Original Article

A New Distraction Intervention to Reduce Venipuncture Pain in School-Age Children: Different Colored Flashlights; An Experimental Study with Control Group

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Abstract

Background: There is now sufficient evidence to conclude that cognitive-behavioral interventions are effective in reducing pain and distress for many.
Aims: To assess the effect of a new distraction intervention, as a practical and cost effective approach to reduce perceived pain and stress during venipuncture in healthy school-age children.
Methods: The study was carried out as an experimental study with a control group. Children (N=144), in whom venipuncture was applied at a child blood collection unit for examination were included in the study. The data were obtained using a form to determine introductory features about the children, and the Wong–Baker FACES Pain Rating Scale and the visual analogue scale to evaluate the pain. For the data analysis, mean and percentage distributions, chi-square test, analysis of variance, and correlation analysis were used. The ethical principles were adhered to in all cases.
Results: Children's pain severity connected to venipuncture in the control group was higher than the three experimental groups. The difference between the groups was determined to be significant ($p>0.01$). Children's cortisol levels connected to venipuncture in the control group was higher than the three experimental groups. The difference between groups was determined to be insignificant ($p>0.05$). Only a low positive correlation was found between the cortisol levels and pain severity ($p<0.01$) in the children in the experimental and control groups. A negative moderate correlation was found between their ages and pain severity ($p<0.001$-0.01) in the experimental and control groups.
Conclusion: It was detected that a new distraction intervention using different colored flashlights effectively reduced the pain and stress related to venipuncture in healthy school children. Distraction intervention with different colored flashlights is a method that nurses will be able to use for venipuncture to obtain optimal pain and stress control.

Key words: Children, Distraction, Nursing, Pain.

Introduction

Pain, a stressful experience considered to be a global health problem (Taylor et al 2008; Biermeier & Sjoberg 2007; Kharasch 2003; Sahar Mahmoud El-Khedr Abd El-Gawad 2015), is a complex, multidimensional, and subjective experience that consists of physiological, sensory, emotional, cognitive, and behavioral

components (Koller & Goldman, 2012). Pain is defined as a major health problem for both children and adults (Hasanpour et al 2006). Inadequate pain management is linked to numerous immediate and long-term negative outcomes (Koller & Goldman, 2012). In hospital settings, children often unexpected experience and severe procedurel pain associated with negative emotional and psychological implications (Kaur et al 2014).

Management of children's health includes painful procedures forming stress in children (Weisman et al 1998). Children having experience inadequate pain control during painful procedures can suffer from immediate and long-term negative sequelae (von Baeyer et al 2004; Zempsky & Schechter 2003). Furthermore, painful procedures can cause short-term and long-term effects. These effects consist of a variety of physical, emotional, behavioral, cognitive, and psychological manifestations (ASPMN 2001).

The most common sources of pain in children are procedures with needle (Abd El-Gawad & Elsayed 2015; Uman et al 2006). Venipuncture, the most painful intervention commonly applied to children (Wong & Baker 1988; Young et al 1996; Jacobson 1999; Smalley 1999), is an invasive procedure frequently performed by nurses. It can be classified as a minor invasive procedure accompanied by pain, fear, and anxiety, but for children (Abd El-Gawad & Elsayed 2015; Uman et al 2006). Thus, nurses should be able to manage painful procedures (Rogers & Ostrow 2004) to reduce the effects of painful procedures and prevent long-term results of pain in children (Hasanpour et al 2006). To this end, various pharmacological and nonpharmacological approaches have been described (Bellieni et al 2006). Among these are independent or complementary non pharmacological approaches have been accepted favorable interventions (Vessey & Carlson 1996). Nonpharmacological strategies are accepted useful approaches to improve experiences of procedural pain of the child. It appears to be safe, inexpensive, and effective for acute procedural pain (Prabhakar et al 2007; Jaaniste et al 2007; Schechter et al 2007; Bellieni et al 2006; Sinha et al 2006; Zi-Xuan Wang 2008). Many nonpharmacological interventions have been successful in reducing pain perception for school-age children with cooperation and sufficient cognitive development (Vessey & Carlson 1996).

