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The Effect of Listening to Music, Performing Mathematic Operations and Ball Squeezing in Reducing Pain During Dressing Change in Children

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ABSTRACT

Objective: The aim of this study was to determine the effect of listening to music (LM), ball squeezing (BS), and performing mathematical operations (MO) on the pain and physiological parameters during the first dressing in children aged 8-18 with appendectomy.

Methods: This study was a randomized controlled trial. The sample of the study consisted of 120 children (LM:30, BS:30, MO:30, control:30). Research data were collected using Information Form, Visual Analogue Scale (VAS), mathematical operations form, a softball, a pulse oximeter, and a thermometer. A minute before dressing and during dressing, the children in the LM group listened to music, the children in the SB group squeezed the ball, and the children in the MO group performed mathematical operations.

Results: According to the assessment of the child, parent, and nurse, it was determined that the pain score of the children in the LM and MO groups was lower than that of BS group and control groups ($p< .05$). The mean pulse of the children in the control group was found to be higher during and after dressing than that of LM and MO groups ($p< .05$). In addition, the mean pulse of the children in the BS group during dressing was found to be higher than that of MO group ($p< .05$).

Conclusion: It was determined that listening to music and performing mathematical operations were effective in reducing the pain of children during dressing. It is recommended that nurses use these non-pharmacological methods, which are easy to apply, in reducing children's pain.

Keywords: Appendectomy, children, distraction, dressing, pain.

1. INTRODUCTION

Acute appendicitis is one of the most common surgical causes of acute abdominal pain in pediatric patients (1). Post-operative wound dressing change causes pain, an unpleasant and undesirable feeling associated with tissue injury. It has been reported that the pain of adolescents who have dressing changes is quite high (2,3). Poor pain management leads to discomfort, dissatisfaction, delay in recovery, and prolongation of hospital stay (4,5). If children's pain is not managed effectively after surgery, the severity and duration of the pain increase. Inadequately treated pain after surgery causes children to suffer needlessly and increases the risk of complications (6). Therefore, postoperative pain should be controlled in a timely and effective manner (7).

A clinical guideline for postoperative pain management recommends the use of non-pharmacological methods in combination with various analgesics in children and adults (Recommendation 6-strong recommendation, high-quality evidence) (8). The distraction method is a non-pharmacological pain management technique that is widely used in the reduction of pain. The distraction method aims to draw the child's attention to something engaging and attractive by inhibiting their capacity to participate in painful stimuli, thus reducing pain, distress, and anxiety (9). There are two main techniques of distraction: active and passive (10). Music is a commonly used form of auditory and passive distraction (9,11-17). Practice Guidelines for Music Intervention recommend using music for pediatric patients as a complementary and alternative approach to take advantage of its calming, relaxing, distracting, sedating and pain-relieving effects (18). Ball squeezing is an active distraction method and has been used in a few studies to reduce pain in pediatric patients during intravenous catheterization, blood collection (19-21). No research has been found indicating the effect of ball squeezing in reducing pain during dressing change. The method of having the child perform mathematical operations during painful intervention was used for the first time in this study. It is estimated that the child may have an active distraction effect while trying to perform mathematical operation, as he wants to find the result of the operation correctly. This study aims to determine the effect of listening to music (LM), ball squeezing (BS), and performing mathematical operations (MO) in reducing the pain experienced during the first dressing in children aged 8-18 with appendectomy.

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2. METHODS

2.1. Ethical Considerations

Ethical approval for the study was obtained from the Clinical Research Ethics Committee (Date: 27.06.2018 / Decision no: KAEK/2018.5.07) of the hospital where the study was conducted. Before the study, the children and their parents were informed about the purpose, duration, and plan of the study. In line with the principles of voluntariness and willingness, verbal consent of the child, both verbal and written consent of the parent were obtained.

2.2. Study Design

This study was conducted as a randomized controlled study and carried out with four groups: the listening to music group (LM), the ball squeezing group (BS), the mathematical operations group (MO), and the control group.

