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Research Article

Efficacy of Distraction Methods on Procedural Pain and Anxiety by Applying Distraction Cards and Kaleidoscope in Children

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SUMMARY

Purpose: This study aims to investigate two different distraction methods, distraction cards and kaleidoscope, on pain and anxiety relief of children during phlebotomy.
Methods: This study is a prospective, randomized and controlled trial. The sample consisted of 7–11 year-old children who required blood tests. Children were randomized into three groups: the distraction cards group, the kaleidoscope group, and the control group. Data were obtained by interviewing the children with their parents and the observer before and after the procedure. The pain levels of the children were assessed by the parent and observer reports as well as self report using the Wong Baker FACES Pain Rating Scale. The anxiety levels of children were assessed by parent and observer reports using Children Fear Scale.
Results: One hundred and eighty-eight children (mean age, 8.8 ± 1.5 years) were included. The pain levels of children showed significant differences among the groups ($p = .005$). Both the distraction card group (2.41 ± 2.49) and the kaleidoscope group (3.10 ± 2.16) had lower pain levels than the control group did (4.44 ± 3.64). The distraction card group had the lowest pain levels (2.41 ± 2.49) among all groups. The procedural anxiety levels of children were significantly different among the groups ($p = <.001$). Both the distraction card group (1.10 ± 1.20) and the kaleidoscope group (1.61 ± 1.12) had lower anxiety levels than the control group did (2.41 ± 1.30). The distraction card group had the lowest anxiety levels ($p = <.001$).
Conclusion: The distraction cards were the most effective method for pain and anxiety relief of children during phlebotomy. Also the distraction method with kaleidoscope was an effective method for pain and anxiety relief during phlebotomy in children.
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Introduction

Pain is a highly prevalent problem in children and adults. It is a predominantly subjective emotional distress that also leads to impairment in the quality of life (Katz, 2002). Medical procedures that are applied using a needle, such as venipuncture and immunization are the most common and important sources of pain for children, causing anxiety, distress and fear (Blount et al., 2009; Inal & Kelleci, 2012b; Leahy et al., 2008; Uman, Chambers, McGrath, & Kisely, 2006). Moreover, fear of pain experienced due to medical procedures in childhood usually continues up to adulthood.

Pain management before the first painful medical procedure in children may reduce pain-related negative emotional and social experiences, reduce anxiety, fear and distress, and contribute to having emotionally less complicated future medical procedures (Wong, Chia, Yam, Teodoro, & Lau, 2004). This management includes pharmacological and nonpharmacological approaches (Taddio et al., 2010). The most commonly used pharmacological approach in order to decrease the medical procedure-related pain is the application of topical anesthetic creams (Rogers & Ostrow, 2004). Topical anesthetic creams supply local anesthesia but need waiting times of approximately 45–60 minutes for acting. Nonpharmacological approaches often include distraction activities such as singing, reading, or playing a game (Cohen et al., 2006; Schechter et al., 2007). Recently, it has been shown that distraction with kaleidoscope is also a beneficial method to provide optimal pain control (Tüfekci, Celebioğlu, & Küçükoğlu, 2009). It has also been shown that distraction with distraction cards is a

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beneficial method for pain during phlebotomy (Inal & Kelleci, 2012a).

This study aimed to compare the effect of distraction by applying distraction cards (Flippits; MMJ Labs LLC, Atlanta, GA, USA) and the kaleidoscope to reduce procedural pain and anxiety during phlebotomy in children between the ages of 7 and 11.

Methods

Study design

This study was conducted at the phlebotomy station of the Karaman Maternity and Children Hospital. It was designed as a prospective randomized clinical trial that evaluated and compared the effects of the distraction cards and the kaleidoscope on procedural pain and anxiety levels of children during phlebotomy.

Setting and sample

The study population consisted of 7–11 year-old children who requested blood test. The study sample size was determined by power analysis. Based on previous research (Inal & Kelleci, 2012a), with a 1.5 standard deviation for the experimental group and 2.0 for the control group. With a power of .80 and an acceptable Type I α error size of 0.05, each group required 50 individuals. Adding 20% loss rate of study group the final sample size required about 60 individuals per group. Children were randomized into three groups: the distraction card group, the kaleidoscope group and the control group (Figure 1). All data were obtained by interviewing with the children, their parents and the observer after the procedure. The phlebotomy process took an average of 3 minutes (min: 1, max: 5).