Cognitive-behavioral interventions are effective in reducing pain and distress for many children undergoing these procedures (Kleiber & Harper 1999; Uman et al 2008). Distraction in pediatrics is often defined as a strategy cognitive or behavioral drawing a child's attention away from pain stimuli (Koller & Goldman 2012), and is used in hospitals to help children tolerate painful procedures (Hussein 2015; Uman et al 2008; Hasanpour et al 2006; Kleiber & Harper 1999). It is also the most commonly used method for procedural pain of short duration (Sinha et al 2006; Hoffman et al 2000; Zi-Xuan Wang 2008). Acute advantages are reduced distress behaviors and eased procedure (Kleiber & Harper 1999; Uman et al 2008). Also, evidence recommends that distraction blocked children's memories of procedural pain; it may reduce the negative aspects of the procedures, which defines their reactions to future painful events and interventions (Brown et al 1999; Cohen et al 2001; Salmon & Pereira 2002; Salmon et al 2002).

To provide effective pain management in children suffering from pain (ASPMN 2001), distraction is a nursing attempt to control and reduce pain better (McCaffery 1990; Hasanpour et al 2006).

Distraction affecting in helping children cope with procedural pain includes blowing bubbles (Fanurik et al 2000; Rusy &Weisman 2000; Lambert 1999), movies (Fanurik et al 2000), cartoons (Cohen et al 1997), books (Fanurik et al 2000; Lambert 1999), party blowers (Manne et al 1994; Blount et al 1992; Manne et al 1990), nurse coaching (Cohen et al 1997; Cohen et al 1999), parent coaching (Lambert 1999; Manne et al 1994), guided imagery (Fernandez 1986; Lambert 1999; Rusy & Weisman 2000), music (Fanurik et al 2000; Rusy & Weisman 2000), novel toys (Colaizzo & Tesler 1994; Ellis & Spanos 1994), illusion kaleidoscope (Canbulat et al 2014; Tufekci et al 2009; Carlson et al 2000; Rusy & Weisman 2000; Kleiber & Harper 1999; Lambert 1999; Vessey et al 1994), counting (Rusy&Weisman 2000), breathing (Rusy &Weisman 2000; Kleiber & Harper 1999; Lambert 1999), video games (Rusy & Weisman 2000), hypnosis (Ellis & Spanos 1994; Lambert 1999; Rusy & Weisman 2000), and virtual reality glasses (Schneider &Workman 2000; Wint et al

2002; Cavender 2004). Thus advocated by many studies to decrease selfreported pain in younger children during procedures such as venipuncture (Tufekci et al 2009).

Distraction has been used for children of different age groups and different procedures in different studies. In these studies, distraction decreased the pain perception; however, a significant difference was not detected between the groups, statistically. In a study, it was determined that distraction did not reduce significantly the pain perception for 5–18 aged children of the experimental group (Windich-Biermeier et al 2007). In other study by, listening to music was used as a distraction to reduce the venipuncture pain of the 6–16 aged group children in pediatric emergency department, and no significant difference was found between in pain levels of the experimental and control groups (Press et al 2003). In the study evaluating the effects of virtual reality glasses on adolescents with cancer undergoing lumbar punctures, the difference between pain scores of the two groups was not significantly although pain scores was tended to be lower in the experimental group than in the control group (Sander et al 2002).

In the studies on preschool and school-age children (Vessey et al 1994) and children and adolescents (Carlson et al 2000), the illusion kaleidoscope distraction decreased the pain associated with venipuncture in the experimental group. In Turkey, in the study by Tufekci et al. (2009), the distraction (looking through kaleidoscopes) reduced perceived pain during venipuncture in healthy school-age children (Guducu Tufekci et al 2009). The other a study in Turkey demonstrated that the distraction affected on procedural pain and anxiety by distraction using cards and kaleidoscope (Canbulat et al 2014).

