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An Investigation of Using Non-Pharmacological Methods in Pain Management in Postoperative Period in Children: A Systematic Review

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Abstract: This study aimed to investigate the effectiveness of nonpharmacological methods used by nurses in the management of postoperative pain in pediatric patients aged 0-18 years. In this descriptive study, the research population consisted of studies that were accessed from the National Thesis Center database by using the keywords “pediatric”, “pain”, “surgical”, “postoperative”, “and non-pharmacological” in different combinations in the literature search and that examined non-pharmacological methods used for pain management in the postoperative period in pediatric patients between the ages of 0-18 years in the last seven years and were conducted in experimental design. This systematic review was carried out using the PRISMA flowchart steps. A total of 1185 individuals, including 905 children and 280 parents, took part in 11 studies. The mean age of the children in the studies was 6.6 years (min-max). The most preferred scale to measure pain in the postoperative period was the Wong-Baker Facial Pain Scale (7 studies). Non-pharmacologic methods used in the studies included distraction (5 studies), therapeutic play (3 studies), distraction and therapeutic play (1 study), massage therapy (1 study), and music therapy (1 study). Different non-pharmacological methods used in the postoperative period are effective in reducing pain levels in children.

Keywords: Child, Non-Pharmacologic, Pain, Postoperative, Surgical.

JEL Classification: I1, I10, I19

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Çocuklarda Postoperatif Dönemde Ağrı Tedavisinde Nonfarmakolojik Yöntemlerin Kullanımının İncelenmesi: Sistematik Bir İnceleme

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Özet: Bu çalışmanın amacı 0-18 yaş arası çocuk hastalarda postoperatif ağrı yönetiminde hemşirelerin kullandıkları nonfarmakolojik yöntemlerin ağrı düzeyinin azaltılmasındaki etkinliğinin incelenmesidir. Tanımlayıcı tipteki bu çalışmanın evrenini Ulusal Tez Merkezi veri tabanından “pediatrik”, “ağrı”, “cerrahi”, “postoperatif”, “nonfarmakolojik” anahtar kelimeleri kullanılarak ulaşılan çalışmalar oluşturmuştur. Literatür taramasında farklı kombinasyonların kullanıldığı ve son yedi yılda 0-18 yaş arası pediatrik hastalarda postoperatif dönemde ağrı tedavisinde kullanılan farmakolojik olmayan yöntemlerin incelendiği ve deneysel tasarımda yürütüldüğü bir çalışmadır. Bu sistematik inceleme PRISMA akış şeması adımları kullanılarak gerçekleştirildi. 11 çalışmaya 905'i çocuk, 280'i ebeveyn olmak üzere toplam 1185 kişi katıldı. Çalışmalara katılan çocukların yaş ortalaması 6,6 (min-max) idi. Ameliyat sonrası dönemde ağrıyı ölçmek için en çok tercih edilen ölçek Wong Baker Yüz Ağrı Ölçeği olmuştur (7 çalışma). Çalışmalarda kullanılan farmakolojik olmayan yöntemler arasında dikkat dağıtma (5 çalışma), terapötik oyun (3 çalışma), dikkat dağıtma ve terapötik oyun (1 çalışma), masaj terapisi (1 çalışma) ve müzik terapisi (1 çalışma) yer almaktadır. Ameliyat sonrası dönemde kullanılan farklı farmakolojik olmayan yöntemler çocuklarda ağrı düzeyinin azaltılmasında etkilidir.

Anahtar Kelimeler: Çocuk, Nonfarmakolojik, Ağrı, Postoperatif, Cerrahi.

JEL Sınıflandırması: I1, I10, I19

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GENİŞLETİLMİŞ ÖZET

Araştırma Problemi

Bu çalışma 0-18 yaş arası çocuk hastalarda postoperatif dönemde ağrı yönetiminde kullanılan farmakolojik olmayan yöntemlerin etkinliğinin değerlendirildiği Türkçe dilinde yazılmış lisansüstü çalışmaların gözden geçirilmesi ve bu çalışmalardan elde edilen verilerin sistematik biçimde incelenmesi amacıyla planlanmıştır.

Araştırma Soruları

Ameliyat sonrası dönemde hemşireler tarafından kullanılan farmakolojik olmayan ağrı yöntemleri nelerdir? Ameliyat sonrası dönemde kullanılan farmakolojik olmayan yöntemler çocukların ağrı düzeylerini azaltmada etkili midir?