The current application in our hospital that conducted this study was that nurses conducted phlebotomy at a phlebotomy station. Routinely, hospitals in Turkey did not provide pharmacological or nonpharmacological method to reduce the pain and anxiety during phlebotomy. Parents are allowed but not required to stay with children during phlebotomy. In this study all parents stay with their children during the procedure.

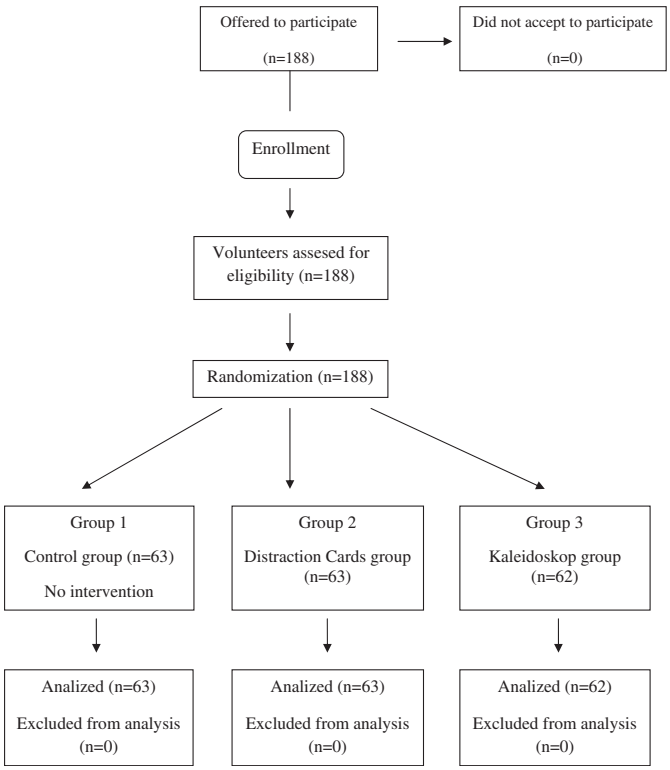


Figure 1. Diagram showing the flow of participants.

Ethical consideration

The study was approved by the ethics committee of Selcuk University Selcuklu Medical Faculty, Konya (2011/45). The aim and method of study were explained to the children and their parents. They were informed that if they did not want to continue, they could withdraw from the study without stating a reason.

Measurement

The distraction cards (Figure 2) consisted of visual cards of 5 cm × 8 cm, covered with various pictures and shapes. In this method, the children first carefully examined the cards. Then, the researcher asked some questions about those cards to be answered by the children, such as “How many ladybugs are there in the picture?” “How many apes are there in the picture?” or “Can you see the comet?” The distraction procedure via distraction cards began just before the phlebotomy and continued until the end of the phlebotomy. Because the children’s native language was not English, the translation and back translation of the instrument were conducted by an expert who knew both languages.

Kaleidoscope is a cylinder toy with mirrors containing a number of loose, colored objects like beads (Figure 3). The images inside a kaleidoscope are based on the principle of multiple reflections of colored objects on typically three mirrors set at 60° angle to each other (Figure 4). The viewer looks into one end and light entering from the other end creates colorful symmetrical patterns inside as one of the cylinders is rotated. Those symmetrical colorful patterns usually draw the attention of children in each turn. The distraction procedure via kaleidoscope began just before the phlebotomy and continued until the end of the phlebotomy.

The level of pain resulting from the applied procedure in each child was assessed by self reports, parent and observer reports using the Wong Baker FACES (WB-FACES) Pain Rating Scale. The WB-FACES is a 0–10 scale, showing six cartoon faces that range from a neutral expression (0 = *very happy/no hurt*) to a crying face (10 = *hurts as much as you can imagine*) (Hockenberry & Wilson, 2009).



Figure 2. Distraction cards (Flippits).



Figure 3. Kaleidoscope.