In many earlier studies, although distraction reduced venipuncture pain, nonpharmacological methods or distractions are not used routinely to reduce pain in children (Carlson et al 2000). The children still continue to experience pain even in minor procedures. In addition, venipuncture pain continues to perception as the most fearful aspect of hospital by children (Duff 2003). In spite of the recent interest in pediatric pain management, many children are still not adequately treated to reduce pain (Franck et al 2000). Moreover, the use of premedication analgesics and sedatives is not suitable for minimal invasive procedures such as venipuncture, whereas, it is clearly effective in improving pain control during invasive procedures (Wang et al 2008; Lechtzin et al 2000).

An effective distractor should stimulate the senses and be developmentally appropriate, easily implemented, acutely engaging, and able to captivate and sustain a child's interest (Fanurik et al 2000; Vessey et al 1994; Cavender et al 2004; Blount et al 1999).

This study aimed to assess the effect of a new distraction intervention (different colored flashlights), a practical and cost-effective approach to reduce perceived pain and stress during venipuncture in healthy school-age children.

The Study Hypotheses

H_0: The distraction made by different colored flashlights does not reduce pain severity and does not prevent a rise in cortisol levels associated with venipuncture in healthy school-age children.

H_1: The distraction made by different colored flashlights reduces pain severity associated with venipuncture in healthy school-age children.

H_2: The distraction made by different colored flashlights reduces different levels of pain severity associated with venipuncture in healthy school-age children.

H_3: The distraction made by different colored flashlights prevents a rise in cortisol levels associated with venipuncture in healthy school-age children.

H_4: The distraction made by different colored flashlights prevents a rise of different cortisol levels associated with venipuncture in healthy school-age children.

Materials and Methods

This experimental study with a control group was performed at the child blood collection unit of Yakutiye Research Hospital of Ataturk University, Erzurum, Turkey between October 2011 and October 2013. In Turkey and in Erzurum, nurses conduct the blood sampling procedure in laboratories. No routine nonpharmacological methods have been described or used to reduce pain associated with the process of venipuncture in any of the hospitals.

Sample

The study involved 144 children who underwent the venipuncture process. In the power analysis, the sample size was calculated as 62; the level of significance: .05; the confidence interval: .99; and the sample represented power: 99%. The study was performed by random sampling on the first day of the week. Children were randomly divided into four groups (n=36).

The criteria of the study group were:

- Aged between 6–12 years;
- Need for venipuncture;
- Identifying and reporting numbers;
- Having no developmental problem or other disabilities that would make communication difficult;
- No chronic diseases;
- No visual and neurological disorders;
- Previously, not under treatment in hospital; and
- No a sedative, analgesic, or narcotic substance history.

In the study, none of the children failed to meet these criteria and the child and their respective families agreed to the child participating in the study.

Data Collection Tools

Data were obtained by interviewing the children, using VAS (Abu-Saad & Holzemer 1981) and the Wong–Baker FACES Pain Rating Scale (WB-FPRS) (Wong & Baker 1988; Mayer et al 2001) for pain, a form to determine general characteristics of the children (gender, age, previous experience of venipuncture, and level of fear), and cortisol values to assess stress levels. Of the two scales used to evaluate the perceived pain levels, the children were able to evaluate their pain more easily with WB-FPRS. This allows us to more accurately measure pain. Thus, it again proved that using more than one scale in pain evaluation was important in school-age children.

VAS

Pain was evaluated with VAS according to numerical values (0–10) starting with 'no pain' and ending with 'unbearable pain' on a 10 cm horizontal or vertical line. The children were asked to indicate their pain intensity by putting a mark on the scale that corresponded to their pain intensity. Once the scale was explained to the child, he/she was asked to point to the place on the line that best represented how much pain he/she was feeling. VAS is considered easily understandable and practical for children five years of age and older (Guzeldemir 1995; Duff 2003). VAS has been used successfully in school-age children (Abu-Saad & Holzemer 1981).