Literatür Derlemesi

Çocuklar için en travmatik deneyimlerden biri olan ameliyat, preoperatif ve postoperatif dönemlerde korku, kaygı ve ağrıya neden olmaktadır (Millett ve Gooding, 2017). Çocukların postoperatif ağrı deneyimlerinin ve etkisiz ağrı yönetiminin artmış morbidite, uzamış iyileşme, daha kötü fiziksel işlev, daha uzun hastane yatışları ve daha yüksek sağlık bakım maliyetleri ile bağlantılı olduğu bildirilmiştir. Bu nedenle, ağrı zamanında ve etkili bir şekilde yönetilmelidir (Miladinia vd., 2016). Çocuklarda ameliyat sonrası ağrı yönetimi için farmakolojik ve nonfarmakolojik yöntemler bulunmaktadır. Amerikan Pediatri Akademisi (AAP), tüm çocuklar ve ergenler için farmakolojik ve nonfarmakolojik ağrı yönetimi yöntemlerinin bir kombinasyonunu önermektedir (Coté ve Wilson, 2016). Çocuklarda ameliyat sonrası ağrı yönetiminde nonfarmakolojik yöntemlerin kullanımını destekleyen kanıtlar bulunmaktadır (Díaz-Rodríguez vd., 2021; Kaheni vd., 2016; Rantala vd., 2020a; Yayan vd., 2020). Ameliyat sonrası ağrı yönetiminde kullanılan nonfarmakolojik yöntemler; fiziksel teknikler (masaj, sıcak/soğuk uygulama, terapötik dokunma, pozisyon değişikliği vb), bilişsel-davranışçı teknikler (müzik dinleme, meditasyon, dikkat dağıtma, hayal kurma vb) ve bu iki yöntem dışındaki diğer tekniklerden (aromaterapi, akupunktur, refleksoloji, plasebo uygulaması, sinir blokları vb) oluşmaktadır (Christaens, 2003; Kwekkeboom ve Gretarsdottir, 2006; Özveren, 2011).

Postoperatif ağrı yönetimi için multidisipliner bir ekip gereklidir ve hemşirelerin temel sorumlulukları vardır. Bu nedenle literatürde hemşirelerin ağrılı hastaların takibinde, bakımında ve ağrının giderilmesinde önemli rol oynadığı bildirilmektedir (Özveren ve Uçar, 2009). Kuzey Amerika Hemşirelik Tanıları Birliği (NANDA) ağrının giderilmesini hemşirelik hedefleri kapsamına almıştır. Bu durumun bir sonucu olarak hemşirenin ağrının değerlendirilmesi, hafifletilmesi ve giderilmesi için farmakolojik ve nonfarmakolojik yöntemler hakkında yeterli bilgiye ve bu bilgiyi etkili bir şekilde uygulama yetkinliğine sahip olması gerekmektedir (Herdman ve Kamitsu, 2017).

Metodoloji

Bu araştırma niceliksel yöntemlerden biri olan tanımlayıcı tipte bir araştırma olarak planlanmıştır. Literatür taraması "çocuk", "ağrı", "cerrahi", "postoperatif", "nonfarmakolojik" anahtar kelimeleri farklı kombinasyonları kullanılarak Ulusal Tez Merkezi veri tabanında yapılmıştır. Tarama sonucunda çocuklarda postoperatif dönemde ağrı yönetimi için kullanılan nonfarmakolojik yöntemleri inceleyen, 2017-2022 yılları arasında, deneysel tasarımda yapılan yüksek lisans ve doktora tezleri araştırma evrenini oluşturmuştur. Bu sistematik incelemenin yapılma ve raporlanma aşamasında 27 maddeden oluşan PRISMA yazım rehberi takip edilmiştir. Rehbere göre seçim süreci üç basamaktan oluşmaktadır. Bu basamaklar çalışmaların başlık, özet ve tam metinlerinin değerlendirilmesi aşamalarını kapsamaktadır. İlk aşamada çalışmalar, başlığın uygunluğu açısından değerlendirilmiştir. Konu başlığına göre dahil etme kriterlerini karşılamayan çalışmalar dışlanmıştır. Daha sonra özetler dahil edilme kriterlerine göre değerlendirilerek, kriterlere uyan çalışmaların tam metinleri indirilmiştir. Tam metin çalışmalar ise dahil etme kriterleri açısından değerlendirilmiş ve ulaşılan 11 tez çalışması araştırmanın örneklemini oluşturmuştur. Bu çalışmada veri çekme aracı olarak; Oğul ve Kurt (2021), Çağlar ve Yıldız (2019) ve Ay (2018)'ın hemşirelik alanında, deneysel araştırmalar için yapmış oldukları sistematik derleme çalışmaları dikkate alınarak, araştırmacılar tarafından geliştirilen 'Çocuklarda Postoperatif Dönemde Ağrı Yöntemi için Kullanılan Nonfarmakolojik Yöntemler Konulu Yayın Sınıflama Formu' kullanılmıştır. Oluşturulan form için uzman görüşü alınmıştır. Geliştirilen formda; çalışmanın kalite