Children Fear Scale (CFS) was used to evaluate the level of anxiety in children. CFS is a 0–4 scale showing five cartoon faces that range from a neutral expression (0 = *no anxiety*) to a frightened face (4 = *severe anxiety*) (McMurtry, Noel, Chambers, & McGrath, 2011). The preprocedural and procedural pain, as well as anxiety, for all children was evaluated using CFS by both parents and the researchers.

Data collection

This study was conducted with two volunteer nurses trained by the researcher. The nurses had a minimum of 5 years of experience in pediatric patient care and venipuncture. The nurses did not have any conflict of interest. Before the procedure, the clinical decision for phlebotomy was made by a pediatrician. For patients agreeing to participate, background demographic information, medical history, recent analgesics, and body mass index were collected via self-report forms. Prior to randomization, the researcher read a standard script to explain the pain and anxiety measures. Both parents and children indicated that they understood how to use the measures.

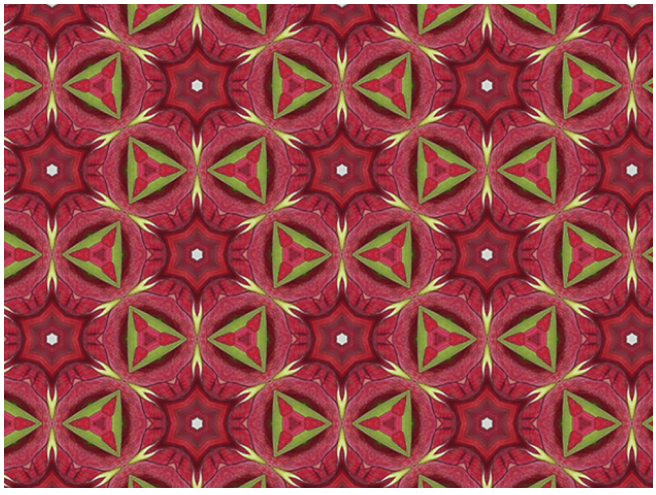


Figure 4. Example of images inside a kaleidoscope.

The first nurse "observer nurse" evaluated the preprocedural and procedural anxiety and procedural pain for all children using the 0–4 CFS scale for anxiety and the 0–10 WB-FACES scale for pain. The second nurse conducted the phlebotomy procedure for all children. The parents and observers assessed the children's anxiety levels. In total, 188 children were randomized on the basis of a computer generated table of random numbers into three equal groups. After the assignment, children and their parents moved into the phlebotomy station for the procedure. Venipunctures were performed between 8 a.m. and 12 p.m., and between 12 p.m. and 4 p.m. with a vacutainer and a 21 G needle. Both distraction methods were conducted by the same nurse for all children. The control group received no intervention. All parents stayed with their children during the procedure. The procedure was considered successful if blood started running into the tube in 15 seconds. If blood specimen collection could not be done in the first attempt, the procedure was attempted in the distal part of the same arm. When second attempts were made, the distractions methods continued from the beginning of the first attempt until the end of the last attempt. After the procedure, the pain levels of children were assessed with self reports, parent reports and observer reports.

Data analysis

All statistical analyses were performed using SPSS (SPSS Inc., Chicago, IL, USA) version 21.0 for Windows. Baseline characteristics among the groups and all parametric data were analyzed by employing the chi-square test and Student's t test. Statistical significance was set at p less than .05. Parametric data such as the level of pain in children was compared with one-way analysis of variance. Kruskal-Wallis and Mann-Whitney U tests were used for analyses of nonparametric data. If p was significant ($p < .05$), a Bonferroni test was performed as a post hoc test.

Results

Comparison of groups in terms of some variables

One hundred and eighty-eight children ($n = 95$, 50.5% female & $n = 93$, 49.5% male) were included in the present study. The mean age of the children was 8.8 ± 1.5 years (range, 7–11 years). The children were randomized into the kaleidoscope group ($n = 62$), the distraction cards group ($n = 63$), and the control group ($n = 63$). The characteristics of children were presented in Table 1. Age, gender, body mass index, preprocedural anxiety levels of children, success of phlebotomy attempt, age of the parents were similar among the three groups. There were no significant differences among preprocedural anxiety levels of the study groups in terms of self report, parent report and observer report ($p = .130$, $p = .079$, & $p = .199$, respectively).