WB-FPRS

Pain in WB-FPRS is evaluated according to numeric values given to six faces arranged side-by-side from the worst pain to the mildest pain (0–5). The lowest point is '1' and the highest is '5.' WB-FPRS is defined as the most accurate pain scale for the 3–18 age groups (Wong & Baker 1988; Mayer et al 2001).

Cortisol value (Normal Value: 5–23 mcg/dL)

To determine the stress levels of the children, cortisol values were used. During blood collection, 1 ml of blood was taken from each child. The blood was then placed into suitable tubes and sent to the biochemistry laboratory for cortisol examination. It is known that cortisol levels are highest in the morning and lowest in the evening (Stawski et al 2013).

Data collection

Data was collected by observation and face-to-face interviews with the children by one of the researchers in the blood collection room between January and August 2013. Data was obtained in the afternoon, between 14:00-16:00, on the first day of the week, during one hour before the end of a shift (during the lowest cortisol levels, physiologically).

Intervention

Standard blood collection in the biochemical unit was applied to the control group. Three experimental groups were formed from the control group. These groups are organic glasses with transparent (colorless) glass, organic glasses with red glass, and organic glasses with blue glass. Flashlight intervention was applied to each of the three groups immediately before venipuncture and then venipuncture was performed. The child was seated on a chair in the blood collection room and asked to wear glasses. After the child had worn the glasses for five minutes, venipuncture was performed. The child was asked to look into the camera during venipuncture. This application was conducted in the same way for each experimental group.

Double observations were used to reduce the possibility of bias in all cases. Thus, interobserver agreement coefficients were evaluated.

Intervention tools

In the study, a multi-function camera, and organic glasses with colorless, red, and blue glass were used.

Camera

In the study, an HD video camera with 16.1 megapixels, 8x optical zoom, 25 mm wide-angle lens and panoramic shooting mode was used.

Organic glasses with transparent (colorless) glass

These are colorless glasses that reflect the color of the flashlight to the eyes with no change.

Organic glasses with red glass

These reflect red as the color of the flashlight to the eyes.

Organic glasses with blue glas

These reflect blue as the color of the flashlight to eyes.

Data Evaluation

Data were analyzed by computer. The following were performed: mean and percentage distributions to determine the characteristics of the children in the control and experimental groups; mean to determine pain severity and cortisol levels; chi-square test to compare characteristics; ANOVA to compare pain severity and cortisol levels; and correlation analysis to determine the relationships between pain severity and cortisol level.

Ethical Aspects of the Study

Approval from Ataturk University Health Sciences Faculty Ethics Board (July 8, 2013) and official permission were obtained from the relevant authorities for the study. In all of the research where information was obtained, voluntary participation of the children and his/her parents was given importance because answers should be given on a voluntary basis. In addition, after explaining the purpose of the study to the children and parents, verbal consent (informed consent principle) was received. The age limit for this principle is seven and older. The consent of the mother or father was received for children less than seven years of age. The individuals participating in the study were informed that information related to them will not be shared with others and "confidentiality" was followed.

Participants

In the study, which investigated the effect of a distraction made by different colored flashlights in healthy school-age children on pain perception and cortisol levels associated with venipuncture, children in the control and experimental groups were similar according to gender, age, painful procedure experience, and fear situation from procedure ($p>0.05$). Of the children in the control group, 61.1% were male and their average age was 9.00±2.04. The percentage of children who had painful procedure experiences was 91.7% (9.47±9.84).

More than half of the children in the experimental groups were female (colorless: 55.8%; blue: 52.8%: red: 52.8%), and their average age was more than nine (colorless: 9.66±1.75; blue: 9.83±1.82; red: 9.11±1.84). The painful process experience rates for the colorless, blue, and red flashlight groups were 88.9%/7.36±7.92, 97.2%/7.75±7.19, and 94.4%/7.25±8.22, respectively. Of the children in the control group, 50% were afraid of the procedure. In the experimental groups, 38.9% of children in the colorless, 52.8% in the blue, and 55.6% in the red were afraid of the procedure ($p>0.05$) (Table 1).