2.3. Participants

The population of the study consisted of children who were hospitalized in the pediatric surgery clinic between January 2019-February 2020. The sample was based on a study (22) reporting that distraction with virtual reality application effectively reduced the pain scores of children aged 4 to 16 during dressing change, and the sample size was calculated using G*power 3.1.9.4 program. When the effect size was accepted as 0.8 for the pain score, the alpha error probability was calculated as 0.05 and the power value 0.95, and the sample size was determined to be 28 children in each group. Considering that there may be case losses, the study was carried out with a total of 120 children, who were divided into four groups homogeneously (LM:30, BS:30, MO:30, control:30). The criteria of the sample selection consisted of the child and parent's consents to participate in the study, the child and parent's speaking Turkish at the level of native speaker, the child's being 8-18 years old and undergoing appendectomy, being the body temperature of the child in the normal level (36.5-37.2°C), the child's not having intense nausea and vomiting, the child's not having any physical, intellectual or neurological disability.

2.4. Randomization

Randomization was performed through an online program (URL=https://www.random.org/). Before the sample number was processed into the program, lots was drawn and the 1st set was assigned to the LM group, the 2nd set to the BS group, the 3rd set to the MO group, and the 4th set to the control group. In order to determine which group the children would be in, numbers from 1 to 120 were processed into the program without recurrence of numbers. The children constituting the sample group were randomly divided into 4 groups by the program. The flowchart of the Consolidated Standards of Reporting Trials (CONSORT) for the research was shown in Figure 1 (23).

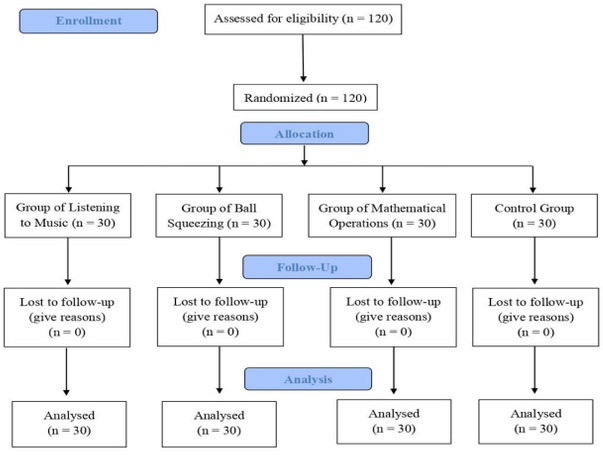

Figure 1. *Consolidated Standards of Reporting Trials (CONSORT) Flowchart*

2.5. Data Collection Tools

Information form, Visual Analogue Scale (VAS), mathematical operations form, ball, and pulse oximeter were used for data collection.

2.5.1. Information Form

In this form, there are 7 questions about the socio-demographic characteristics of the child and parent, appendicitis type, the parent accompanying the child, mobilization time, time of analgesic, antipyretic, anti-inflammatory drugs use, and the child's previous surgery experience. Also, physiological measurement values and pain scores can be written in this form.

2.5.2. Visual Analogue Scale (VAS)

The Visual Analogue Scale (VAS) was used by the child, parent, and nurse to measure the child's pain. The VAS is a valid and reliable tool that is easy for adults and children to use. The VAS consists of a 10 cm horizontal line, where 0 point in this line means 'no pain' and 10 point means 'unbearable pain'. The severity of the pain especially perceived or measured by the person is marked on the line, and the point marked by the person is measured with the help of a ruler and the pain score is determined (24,25).

2.5.3. Mathematical Operations Form

This form was used to have children in the MO group perform mathematical operations. Prepared by the researchers, the form involved mathematical operations such as addition, subtraction, multiplication, and division. The difficulty level of the mathematical operations in the form was determined by age groups of children. Accordingly, mathematical operations were divided into 3 groups primary school, secondary school, and high school levels.

2.5.4. Ball

For the BS group, softball that could fit in the palm and be easily squeezed by the child was used.

2.5.5. Pulse Oximeter

A calibrated Covidien console-type pulse oximeter was used to measure the pulse and oxygen saturation levels of the children.

2.6. Data Collection

The data of the study were collected in 3 stages: pre-dressing, during dressing and post-dressing.

2.6.1. Pre-dressing

Children who met the sample selection criteria and parents were informed about the study. Information about the children and their parents was recorded on the 'Information Form' 5 minutes before the dressing by the researcher. The child and his parents were informed about the VAS. Before the dressing, the child's pain was assessed by the child, his parents and the nurse. The children in the LM group were asked to choose a song they wanted to listen to on their own phones or on their parent's. The children started listening to the music with headphones a minute before the dressing. The children in the BS group started to squeeze the softball a minute before the dressing. The children in the MO group were asked to perform mathematical operations a minute before the dressing. The control group, underwent routine applications, and no distraction method was applied. The pulse and oxygen saturation levels of all groups were measured just before the dressing and recorded in the information form by the nurse.

