactile stimulations before a heel lance, such as clustered care (Holsti et al., 2006) and handling (Porter et al., 1998) increase preterm infants' pain response during the procedure. So, the exposure of preterm infants to excessive NICU light and noise may diminish their physiological resources to help them to manage pain while they are experiencing painful procedures.

While evidence suggests that reducing environmental sensory stimulation in preterm infants may decrease their pain response and prevent long-term sequelae associated with pain, reducing preterm infants' exposure to NICU light and noise with eye shields (Shiroiwa et al., 1986) and earmuffs (Abujarir et al., 2012; Duran et al., 2012; Zahr and de Traversay, 1995) is reported to promote physiological stability. However, up to now, no study has evaluated how minimizing preterm infants' exposure to both NICU light and noise may influence their pain response to a painful procedure. The goal of this study was to evaluate the pain response of 28–32 week gestational age preterm infants during a heel lance procedure following a 4-h period where their exposure to NICU light and noise was reduced by wearing eye shields and earmuffs.

Methods

Design

A randomized controlled trial (RCT) was conducted to evaluate the pain response of preterm neonates during a heel lance. The procedure was performed for clinical purposes following a medical order. Block randomization by size of four was achieved by using sequentially numbered sealed opaque envelopes generated by an Information Technology Security Officer who used the www.randomization.com website. Infants randomized in the experimental group wore eye shields and earmuffs in their incubator for a 4-h period before and during the heel lance procedure, while infants in the control group rested in a covered incubator the 4-h prior to and during the painful procedure.

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