It was determined that children in the control group had the highest procedure average (9.47 ± 9.84). It was also detected that children in the blue (7.75±7.19), colorless (7.36±7.92), and red (7.25±8.22) flashlight groups were listed after the control group ($p>0.05$) (Table 2).

Results

Children's pain severity (4.38±3.44) (VAS) connected to venipuncture in the control group was higher than the other groups, followed by red (3.13±2.84) (VAS), blue (2.58±2.48) (VAS), and colorless flashlights (2.19±2.60) (VAS), according to the listed pain severities.

The difference between the groups was determined to be significant ($p>0.01$) (Table 3). *"The distraction made by different colored flashlights does not reduce pain severity associated with venipuncture in healthy school-age children,"*

H_0 hypothesis was rejected. *"The distraction made by different colored flashlights reduces pain severity associated with venipuncture in healthy school-age children,"* H_1 hypothesis, and *"The distraction made by different colored flashlights reduces different levels of pain severity associated with venipuncture in healthy school-age children,"* H_2 hypothesis, were supported.

Table 1. The Comparison of Groups in Terms of Gender, Procedural Experience Status, and Fear from Procedure (N= 144)

Groups	Gender				Procedural Experience				Fear from Procedure			
	Kız		Erkek		Yes		No		Yes		No	
	S	%	S	%	S	%	S	%	S	%	S	%
Control (n= 36)	14	38.9	22	61.1	33	91.7	3	8.3	18	50.0	18	50.0
Colorless (n= 36)	21	58.3	15	41.7	32	88.9	4	11. 1	14	38.9	22	61.1
Blue (n= 36)	19	52.8	17	47.2	35	97.2	1	2.8	19	52.8	17	47.2
Red (n= 36)	19	52.8	17	47.2	34	94.4	2	5.6	20	55.6	16	44.4
χ^2 and p	χ^2= 2.973 p=0 .396				χ^2= 2.149 p= 0.542				χ^2= 2.306 p= 0.511			

Table 2. The Comparison of Groups in Terms of Age and Procedural Experience (N= 144)

Groups	Age	Procedural Experience
	X ± SD	X ± SD
Control (n= 36)	9.00 ± 2.04	9.47 ± 9.84
Colorless (n= 36)	9.66 ± 1.75	7.36 ± 7.92
Blue (n= 36)	9.83 ± 1.82	7.75 ± 7.19
Red (n= 36)	9.11 ± 1.84	7.25 ± 8.22
T and p	F= 1.720 p= 0.166	F=0.549 p=0.650

Table 3. The Comparison of Groups in Terms of Pain Severity and Cortisol Levels

Groups	Pain		
	VAS	WB-FPRS	Cortisol
	X ± SD	X ± SD	X ± SD
Control (n= 36)	4.38 ± 3.44	2.88 ± 1.48	9.64 ± 4.02
Colorless (n= 36)	2.19 ± 2.60	2.30 ± 0.82	8.98 ± 5.38
Blue (n= 36)	2.58 ± 2.48	2.44 ± 0.93	9.27 ± 6.24
Red (n= 36)	3.13 ± 2.84	2.91 ± 1.22	9.21 ± 4.95
T and p	F= 4.002 p=**0.009**	F= 2.623 p=0.053	F=0.098 p=0.961

Table 4. The Relationship Between Children's Pain Severity and Cortisol Levels in Control and Experimental Groups (N= 144).

Correlation	Pain (WB-FPRS)	
	r	p
Cortisol	0.233**	**0.005**

Table 5. The Relationship Between Children's Ages and Pain Severity in Control and Experimental Groups (N= 144)

Correlation	Pain			
	VAS		WB-FPRS	
	r	p	r	p
Age	-0.321**	**0.000**	-0.286**	**0.001**

Table 6. Comparison of the Pain Severity According to Children's Ages in Control and Experimental Groups (N= 144)

Age Group			Pain	
			VAS	WB-FPRS
	N	%	X ± SD	X ± SD
6–9	71	49.3	4.00 ± 3.31	2.98 ± 1.29
10–12	73	50.7	2.17 ± 2.25	2.30 ±0.92
T and p			t= 3.870 p=**0.000**	t= 3.664 p=**0.000**