2.6.2. During Dressing

The first dressing of all children after appendectomy was performed by the doctor in the clinic. No distraction method was applied to the control group during dressing. The LM group were dressed while listening to music. The BS group continued to squeeze the ball during the dressing. The children in the MO group were asked to perform mathematical operations given by the nurse. While the dressing, the pulse and oxygen saturation levels were recorded. At the last stage of dressing, the children were asked to mark the level of pain they experienced during dressing on the VAS, immediately after the sticking plaster was placed on the surgical area. Parents and nurses assessed the pain level of the child during dressing through the VAS.

2.6.3. Post-dressing

When the dressing was over, the application of distraction methods was terminated. The child's pulse and oxygen saturation levels were recorded by the nurse.

2.7. Data Analysis

Data were evaluated using the SPSS package program for Windows (version 21, IBM Corporation, Armonk, NY). Number, percentage, mean and standard deviation were used in descriptive statistics. The normal distribution was evaluated with Skewness and Kurtosis tests.

Pearson chi-square test for categorical variables, one-way analysis of variance in independent groups for numerical variables and Kruskal Wallis test were used in the evaluation of the homogeneity of the descriptive features of the four study groups. T-test in dependent groups was used in the comparison of the mean scores of pain before and after dressing separately by the four study groups (for in-group difference). Analysis of variance in repeated measurements was used in the comparison of the mean pulse and oxygen saturation obtained from three repeated measurements before, during and after dressing (further analysis Bonferroni test). One-way analysis of variance (advanced analysis Tukey HSD) in independent groups was used in the comparison of the difference between the mean scores of pain, pulse and oxygen saturation of the four study groups separately according to the measurement time (for differences between groups). Significance was evaluated at the $p < .05$ level.

3. RESULTS

There was no significant difference between the groups in terms of the age and gender of the children, the parent accompanying them, type of appendicitis, previous surgery, the means of how many hours ago the analgesic/inflammatory drug was taken, and mobilization time ($p > .05$, Table 1).

3.1. Sample Characteristics

It was found that there was no significant difference between the pre-dressing pain scores of the children in the four groups. Post-dressing mean pain score of the children according to the assessment of the child, nurse, and parent was found very significant difference ($p < .001$). In further analysis, it was found that the post-dressing mean pain score of the children in the LM and the MO groups was significantly lower than that of BS and the control groups ($p < .05$). (Table 2).

3.2. Mean Pain Scores

It was found that the post-dressing mean pain score of the LM group was lower than that of pre-dressing, and the difference between the two measurements was very significant according to the assessment of the child ($p < .01$) and highly significant according to the assessment of the parent and nurse ($p < .01$) (Table 2).

The mean pain scores of BS group was examined according to the assessment of the child ($p > .05$), the parent ($p > .05$) and the nurse ($p > .05$), it was found that the post-dressing mean pain score of the children did not change significantly compared to that of pre-dressing (Table 2).

The mean pain score of MO group during dressing was analyzed according to the assessments of the child, parent, and nurse, it was determined that the post-dressing pain score was significantly lower than pre-dressing score ($p < .001$, Table 2).

The post-dressing mean pain score of the control group was found to be higher than pre-dressing and the difference between the two measurements was detected to be significant according to the assessment of parent ($p < .05$), and very significant according to the assessment of child ($p < .01$) and nurse ($p < .01$). ($p < .01$) (Table 2).

The pre – and post-dressing mean pain scores of the children in the four groups were assessed by the child, parent and nurse. There was no significant difference between the pain scores obtained by the three observers ($p > .05$, Table 2).

