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The Effect of Distraction with a Kaleidoscope Used on the Perceived Pain During Blood Sampling in Children: Randomized Study

Çocuklarda Kan Alma Sırasında Kullanılan Kaleydoskopla Dikkatin Dağıtılmasının Algılanan Ağrıya Etkisi: Randomize Çalışma

Beyhan TURKAN[a], İlknur KAHRİMAN[b]

[a]İzzet Baysal Mental Health and Diseases Hospital, Adult Detoxification Center, Bolu, Türkiye
[b]Karadeniz Technical University, Faculty of Health Sciences, Department of Nursing, Division of Pediatric Nursing, Trabzon, Türkiye

This study was prepared based on the findings of Beyhan TURKAN's thesis study titled "The effect of distraction on the perception of the pain during the operation with the kaleidoscope used in blood collection in children" (Trabzon: Karadeniz Technical University; 2019).

ABSTRACT Objective: A pain-free life is the right of every child. Unmanaged pain causes children to have negative experiences. On the perception of pain with the kaleidoscope used during blood collection can be reduced with appropriate nonpharmacological methods in children, thereby unnecessary distress could be prevented. The aim of this randomized controlled study was to evaluae the effect of distracted attention with the kaleidoscope used during blood collection on the perception of pain in children. **Material and Methods:** The population of the study consisted of children between the ages of 7-12 who came to the Blood Collection Unit of Education and Research Hospital in city center between May 30-June 30, 2019. A total of 60 children (30 kaleidoscope and 30 control groups) were selected according to the research criteria. Data were collected using the "information form" to determine the descriptive characteristics of the children and the "Wong-Baker Pain Scale" to assess the pain level of the children. **Results:** It was found that the children in the control group (2.30±1.49) felt more pain during the blood collection than the children in the kaleidoscope group (0.73±0.78) and the difference between them was statistically significant (p<0.001). Conclusion: The use of kaleidoscope during blood collection was found to be effective in reducing the pain experienced by children. Kaleidoscope can be used to reduce the pain of children during blood collection.

Keywords: Child; nursing; pain; pediatrics

ÖZET Amaç: Ağrısız bir yaşam her çocuğun hakkıdır. Yönetilmeyen ağrı çocukların olumsuz deneyimler yaşamasına neden olur. Çocuklarda kan alımı sırasında kullanılan kaleydoskop ile ağrı algısı uygun nonfarmakolojik yöntemlerle azaltılarak gereksiz sıkıntıların önüne geçilebilir. Bu randomize kontrollü çalışmanın amacı çocuklarda kan alma sırasında kullanılan kaleydoskopla dikkatin dağılmasının ağrı algısı üzerindeki etkisini değerlendirmektir. **Gereç ve Yöntemler:** Araştırmanın evrenini 30 Mayıs-30 Haziran 2019 tarihleri arasında şehir merkezinde bulunan Eğitim ve Araştırma Hastanesi Kan Alma Ünitesine gelen 7-12 yaş arası çocuklar oluşturmuştur. Araştırma kriterlerine göre toplam 60 çocuk (30 kaleydoskop ve 30 kontrol grubu) seçildi. Veriler, çocukların tanımlayıcı özelliklerini belirlemek için "bilgi formu" ve çocukların ağrı düzeyini değerlendirmek için "Wong-Baker Ağrı Ölçeği" kullanılarak toplandı. **Bulgular:** Kontrol grubundaki çocukların (2,30±1,49), kaleydoskop grubundaki çocuklara (0,73±0,78) göre kan alma sırasında daha fazla ağrı hissettikleri ve aralarındaki farkın istatistiksel olarak anlamlı olduğu belirlendi (p<0,001). **Sonuç:** Kan alma sırasında kaleydoskop kullanımının çocukların yaşadığı ağrıyı azaltmada etkili olduğu belirlendi. Kan alma sırasında çocukların acısını azaltmak için kaleydoskop kullanılabilir.