Children's cortisol levels connected to venipuncture in the control group (9.64±4.02) was higher than the other groups, followed by blue (9.27±6.24), red (9.21±4.95), and colorless flashlights (8.98±5.38), according to the listed cortisol levels. The difference between groups was determined to be insignificant (p>0.05) (Table 3). "*The distraction made by different colored flashlights does not prevent a rise in cortisol levels associated with venipuncture in healthy school-age children,*" H_0 hypothesis was rejected. "*The distraction made by different colored flashlights prevents a rise in cortisol levels associated with venipuncture in healthy school-age children,*" H_3 hypothesis, and "*The distraction made by different colored flashlights prevents different rises in cortisol levels associated with venipuncture in healthy school-age children,*" H_4 hypothesis, were partially supported.

Only a low positive low correlation was found between cortisol levels and pain severity (WB-FPRS) (p<0.01) in the experimental and control groups (Table 4). In addition, only a moderate negative correlation was found between their

ages and pain severity ($p<0.001$-0.01) in the experimental and control groups (Table 5). Pain severity was significantly higher in the 6–9 age groups than in the 10–12 age group in the experimental and control groups ($p<0.001$) (Table 6).

Discussion

Pain during the medical procedures may cause stress, fear, and anxiety for children in hospitals (Cassidy et al 2001; Razzaq 2006). The American Society for Pain Management Nursing suggests that optimal pain control before and during painful procedures needs to be provided (Czarnecki et al 2011). Now, most of interventions are used to decrease procedural pain, and the most commonly used and the most effective among these is distraction (Schechter et al 2007). Distraction acts as a gate-control mechanism; in this way, when the child is distracted from the pain stimuli, the method can be effective (Gedaly 1991). This helps children focus their attention on something other than pain; thus, their anxiety is reduced, thereby lessening their perception of pain. In some instances, distraction can make a child completely unaware of pain and time to the extent distracting his/her "undivided" attention, especially during venipuncture (Snget al 2013). Distraction is widely used to reduce procedural pain (Canbulat et al 2014; Guducu Tufekci et al 2009; He et al 2005; Inal and Kelleci 2012a). The method diverts the focus of attention (Canbulat et al 2014; Vessey et al 1994; Arts et al 1994; Cassidy et al 2002; Mason et al 1999).

Several studies reported that audiovisual distractions could reduce pain (Bellieni et al 1996; Wang et al 2008; Prabhakar et al 2007; Sinha et al 2006; Hoffman et al 2000; Cassidy et al 2001; Ball et al 2003; Kemper and Kelly 2004; Rogovik and Goldman 2007; Russell and Smart 2007; Schechter et al 2007). Distraction with kaleidoscope might be effective to distract children (Hasanpour et al 2006). However, in some studies used different distractors on different aged group children, although distraction decreased the pain, a significant difference between the groups was not detected (Kleiber and Harper 1999; Sander Wint et al 2002; Schneider and Workman 2000; Windich-Biermeier et al 2007; Press et al 2003; Arts et al 1994; Sparks 2001). Our study investigated whether distractions made by using different colored flashlights decreased the pain perception and cortisol level associated with venipuncture in healthy school-age children. To our knowledge, this is the first study of this kind. Since researches conducted using this intervention are minimal to non-existent (Rahimi et al 2013), the findings of our study also discussed the findings of other distraction researches conducted with a similar group in the literature.