Table 1. *Comparison of descriptive characteristics*

Characteristics	LM Group (n= 30)		BS Group (n= 30)		MO Group (n= 30)		Control Group (n= 30)		$^{1}x^{2}$	*p*
	n	%	n	%	n	%	n	%		
Gender										
Girl	18	60.0	12	40.0	15	50.0	17	56.7	2.803	.423
Boy	12	40.0	18	60.0	15	50.0	13	43.3	(df: 3)	
Parent accompanying during the procedure										
Mother	22	73.3	25	83.3	26	86.7	25	83.3	2.004	.572
Father/Family member	8	20.7	5	16.7	4	13.3	5	16.7	(df: 3)	
Type of appendicitis										
Perforated appendicitis	26	86.7	22	73.3	24	80.0	25	83.3	1.883	.597
Acute appendicitis	4	13.3	8	26.7	6	20.0	5	16.7	(df: 3)	
Prior surgery status										
Yes	4	13.3	3	10.0	2	6.7	7	23.3	4.038	.257
No	26	86.7	27	90.0	28	93.3	23	76.7	(df: 3)	
	X̄±SD (Min-Max)		X̄±SD (Min-Max)		X̄±SD (Min-Max)		X̄±SD (Min-Max)		^{2}F / ^{3}KW	*p*
Age (years)	11.97±2.62 (8-16)		12.57±2.56 (8-16)		12.17±2.64 (8-16)		12.03±2.55 (8-16)		F: .322	.809
*Medication time (hour)	9.83±1.33 (8-11)		10.75±2.43 (8-16)		9.71±1.38 (8-12)		10.43±1.40 (9-13)		KW: 1.246	.742
**Mobilization (hours)	6.93±2.39 (3-11)		7.34±2.69 (3-12)		7.83±2.56 (3-12)		8.07±2.20 (3-11)		KW: 3.826	.281

LM: Listening to Music, BS: Ball Squeezing (BS), MO: Mathematical Operations, df: Degree of Freedom.1 Pearson Chi-square test.2 One-way analysis of variance in independent groups.3 Kruskal Wallis test. How many hours ago the analgesic/inflammatory drug was taken before the dressing.** How many hours ago the child was mobilized before the dressing. df (degree of freedom): 3 Between-group/in-group/total df (degree of freedom): 3/116/119 (One way ANOVA).*

Table 2*. Comparison of the mean pain scores of the groups pre – and post-dressing*

The person assessing the pain	Time	LM Group[a] (n=30) x̄ ±SD	BS Group[b] (n=30) x̄ ±SD	MO Group[c] (n=30) x̄ ±SD	Control Group[d] (n=30) x̄ ±SD	^{1}F	*p* (difference)
Child	Pre-dressing	2.13±.73	2.10±.76	2.27±.64	2.17±.59	.333	.802
	Post-dressing	1.57±.77	2.20±.96	1.43±.63	2.67±.76	15.888	**.000** (a,c < b,d)
In-group difference	^{2}t	*3.195*	*.571*	*6.113*	*3.340*		
	p	***.003***	*.573*	***.000***	***.002***		
Parent	Pre-dressing	2.17±.70	2.13±.51	2.03±.61	2.07±.78	.255	.857
	Post-dressing	1.33±.71	2.10±1.06	1.47±.68	2.57±.68	15.460	**.000** (a,c < b,d)
In-group difference	^{2}t	*5.473*	*.166*	*4.011*	*2.715*		
	p	***.000***	*.869*	***.000***	***.011***		
Nurse	Pre-dressing	2.23±.68	2.03±.67	2.13±.68	2.10±.84	.399	.754
	Post-dressing	1.50±.63	2.23±1.04	1.33±.61	2.63±.67	19.668	**.000** (a,c < b,d)
In-group difference	^{2}t	*5.430*	*.972*	*5.442*	*3.395*		
	p	***.000***	*.339*	***.000***	***.002***		
Pre-dressing difference between child-parent-nurse	^{3}F	.393	.343	2.016	.230		
	p	.679	.713	.152	.796		
Partial eta squared / Observed power		.03 / .11	.02 / .10	.13 / .38	.02 / .08		
Post-dressing difference between child-parent-nurse	^{3}F	1.130	.556	.649	.389		
	p	.337	.580	.530	.682		

LM: Listening to Music, BS: Ball Squeezing (BS), MO: Mathematical Operations, SD: Standard Deviation. [1] One-way analysis of variance in independent groups, between-group/in-group/total df (degree of freedom): 3/116/119. [2] t test in independent groups, df (degree of freedom): 29. [3] Analysis of variance in repeated measurements, df (degree of freedom): 2.

3.3. Mean Pulse

It was found that there was no difference between the groups before the dressing (p>.05), and there was a very significant difference in during and post-dressing measurements (p<.01). The mean pulse score of the children was determined to be significantly higher in the control group than LM group and MO group (p< .05) during dressing, and the mean pulse score of the children in the BS group was significantly higher than MO group (p< .05). The post-dressing mean pulse the control group was determined to be significantly higher than LM group and MO group (p< .05, Table 3).

It was found that the mean pulse rate of the children in the LM group during dressing was significantly lower than that of pre-dressing (p<.01). It was determined that the pre – and post-dressing mean pulse rate of the children in the BS group was significantly lower than the mean pulse rate during dressing (p<.001). The mean pulse rate of the children in the MO group was found to be significantly lower during and post-dressing than pre-dressing (p<.01). The mean pulse of the children in the control group during and post-dressing was significantly higher than that of pre-dressing (p<.001).