Anahtar Kelimeler: Çocuk; hemşirelik; ağrı; pediatri

Pain is defined as an unpleasant emotional and sensory experience of the individual due to existing or potential tissue damage and is stated to be a control mechanism for the human body.[1] Pain is subjective and specific to the individual.[2] No physiological or chemical test can measure pain. According to Mc Caffery; "Pain is whatever the experiencing person says it is, s/he should be believed".[3]

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Correspondence: İlknur KAHRİMAN
Karadeniz Technical University, Faculty of Health Sciences, Department of Nursing, Division of Pediatric Nursing, Trabzon, Türkiye
E-mail: ilknurkahriman@ktu.edu.tr

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In childhood, painful procedures can be frequently performed for routine controls, illness, or trauma.[4] Children are afraid of these procedures and are generally reluctant. The treatment of children who refuse these procedures is delayed or not performed at all.[5,6] One of these procedures is blood sampling, which can cause fear and anxiety in children. Blood sampling is mostly performed during hospital admissions of children.[6-8] The perception of pain caused by medical treatment is an experience that starts in childhood and is remembered at later ages.[9] Fear of painful intervention arising from negative experiences in childhood may be permanent in adulthood, they may refuse blood sampling, and their sensitivity to pain and fear increases.[10] Pain is a significant source of a stressor for metabolism and causes stress reactions in children. When children perceive pain, they give physiological, behavioural, or psychological responses.[11]

In pain management, the child's pain should first be evaluated, appropriate intervention to relieve pain should be selected and implemented, and then the effectiveness of these interventions should be evaluated.[12] Pharmacologic and nonpharmacologic methods are used in pain management. Non-pharmacological methods are inexpensive methods that the nurse, the child, and the family can apply comfortably and independently and facilitate positive experiences and cooperation between the child and the parents.[13] The individual's developmental age, cognitive level, cultural and behavioural factors, and ability to cope with stress, should be taken into consideration in the selection of nonpharmacological methods.[14]

Accurate measurement and evaluation of pain in children facilitate pain control.[3] Appropriately applied nonpharmacologic methods have been reported to be effective in reducing pain during interventional procedures in children. These methods can be categorized three groups.[15] Supportive methods are watching videos, reading books, and family participation during the procedure, etc..[15] Physical methods include applications like hot-cold application, positioning, and vibration (buzzy device).[15] Cognitive/behavioural methods cover perceptual, sensory, and behavioural dimensions of pain and include methods such as relaxation, distraction, and hypnosis. Among the methods of distraction, there are various applications like playing digital games, watching cartoons, using kaleidoscope, using distractor cards, using virtual reality glasses, watching balloons, and listening to music.[15-18] Distraction methods are a nursing approach that allows the person to tolerate pain more by distracting their perception. This practice aims to distract the child from the painful procedure by focusing his/her attention on something else. The effectiveness of the distraction method is explained by the gate control theory. The use of distraction techniques closes the door by directing attention to the distracter rather than the pain so that the pain remains further away from awareness.[12]

A lot studies have shown that distraction techniques are effective in reducing pain levels of children.[19-24]

This study aimed to determine the effect of distracting children with a kaleidoscope during blood sampling on their perception of pain during the procedure.

OBJECTIVES OF THE STUDY

1. To determine whether perceived pain assessments of the child, parent, and nurse during blood sampling are compatible.

2. To determine whether the age and gender of the child influence the perceived pain during the procedure.

3. To determine whether a kaleidoscope influences the perceived pain during the procedure.

MATERIAL AND METHODS

This was designed as randomized controlled trial study.

PLACE AND TIME OF THE RESEARCH

The study was conducted in the blood sampling unit of a Hospital located in northeast in Türkiye between May 30, 2019 and June 30, 2019. The pediatric blood sampling unit is a room with visual features organized with cartoon characters and decorations to attract the attention of children. In this blood sampling unit, no non-pharmacological method is routinely applied to reduce procedural pain, and the child is ac-

companied by the parent during the blood sampling process. In addition, no local anesthetic is used as a routine application.

POPULATION AND SAMPLE

The population consisted of children aged 7-12 admitted to a university hospital in the northeast of Türkiye for blood tests. Based on the study of Semerci and Kostak, G* Power analysis version 3.1.9.7 (Franz Faul, Universität Kiel, Kiel, Almanya) was performed, and independent samples t-test was selected (Comparisons of pain and physiological parameters for the two groups were performed using independent samples t-test analysis).[19] The sample size was determined to be 58 with an alpha error of 0.05 and an effect size of 0.97 with 95% power (29 kaleidoscope, 29 control). At least 30 people were included in each group in case of data loss.