In the study, children in the experimental groups had lower pain intensity than the control group. A statistically significant difference was found between the pain perception levels of the control and experimental groups, supporting the first hypothesis of the study. Afterwards, red, blue, and colorless flashlight groups, respectively, were listed according to the pain intensity, supporting the second hypothesis of the study ($p<0.01$). These results support the findings of previous studies. In the same way, these results support the findings of the study by Rahimi et al. (2013) who successfully demonstrated the effects of a flash of light in different colors on the frequency and severity of pain during venous cannulation in adults (Rahimi et al 2013). In this research, all of the light groups' pain levels were lower than the control group. Canbulat et al. (2014) demonstrated the efficacy of distraction on procedural pain and anxiety by using cards and kaleidoscopes with children (Canbulat et al 2014). The results revealed that there is significantly less pain in children with cartoon distractions at initiation, at five minutes, and at termination of administration of intravenous injection (Kaur et al 2014). James et al. (2012) showed that children who underwent venipuncture with animated cartoon distractions had a lower pain score compared to routine care before, during, and after venipuncture (James et al 2012). In addition, Inal and Kelleci (2012a) determined that distraction cards were very effective in decreasing procedural pain and anxiety in children during phlebotomy, while in another study, it was detected that distractions with DVDs (Inal and Kelleci 2012a) and a vapocoolant spray were effective on pain and anxiety levels in children during vaccination (Luthy et al 2012). Tufekci et al. (2009) detected the effect of kaleidoscopes to decrease the pain of venipuncture in school-aged children (Tufekci et al 2009). In a randomized prospective study conducted by Caprilli et al. in 2007, interactive music as a distraction method reduced pain and stress in children during venipuncture (Caprilli et al 2007).

In the study, children's cortisol levels connected to venipuncture in the control group was higher than the other groups, followed by blue, red, and colorless flashlights according to the listed cortisol levels. The difference between groups was determined to be insignificant ($p>0.05$). Likewise, in a study investigating the effectiveness of animal-assisted interventions as a distraction for reducing children's pain and distress before, during, and after the blood collection procedure, cortisol levels were lower in the experimental group compared to the control group (Vagnoli et al 2015). Two other studies conducted on painful procedures showed that parental coaching (Pringle et al 2003) and watching cartoon videos reduced children's distress (Kaur et al 2014).

In the study, a low positive correlation was found between the cortisol levels and pain severity (WB-FPRS) ($p<0.01$) in the children in the experimental and control groups. In the pediatric group, it can be one of the most distressing events associated with medical encounters (Rogers and Ostrow 2004). Because of the needle fear, almost all children have fear, pain, and distress before and during the procedure (Caprilli et al 2007; Deacon and Abramowitz 2006).

Many of the studies examining the effects of one or two factors shown to affect children's responses to painful procedures, such as the child's age, but few studies had an adequate sample size to examine multiple variables (McCarthy and Kleiber 2006). In the study, only a moderate negative correlation was found between their ages and pain severity ($p<0.001$) among the characteristics of the children in the experimental and control groups. The children's pain severity in the 6-9 age groups was significantly higher than in the 10-12 age group in the experimental and control groups ($p<0.001$). In one study, the findings revealed an inverse relationship between the behavior pain response and the age of the child (Kaur et al 2014). In another study, the younger children (4-6 years) reported higher pain with the same stimulus than older children (7 years or older). This shows that as age increases, the perception of pain decreases suggesting that there is an inverse relationship between pain responses and the age of the child before, during, and after venipuncture. However the difference was significant only during venipuncture (James et al 2012). Age has consistently been shown to be associated with needle pain and fear in children older than eight years of age (Duff 2003). It was found that eight-year-old children had significantly higher ratings of unpleasantness and sensory intensity of needle pain. Prior to the age of eight, children tended to give equivalent ratings of intensity and unpleasantness (Goodenough et al 1999). In contrast, it is found that the intensity of pain behavior during invasive procedures reduces with the age of the child (Craig 2002).

Conclusion

The distraction performed by using different flashlights decreased the pain perception and stress associated with venipuncture in school age children. Thus, it can be said that this distraction method may be routinely used in children. However, in school age children who need to undergo procedures other than venipuncture, further studies are needed to evaluate the pain and stress reducing effect of using different flashlights as distractors, and studies investigating effective distractors for various interventional procedures will be contributory. Another finding of the study indicated that children aged 6-9 experienced higher pain severity. In light of this finding, nurses should take the child's age and other characteristics into consideration before beginning the procedure to provide a less painful and a more positive experience.

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