Comparison of the groups in terms of pain levels

The evaluation of procedural pain levels during phlebotomy collection is presented in Table 2. The self-reported procedural pain levels showed significant differences among the study groups ($p = .005$); the distraction card group (2.41 ± 2.49) had significantly lower pain levels ($p = .002$) than the control group did (4.44 ± 3.64). There were also significant differences both in the parent- and observer-reported procedural pain levels among the study groups ($p = <.001$ for each). Both the distraction cards and the kaleidoscope groups' pain levels were significantly lower than

Table 1 *Baseline Characteristics and Preprocedural Anxiety Scores of Study Groups (N = 188)*

	Distraction card group ($n = 63$) n (%) or $M \pm SD$	Kaleidoscope group ($n = 62$) n (%) or $M \pm SD$	Control group ($n = 63$) n (%) or $M \pm SD$	p
Gender				
Female	27 (42.9)	36 (58.1)	32 (50.8)	.235
Male	36 (57.1)	26 (41.9)	31 (49.2)	
BMI	16.59 ± 2.7	16.30 ± 2.83	16.32 ± 2.81	.811
Mother's age	34.92 ± 5.95	34.89 ± 5.11	34.86 ± 5.81	.998
Father's age	38.05 ± 6.93	39.37 ± 7.09	37.75 ± 5.53	.340
Preprocedural anxiety levels				
Self-reported	2.49 ± 1.41	2.19 ± 1.26	1.97 ± 1.64	.130
Parent-reported	2.67 ± 1.36	2.21 ± 1.32	2.14 ± 1.53	.079
Observer-reported	2.57 ± 1.43	2.13 ± 1.36	2.25 ± 1.44	.199
Success of phlebotomy attempt				
In first attempt	58 (92.1)	59 (95.2)	59 (93.7)	.480
In second attempt	5 (7.9)	3 (4.8)	4 (6.3)	

Note. BMI = body mass index.

that of the control group (respectively $p = .001$, $p = <.001$). The observer-reported pain levels of distraction card group was also significantly lower than that the kaleidoscope group ($p = .001$).

Comparison of the groups in terms of anxiety levels

The procedural anxiety levels during phlebotomy are presented in Table 3. The procedural child anxiety levels reported by the parents showed a significant difference among the study groups ($p = <.001$). The anxiety level in the distraction card group was significantly lower than those of the kaleidoscope and control groups ($p = .004$ & $p = <.001$, respectively), whereas the score in the kaleidoscope group was also significantly lower than the control group ($p = .001$). Similarly, procedural anxiety levels of children reported by the observers were found to be significantly different among the study groups ($p = <.001$). The anxiety levels of the control group were significantly higher than those of the distraction card and kaleidoscope groups ($p = <.001$ for each). Moreover, the procedural anxiety level of the kaleidoscope group was significantly higher than that of the distraction card group ($p = <.001$).

Discussion

Pain experienced during the medical procedures routinely performed in hospitals, such as phlebotomy and immunization, may cause stress, fear and anxiety in children (Cassidy et al., 2001; Razzaq, 2006). These procedures may also cause anxiety and fear in families for their children (Cohen, 2008; Shavit & Hershman, 2004). Although procedural pain and anxiety levels may be influenced by the type of the procedure applied (Rawe et al., 2009), they are also associated with a number of individual factors including children's and their parents' emotional status, previous experiences and physicians' skills. The American Society for Pain Management Nursing recommends that optimal pain control before and during painful procedures needs to be provided (Czarnecki et al., 2011). Therefore pharmacological and nonpharmacological approaches should be used to control acquired pain and the resulting future anxiety behavior. Currently, a number of interventions are used to reduce pain perception during medical procedures and distraction is one of the most commonly used and the most effective one (Schechter et al., 2007).