RANDOMIZATION AND BLINDING

Groups were randomly and equally assigned into two groups using www.randomizer.org. These groups are the kaleidoscope and the control care group. Since it was impossible to blind the nurses and parents who would take blood samples, the research was carried out blindly to the researcher who performed the statistical analysis. It was aimed to ensure that children, nurses, and parents are blind to each other's pain scores and to minimize the effects.

DATA SAMPLING TOOLS

The Information Form

The form was prepared by the investigators and consisted of questions about age, gender, place of residence, chronic disease, blood sampling procedure in the last three months, and history of the disease and was completed for each child before the procedure.

THE WONG-BAKER FACES PAIN SCALE (WBFPS)

Pain intensity was self-reported using the WBFPS by the participant, parent, and nurse. This scale consists of six facial expressions, each representing an increasing degree of pain scored from 0 (no pain) to 5 (worst pain). WBFPS has been shown to be valid and reliable in identifying level of pain in children aged 3-18 and is a robust scale frequently used on Turkish children.[25]

FIGURE 1: Kaleidoscope image.

KALEIDOSCOPE

A kaleidoscope is a game tool with colorful patterns that reproduce the image outside when viewed through it. The images are produced by lenses placed at different angles inside the kaleidoscope. The patterns are constantly changing as the kaleidoscope is rotated, like the way the image in binoculars changes. As these patterns are different in each view, the kaleidoscope provides a distraction for the child. It can be used as one of the effective and reliable methods to reduce the child's pain by affecting the child's visual and auditory senses (Figure 1).[23,26,27]

PROCEDURES

Prior to the study, the purpose, type, implementation process, and where and how the data would be used were explained to the parents of children in the study, and they were asked to give written informed consent. Each child was taken to the blood sampling unit separately with his/her parents to prevent the children coming to the pediatric blood sampling unit from being affected by each other. Each child sat on the blood sampling chair alone. Parents stood next to their children during the procedure. To control nurse-induced factors, blood sampling was performed by the same nurse with 10 years of experience. In all groups, the same type of tourniquet was used with a 21 G needle in the antecubital fossa from a thick vein close to the skin surface. A local anesthetic was not used in routine practice. All children involved in the study were seated in the same blood sampling chair to ensure similar environmental factors. Blood was collected from all children with the same technique, and the same antiseptic solution was used for the procedure. The procedure was considered successful when blood flowed into the tube within 10-15 seconds. If blood sampling was not

successful in the first attempt, these children were excluded from the study in case the pain and fear of the child were affected.

ETHICAL AND LEGAL ASPECTS OF THE STUDY

Institutional permission was obtained from the hospital on April 26, 2019 and ethics committee permission was obtained from ethics committee on May 22, 2019 with protocol number 2019/13. The research was carried out in accordance with the principles of the Declaration of Helsinki.

DATA ANALYSIS

The data were analysed with SPSS V23 (IBM, Armonk, NY, USA). Independent samples t-test and analysis of variance were used for intergroup comparisons of quantitative data. Paired samples t-test was used in all intra-group pre-treatment and post-treatment comparisons. X^2 test was used to analyse data according to groups. Pain scores were analysed under three headings as child, nurse, and parent, and the concordance between these values was evaluated by the Kendall W coefficient of concordance, which evaluates the compatibility between the raters on an ordinal scale.

RESULTS

Gender, the place of residence and family type wasn't significant difference among participants (p=1.000), and most of the children in the kaleidoscope and control groups lived in the village (p=1.000). The ratio of the nuclear family was 90% in both groups. In both groups, 16.7% had a chronic disease. There was no significant difference between the groups in terms of blood sampling in the last three months (p=0.053) (Table 1).

There was difference among the groups in terms of the child's average pain score (p<0.001), and it was 0.73±0.78 in the kaleidoscope group and 2.30±1.49 in the control group. The nurse's average pain score differed between the groups (p<0.001), and it was 0.63±0.61 in the kaleidoscope group and 2.10±1.27 in the control group. The parent pain score differed between the groups (p<0.001), and it was 1.00±0.79 in the kaleidoscope group and 2.40±1.38 in the control group (Table 2).

TABLE 1: Comparison of groups according to characteristics of the children.