3.4. Mean Oxygen Saturation

No significant difference was found between the pre-, during and post-dressing oxygen saturation mean scores of the children in the four study groups (p> .05, Table 4). When the pre-, during and post-dressing oxygen saturation mean scores of the children was compared within the groups, no significant difference was found in all groups (p> .05, Table 4).

Table 3. *Comparison of the mean pulse of the groups pre – , during and post-dressing*

Time	LM Group[a] (n=30) x̄ ±SD	BS Group[b] (n=30) x̄ ±SD	MO Group[c] (n=30) x̄ ±SD	Control Group[d] (n=30) x̄ ±SD	[1]F	*p* (difference)
Pre-dressing[x]	81.67±8.32	81.00±7.65	81.53±6.60	81.50±7.98	.044	.988
During dressing[y]	80.83±7.17	83.43±6.19	78.63±5.71	85.70±8.61	5.771	**.001** (a, c < d) (b > c)
Post-dressing[z]	78.33±6.08	80.20±5.28	77.77±5.53	83.73±6.65	6.230	**.001** (a, c < d)
In-group difference						
[2]F	7.606	10.977	7.473	13.961		
p (difference)	**.002** (x > z)	**.000** (x, z < y)	**.003** (x > y, z)	**.000** (x < y, z)		

LM: Listening to Music, BS: Ball Squeezing (BS), MO: Mathematical Operations, SD: Standard Deviation.[1] Analysis of variance in independent groups, between-group/in-group/total df (degree of freedom): 3/116/119.[2] Analysis of variance in repeated measurements, df (degree of freedom): 2.

Table 4. *Comparison of the mean oxygen saturation of the groups pre – , during and post-dressing*

Time	LM Group (n=30) x̄ ±SD	BS Group (n=30) x̄ ±SD	MO Group (n=30) x̄ ±SD	Control Group (n=30) x̄ ±SD	[1]F	*p*
Pre-dressing	98.63±.76	98.53±.82	98.63±.72	98.67±.84	.161	.922
During dressing	98.57±.82	98.60±.81	98.77±.77	98.63±.89	.339	.797
Post-dressing	98.60±.72	98.70±.99	98.80±.71	98.57±.86	.485	.693
In-group difference						
[2]F	.059	.265	.486	.103		
p	.943	.769	.620	.902		

LM: Listening to Music, BS: Ball Squeezing (BS), MO: Mathematical Operations, SD: Standard Deviation.

[1] Analysis of variance in independent groups, between-group/in-group/total df (degree of freedom): 3/116/119

[2] Analysis of variance in repeated measurements, df (degree of freedom): 2

4. DISCUSSION

When a distraction technique is performed to relieve pain, the neurocognitive pathways that direct the perception of pain may be disrupted (26). The child's capacity to attend a painful stimuli may be hindered by distracting his attention, enabling him to focus on engaging and attractive things, and therefore his pain, distress, and anxiety can be reduced (9). Active distraction methods require the child's cooperative involvement. Passive methods, are distractions that require such passive interactions as listening to music or watching videos. It has been reported that compared to passive distraction techniques, active distraction methods (distraction cards, playing digital games, virtual reality, etc.) provide a more significant reduction in children's pain and anxiety (22,27-30). However, the use of passive distraction methods has been reported to be more effective in the reduction of pain in painful procedures where no distraction methods were used (13,31,32). It has been reported that the use of active methods such as squeezing balls or playing with electronic devices and the use of passive methods such as watching videos, deep breathing exercises, and listening to music are appropriate in children aged 8-18 during painful interventions (33). In this study, the children in the intervention group carried out activities such as squeezing the ball and performing mathematical operations, among the active methods, and listening to music, a passive method. When the results of the study were examined, it was found that the pain scores of the children who listened to music (passive) and performed mathematical operations (active) were lower than those who squeezed the ball (active) and those in the control group. This result is important as it shows that active methods are not always more effective in reducing pain than passive methods.