puanı, yazar, yayın yılı, tez türü, çalışma yöntemi (deseni/ örneklemi), yapılan müdahale (ler), postoperatif ağrı için kullanılan ölçek (ler) ve başlıca sonuçlar dikkate alınmıştır. Nicel verilerin istatistiksel analizi SPSS 26 paket programı kullanılarak, kullanılma sıklığı (f) ve yüzdelik (%) oranlarla ifade edilmiştir. Çalışmalardan elde edilen verileri analiz etmek için içerik analizi yöntemi kullanılmıştır.

Bulgular ve Sonuçlar

İnceleme kapsamına alınan 11 tezde 905 çocuk ve 280 ebeveyn olmak üzere toplam 1185 birey yer almıştır. Çalışmalarda kullanılan nonfarmakolojik yöntemler; dikkati başka yöne çekme (%45,45), terapötik oyun (%27,27), dikkati başka yöne çekme ve terapötik oyun (%9.09), masaj terapi (%9,09) ve müzik terapi (%18,18) olarak belirlenmiştir. Dikkati başka yöne çekme yöntemleri ise; sanal gerçeklik uygulaması (%40), rehberli hayal kurma tekniği (%20), farklı işitsel teknikler (%20), ve parmak kukla oyunu (%20) olarak saptanmıştır. Nonfarmakolojik yöntemlerin uygulandığı ameliyatlar ise; sünnet, hidrosel, inmemiş testis, hipospadias, herni, apandisit, dil bağı, invajinasyon, üretral distilasyon ve kalp ameliyatı olup, en çok uygulama sünnet sonrası yapılmıştır. Sistematik derleme kapsamına alınan tezlerin sonuçları incelendiğinde; 7 çalışmada kullanılan nonfarmakolojik yöntemlerin ağrı düzeylerini istatistiksel olarak anlamlı düzeyde azalttığı, 4 çalışmada ise kullanılan yöntemlerin ağrı üzerinde etkili olduğu ancak istatistiksel olarak anlamlı olmadığı belirlenmiştir.

INTRODUCTION

Pain is defined by the International Society for the Study of Pain as “an unpleasant sensory and emotional experience associated with confirmed or possible tissue damage” (ISAP). The definition made by McCafferry is considered to be the most useful definition for both nurses and patients. According to this definition, pain is “Pain is what the individual says. Whenever and wherever the individual mentions that he/she has pain, it exists and should be believed”. The experience of pain is objective and individualized (Pasero and McCaffery, 2004).

Surgical procedures, which are among the worst experiences for children, cause pain in the preoperative, intraoperative, or postoperative period (Alm et al., 2021; Chieng et al., 2014). Most patients undergoing surgical procedures experience postoperative acute pain, but very little evidence shows that the level of pain decreases in the postoperative period. The postoperative period, in which 80% of patients describe severe acute pain, is a complex process requiring multidisciplinary care (Chng et al., 2015; Crowe et al., 2008). There are many preoperative, intraoperative, and postoperative intervention strategies to manage postoperative pain (Chou et al., 2016). It has been reported that children's pain experiences in the postoperative period and ineffective pain management are associated with increased morbidity, prolonged recovery, poorer physical function, increased length of hospital stay, and higher costs in health care. Therefore, pain must be managed timely and effectively (Miladinia et al., 2016).

There are pharmacological and non-pharmacological methods for postoperative pain management in children. While there is evidence supporting the use of non-pharmacologic methods in the management of postoperative pain in children (Díaz-Rodríguez et al., 2021; Kaheni et al., 2016; Rantala et al., 2020b; Yayan et al., 2020), there are studies with opposite results (Buffel et al., 2019; Matthyssens et al., 2020). Pharmacologic methods are effective and widely used in pain management. However, the risk of drug addiction may occur in long-term use. Addiction may complicate the treatment process and may lead to more invasive interventions. In addition, such invasive procedures may increase the risk of infection and exacerbate the pain experienced by the patient. Therefore, it is important to use pharmacologic methods carefully and consider non-pharmacologic methods in the treatment of diseases. Opioid drugs can often burden the liver and kidneys in the processes of metabolism and excretion. The liver is the main organ responsible for the metabolism of many opioid drugs. These drugs are metabolized using liver enzymes and then converted into active or inactive components. However, this metabolic burden on the liver can affect liver function and increase the risk of toxicity with long-term use. The kidneys play an important role in the excretion of some opioid medicines. The kidneys are responsible for the removal of drugs from the body through urine and filter out the active metabolites and waste products of some opioids. However, long-term and high-dose use can cause damage to the kidneys and adversely affect kidney function. Therefore, it is important to be careful when using opioid drugs and to avoid long-term use (Smith, 2009). Monitoring patients closely during the treatment process and referring them to alternative methods, when necessary, can help prevent negative outcomes (Yardımcı, 2015). For this reason, the American Academy of Pediatrics (AAP) and the American Academy of Pediatric Dentistry (AAPD) recommend a combination of pharmacological and non-pharmacological methods to manage pain in all children and adolescents in the best way (AAPD, 2022; Coté and Wilson, 2016).