	Kaleidoscope group (n=30)		Control group (n=30)			
	n	%	n	%	Test statistics*	p value
Gender						
Female	14	46.7	13	43.3	χ^2=0.000	1.000
Male	16	53.3	17	56.7		
Place of Residence						
Village	14	46.7	14	46.7	χ^2=0.000	1.000
Province	13	43.3	13	43.3		
City	3	10.0	3	10.0		
Family type						
Nuclear	27	90	27	90	χ^2=0.000	1.000
Extended	3	10	3	10		
Chronic disease						
Yes	5	16.7	5	16.7	χ^2=0.000	1.000
No	25	83.3	25	83.3		
Blood sampling in the last three months						
Yes	9	30	3	10.0	χ^2=3.750	0.053
No	21	70	27	90.0		
Disease history						
Yes	11	36.7	10	33.3	χ^2=9.226	0.324
No	19	63.3	20	66.7		

*chi-square test.

TABLE 2: Comparison of groups according to the pain scores of children, nurses, and parents during the procedure.

Pain scores	Kaleidoscope group	Control group	Test statistics*	p value
Pain score child	0.73±0.78	2.30±1.49	t= -5.098	**<0.001**
Pain score nurse	0.63±0.61	2.10±1.27	t= -5.697	**<0.001**
Pain score parent	1.00±0.79	2.40±1.38	t= -4.826	**<0.001**

*Independent samples t-test.

TABLE 3: Kendal W coefficient of concordance.

	Kendal W	Test Statistics*	p value
Kaleidoscope	0.659	57.364	0.001
Control	0.893	77.664	<0.001

*chi-square test statistics.

In the kaleidoscope group, the pain was evaluated by the child, nurse, and parent. The concordance between these assessments was W=0.659, which was statistically significant and showed that the concordance between the 3 raters is above the moderate level. Similarly, the concordance in the control group was W=0.893, indicating a strong agreement (Table 3).

There was no significant difference among age groups and gender in intra-group comparisons in kaleidoscope and control groups. In intergroup comparisons, mean pain values differed between age groups except for the 11-12 age group. The same situation was also observed for gender. In both females and males, mean values were higher in the control group (Table 4).

There was a difference among the avarage values between the groups ($p<0.001$), and the average value in the kaleidoscope is lower than in the control group (Table 5).

DISCUSSION

It is not possible to eliminate pain completely, but it is one of the most significant nursing practices to reduce the severity of a child's pain and contribute to coping with pain more easily.[15,28] In various studies, different methods have been used to reduce the child's pain during blood sampling, and in study, the whether it is effective of kaleidoscope use was evaluated.

No statistically difference was found among both groups in terms of descriptive characteristics of children such as gender, age, place of residence, family type, chronic disease status, and blood sampling experience in the study. This result was due to the homogeneity of the kaleidoscope and control groups and the lack of effect of control variables that may affect pain perception on the study findings.

TABLE 4: Intra- and Inter-group comparison of child pain scores according to age and gender.

	Kaleidoscope group		Control group			
	n	$\bar{X}$±SD	n	$\bar{X}$±SD	Test statistics	p value
Age						
7-8	11	0.73±0.9	10	2.7±1.64	t=-3.464	**0.003**
9-10	13	0.62±0.51	11	2.18±1.54	t=-3.234	**0.007**
11-12	6	1±1.1	9	2±1.32	t=-1.530	0.150
Test statistics		F=0.348		F=0.561		
p value		0.714		0.577		
Gender						
Female	14	0.93±0.92	13	2.46±1.2	t=-3.750	**0.001**
Male	16	0.56±0.63	17	2.18±1.7	t=-3.564	**0.001**
Test statistics		t=1.289		t=0.513		
p value		0.208		0.612		

SD: Standard deviation.

TABLE 5: Comparison of child pain score according to kaleidoscope and control groups.

	X̄±SD	Test statistics	p value
Kaleidoscope	0.73±0.78	t=-5.098	<0.001
Control	2.3±1.49		

SD: Standard deviation.