Music potentially reduces the need for pharmacotherapy. The distraction effect of music can relieve pain and anxiety (13). In studies examining the effect of music therapy in similar age groups as in our study, the children in the music group were reported to experience less pain (11-13). In the study conducted by Atak and Özyazıcıoğlu (14), three different audio distraction methods were determined to be effective in the reduction of postoperative pain in children aged 7-14. In the study in which the pain related to circumcision was assessed, it was determined that the mean pain scores of the children in the experimental group who listened to music and watched kaleidoscope were lower than the control group (15). In the study in which the effects of distraction cards and listening to music in the reduction of the pain experienced during blood collection were compared, no difference was found between the groups. As in our study, music was compared with the active distraction method in that study and it had a similar effect with the active distraction (16). In the study evaluating the effects of music on pain and anxiety during donor site dressing change in pediatric burn patients aged 6-16, it was found that there was no difference between the groups (17). The reason for a different result between that study and our study in terms of listening to music may be due to the fact that the dressing change performed after appendicitis surgery caused less pain in our study than the donor site dressing change.

Ball squeezing is an easy distraction method that does not require learning and preparation. Sadeghi et al. (19) used a soft ball for squeezing during intravenous catheter insertion and found that it significantly reduced the pain. In another study in which a squishy object was used for squeezing during intravenous catheter insertion, the pain in children over 8 years old was assessed through the VAS, and this distraction method was found to be effective in the reduction of pain (20). In the study conducted by Aydin et al. (34), ball squeezing was found to be effective in reducing pain during blood sampling. Although it was not statistically significant, Aydin et al. (34) compared three different methods of distraction in their study and found that ball squeezing reduced the pain of children compared to the control group. Similarly, it was found in our study that the children in the BS group had lower pain scores than the control group although it was not statistically significant.

According to the gate control theory, pain sensations must pass through various control centers or gates in their pathway in order for pain sensations to be perceived and then be felt as pain. However, each "gate" along the pathway can be opened or closed by other types of stimuli, not just by pain. Thanks to distraction methods, doors can be closed and pain sensations can access fewer pathways (35). It was found that having children perform mathematical operations was effective in reducing pain, and therefore it was a very powerful distraction method. While performing mathematical operations, the child-focused all his attention on the questions, on answering them correctly and on succeeding. No study was found in which children were asked to perform mathematical operations as a distraction method during painful attempts. This method was used for the first time in this study. This study is of great importance in terms of indicating that performing mathematical operations is effective in the reduction of pain during dressing in children with appendectomy. This method, which has no cost, does not require preparation for use and can be easily performed during all kinds of painful interventions, can be used to reduce pain, especially in school-age children.

In our study, it was observed that the pain scores of the LM and MO groups were lower according to the parents' and nurses' assessments of the child's pain. This result was similar to the self-report of children. We consider that the assessments of the parent and nurse are additional evidence to indicate the effect of distraction methods. In many studies, the pain assessment of parents and observers was found to be similar to the self-report of the child (16,21,34,36,37).

It was found that the mean pulse of the MO and LM groups during dressing was lower than the control group. This result indicates that pulse is also affected in parallel with pain. However, no significant difference was found in oxygen saturation levels. Similar to our study, in the study conducted by Hua et al. (22), it was found that the pulse and the pain level of the children to whom the distraction method was applied

during the dressing change decreased, and no difference was detected between the oxygen saturation levels of the groups. In some studies, it has been emphasized that physiological parameters can be affected by various factors such as age, gender, emotions, drugs, and environmental atmosphere and that physiological parameter changes are not reliable indicators in the assessment of the intensity of pain (38,39). In a systematic review study examining the effect of audio-visual distraction on pain and anxiety in children, it was stated that the relationship between pain level and oxygen saturation level was examined in only two studies, and different results were obtained (40).

5. CONCLUSION

In this study, listening to music and performing mathematical operations were found to be effective in reducing pain during the first post-operative dressing in children with appendectomy. It was also determined that ball squeezing reduced the pain, but there was no statistical significance between the control group. The mean pulse of the children who performed mathematical operations and listened to the music was lower during and after dressing than the control group. However, there was no significant difference between the oxygen saturation of the four groups pre-, during, and post-dressing. That listening to music and performing mathematical operations are easy, do not require much preparation, are economical, and are effective in reducing pain makes these them prominent among the non-pharmacological methods used in the research. These methods can be used to relieve pain in children. Since performing mathematical operations does not require any materials, it is recommended to be used in all pediatric clinics during all kinds of painful interventions when the child is conscious.

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Author Contributions:
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Design of the study: BM, ZE, MYA
Acquisition of data for the study: MYA
Analysis of data for the study: BM, ZE, MYA
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Drafting the manuscript: BM, ZE
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