Distraction methods are widely used to reduce procedural pain and anxiety (He, Pölkki, Vehviläinen-Julkunen, & Pietilä, 2005; Inal & Kelleci, 2012a; Tüfekci et al., 2009). The methods performed in various ways during medical procedures divert the focus of attention (Arts et al., 1994; Cassidy et al., 2002; Mason, Johnson, & Woolley, 1999; Tüfekci et al.; Vessey, Carlson, & McGill, 1994). Recently, Inal and Kelleci (2012a) demonstrated that distraction cards (Flippits) were very effective in reducing procedural pain and anxiety in children during phlebotomy. In another study, the researchers compared the effects of distraction with DVD and a vapocoolant spray on pain and anxiety levels in children during vaccination (Luthy, Beckstrand, & Pulsipher, 2012). They found that both methods did not decrease either pain or anxiety.

Distraction with kaleidoscope causes the child to draw his/her attention away from pain stimuli during a medical procedure. Therefore, as a distraction method, kaleidoscope might be useful for reducing pain and anxiety during medical procedures. There are several studies in the literature which evaluated the effect of distraction with kaleidoscope on pain control (Tüfekci et al., 2009; Vessey et al., 1994). Recently, Tufekci et al. investigated pain levels during venipuncture in children and the effects of using kaleidoscope as a distraction method to control procedural pain, by employing two different scales, WB-FACES and the visual analog scale. Their results indicated that pain during the procedure was effectively controlled with kaleidoscope.

Table 2 *Comparison of Procedural Pain Scores of Study Groups (N = 188)*

Procedural pain scores	Distraction card group ($n = 63$) $M \pm SD$	Kaleidoscope group ($n = 62$) $M \pm SD$	Control group ($n = 63$) $M \pm SD$	p	p[a]		
					Distraction card vs. kaleidoscope	Kaleidoscope vs. control	Distraction card vs. control
According to WB-FACES							
Self-reported	2.41 ± 2.49	3.10 ± 2.16	4.44 ± 3.64	.005	.051*	.109*	.002*
Parent-reported	2.16 ± 2.70	2.55 ± 2.05	5.81 ± 3.08	<.001	.080*	<.001*	<.001*
Observer-reported	1.49 ± 2.29	2.42 ± 2.11	6.13 ± 2.93	<.001	.001*	<.001*	<.001*

Note. WB-FACES = Wong Baker FACES pain rating scale.
[a] Bonferroni test results.

Table 3 *Comparison of Procedural Anxiety Scores of Study Groups (N = 188)*

Procedural anxiety scores	Distraction card group ($n = 63$) $M \pm SD$	Kaleidoscope group ($n = 62$) $M \pm SD$	Control group ($n = 63$) $M \pm SD$	p	p^a		
					Distraction card vs. kaleidoscope	Kaleidoscope vs. control	Distraction card vs. control
Parent-reported	1.10 ± 1.20	1.61 ± 1.12	2.41 ± 1.30	<.001	.004	.001	<.001
Observer-reported	0.79 ± 0.97	1.27 ± 0.85	2.49 ± 1.28	<.001	<.001	<.001	<.001

Note. [a]Bonferroni test results.

Previously published studies have reported that pain rating is influenced by some demographic variables including gender, age, and education levels of parents (Cohen, 2008; Goodenough et al., 1999; Unruh, 1996). However, the results of our study did not support those findings. In our study, all demographic variables were similar between the study groups. Moreover, the self-reported, parent-reported, and observer-reported procedural pain and anxiety levels were controlled better with the distraction cards than with kaleidoscope or no distraction. It is widely accepted that most children who previously experienced a painful medical procedure also perceive fear and anxiety in future procedures. Therefore, decreasing the emotional effects of painful procedures in clinical practice with better pain control is essentially important in children. In order to avoid the future undesirable effects of painful medical procedures, successful pain control should be aimed for.

Conclusion

Distraction cards were found to be the most effective method for pain and anxiety relief for children during phlebotomy. Distraction with kaleidoscope may also be an alternative method that may be useful to reduce pain and anxiety levels during phlebotomy in children.

Nurses need to be aware of procedural anxiety and pain during phlebotomy. Interventions should be implemented to decrease anxiety and pain in children. Nurses can use distraction cards and kaleidoscope for pain and anxiety relief in children during phlebotomy. This study contributes to the literature on non-pharmacological pain relief methods. This study should be replicated in more settings to see if the findings are similar.

Conflict of interest

The authors declare no conflict of interest.

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