Children's pain self-reports are the most reliable method of pain management. However, in cases where children cannot provide pain reporting, parents' and nurses' reports are referenced in pain management. Procedural and acute pain, especially venipuncture, is evaluated by the nurse. In this respect, the concordance of pain assessments of children, parents, and nurses is important in the present study. The concordance between the child, nurse, and parent groups evaluating pain was statistically significant and strong. The avarage pain scores were highest in the parents and lowest in the nurses in both groups. The avarage pain scores of children, nurses, and parents were higher in the control group than in the kaleidoscope group and showed a highly significant difference. It is thought that the kaleidoscope used in the kaleidoscope group caused the children to feel less pain. Studies conducted in Türkiye to determine the effect of using a kaleidoscope to distract attention during venipuncture procedure in children have shown that the children in the control group felt more pain than the children in the group using the kaleidoscope and that the kaleidoscope is an effective method to alleviate the pain of the.[19,28-30] In international studies, the use of kaleidoscope was found to be effective in the treatment of pain in children during intravenous cannulation.[23,31]

In our study, the pain scores of children among aged 7-8 years in the kaleidoscope and control groups during the procedure were higher than those of children among aged 9-10 and 11-12 years. As the age of children increases, their tolerance to pain increases.[31] Consistent with our results, pain perception in children aged 5-7 years was reported to be higher than in children aged 8-10 years.[32] In another study, it was found that the pain perception of children aged 10-12 years was lower than that of children aged 6-9 years.[26] Unlike our results, Kunjumon and Upendrababu found that the use of a kaleidoscope was effective in managing pain during intravenous cannulations in children aged 4 to 6 years.[23] In contrast to our results, Karakaya and Gözen found that the level of pain felt increased with increasing age. However, our study results did not show a statistically difference between the avarage pain scores of children in both the kaleidoscope and control groups and the age group.[28]

While some studies reported that gender did not affect pain scores, in some studies, it was reported that the male gender had higher pain tolerance.[23,31-33] According to gender, the avarage pain scores of the children in the control group were higher than those in the kaleidoscope group. The avarage pain scores of girls in both the kaleidoscope and control groups were higher than those of boys. However, there was no statistically difference between gender and avarage pain scores. In parallel with our research results, no statistically significant difference was found between the mean pain scores according to gender in a study.[26]

In our study, the avarage pain scores of the children in the kaleidoscope group were lower than the avarage pain scores of the control group, which confirms the H1 hypothesis "There is a difference between the pain scores of the kaleidoscope group (0.73±0.78) and the control group (2.30±1.49) during blood sampling" (p<0.001).

CONCLUSION

Our study revealed that descriptive characteristics that may affect the pain perception of children in the both groups such as gender, place of residence, family type, presence of chronic disease, and blood sampling in the last three months create a statistically significant difference among the groups. The mean values of the child, nurse, and parent pain scores differed according to the groups. The mean pain scores during the procedure were highest in the parent, then in the child, and finally in the nurse group in both kaleidoscope and control groups. There was a significant difference among the pain scores of the both groups during the procedure, and the average pain scores of the children in the kaleidoscope group were

lower than those of the control group. In children aged 7-12 years, distraction with a kaleidoscope during blood sampling was found to be an effective method to reduce pain sensation in children. Pharmacological and non-pharmacological methods that can be used in the management of procedural pain have some limitations. Therefore, there is an ongoing research effort to find the best pain management methods. In this regard, it is important to identify user-friendly interventions that are both effective in pain management, cost/time effective, and applicable in the clinic. Kaleidoscope is user-friendly, inexpensive, and suitable for repeated use for the 7-12 age group. In line with these results, it is recommended that paediatric nurses can reduce the pain of children in the 7-12 age group with a kaleidoscope, a very simple method to distract children's attention during blood sampling.

Healthcare personnel should reliably determine the presence and severity of pain at first to effectively manage the pain of children. Considering all these factors, pain evaluation tools should be easy-to-use, versatile as well as include behavioral and physiological variables.

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Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Beyhan Turkan;* ***Design:*** *İlknur Kahriman;* ***Control/Supervision:*** *İlknur Kahriman;* ***Data Collection and/or Processing:*** *Beyhan Turkan;* ***Analysis and/or Interpretation:*** *İlknur Kahriman;* ***Literature Review:*** *Beyhan Turkan;* ***Writing the Article:*** *Beyhan Turkan, İlknur Kahriman;* ***Critical Review:*** *İlknur Kahriman;* ***References and Fundings:*** *Beyhan Turkan;* ***Materials:*** *Beyhan Turkan, İlknur Kahriman.*

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