Non-pharmacological methods used in postoperative pain management consist of physical techniques (massage, hot/cold application, therapeutic touch, position change, etc.), cognitive-behavioural techniques (listening to music, meditation, distraction, imagination, etc.), and other techniques (aromatherapy, acupuncture, reflexology,

placebo application, etc.) (Christaens, 2003; Kwekkeboom and Gretarsdottir, 2006; Özveren, 2011). Non-pharmacologic methods have advantages such as being easily applicable, being free of side effects, and not imposing an economic burden on the individual (Chatchumni et al., 2016).

Postoperative pain management requires a multidisciplinary team and nurses are an important part of this team. The use of some non-pharmacological methods for pain management in the postoperative period can be defined as one of the independent roles of nurses (Miftah et al., 2017; Özveren et al., 2016). Pediatric nurses have fundamental responsibilities in providing postoperative pain management. For this reason, it has been reported in the literature that nurses have a critical role in the follow-up, care, and pain relief of patients with pain (Özveren and Uçar, 2009). The North American Nursing Diagnoses Association (NANDA) has included pain relief within the scope of nursing objectives. As a result of this situation, the nurse should have sufficient knowledge about pharmacologic and non-pharmacologic methods related to the assessment, alleviation, and elimination of pain and should be competent enough to use this knowledge effectively (Herdman and Kamitsu, 2017).

Despite good progress in pain management, ineffective management of postoperative pain in children is still a worldwide problem (Sng et al., 2017; Twycross and Collis, 2012). However, no study with a high level of evidence supporting the effectiveness of nonpharmacological methods was found in the literature. Therefore, studies with a high level of evidence are needed in the future. For this purpose, postgraduate theses investigating the effectiveness of non-pharmacological methods used in the treatment of postoperative pain in pediatric patients aged 0-18 years will be systematically examined. It is expected that the data obtained will contribute to the existing national and international literature, health practices in this field, and scientific studies planned to be carried out in the future. In this context, answers to the following questions will be sought in this systematic review:

1. What are the non-pharmacological pain methods used by nurses in the postoperative period?
2. Are non-pharmacological methods used in the postoperative period effective in reducing the pain levels of children?

2. MATERIALS AND METHODS

2.1. Desing

The writing guide 'Checklist of Items for Preferred Reporting Items in the Writing of a Systematic Review and Meta-analyses Research Report (PRISMA)' consisting of 27 items was followed in the process of conducting and reporting this systematic review type study (Page et al., 2021). Turkish version of this guideline is available (Karaçam, 2013). According to this guideline, the selection process consists of three steps. These steps include the evaluation of the title, the abstract, and the full text of the studies. In the first stage, studies were evaluated in terms of the suitability of their title. The studies were analysed according to the title and studies that did not meet the inclusion criteria were not included in the systematic review. The abstracts were then evaluated according to the inclusion criteria and the full texts of the studies that met the criteria were downloaded. The full texts of studies were then evaluated in terms of inclusion criteria and quality (Page et al., 2021). The search process is recorded in the PRISMA flow diagram in Figure 1.

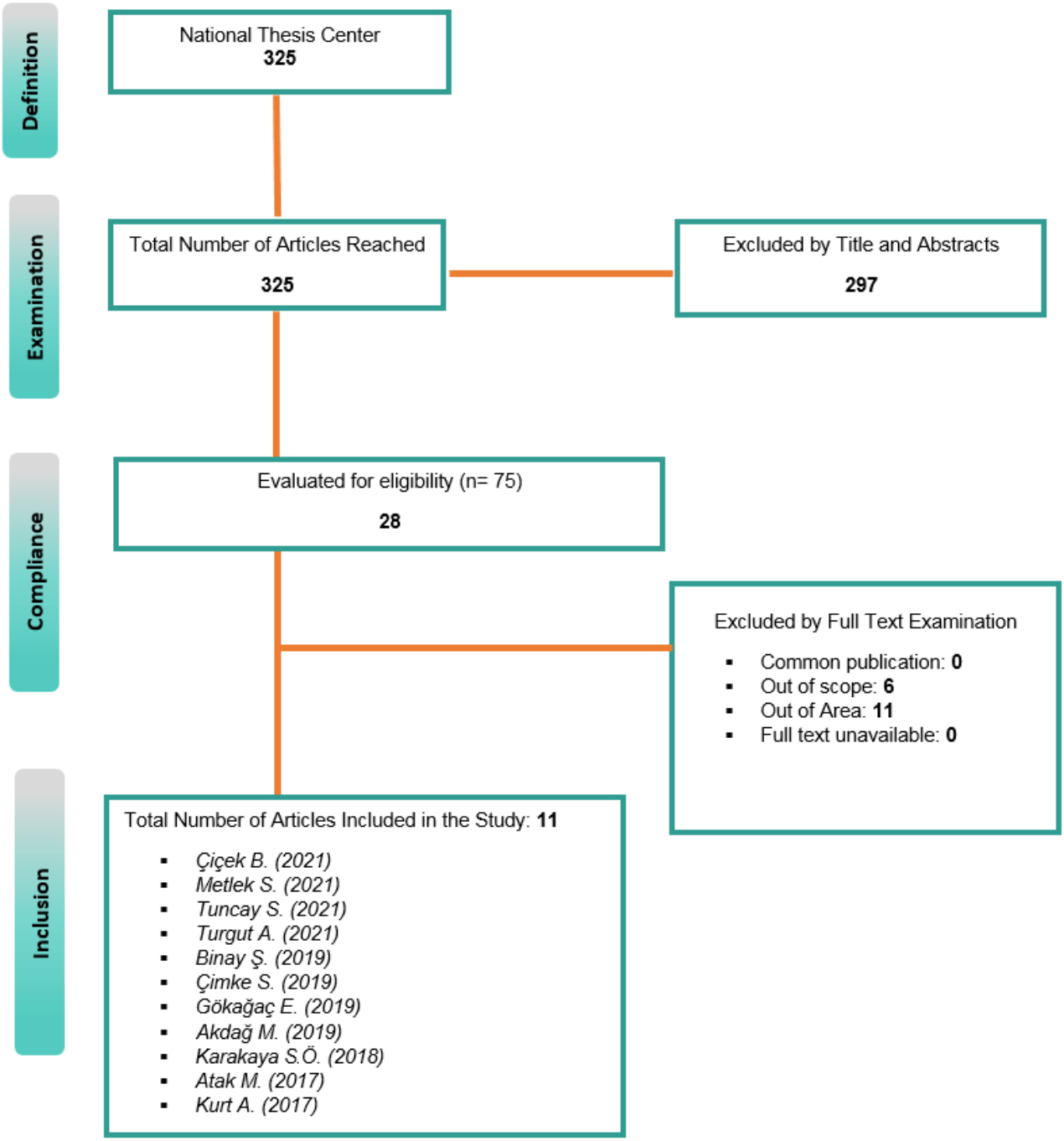

Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Flow Chart (Page et al., 2021)

In this systematic review, to minimize the risk of bias, literature search (3 researchers), article selection (3 researchers), data retrieval stage (2 researchers), and quality evaluation of the articles (3 researchers) were performed independently by the researchers. For the research process to take place in the appropriate format and quality, a review was performed with a keyword (non-pharmacological) within the scope of the study in the National Thesis Centre database and an article was selected in a session where all researchers were together. Data were retrieved from the selected research article and a pilot study was conducted to include quality evaluation of the selected articles. Following the pilot study, each stage was re-checked in a single session in which all three researchers were together, and a consensus was reached on the differences in opinions and knowledge that emerged.

2.2. Search Strategy

The searches related to the systematic review were carried out between 15 January and 15 February 2023 by retrospectively searching the relevant studies from the "National Thesis Centre" database by using the keywords "child", "pain", "surgery", "postoperative", "non-pharmacological" in different combinations, including studies conducted in the last seven years. The database and the selection of keywords, it was aimed at reaching all studies written in the Turkish language in which pediatric patients between the ages of 0-18 years were included.

2.3. Selection Criteria and Selection of Studies

Studies eligible for this systematic review were selected according to PICOS criteria (CRD, 2008; Gerrish and Lacey, 2010). According to these criteria;

1. **Study group (P: Patient):** Children who have undergone surgery
2. **Intervention (I):** Use of non-pharmacological pain intervention
3. **Comparison (C):** No use of non-pharmacological pain intervention
4. **Outcomes (O):** The use of non-pharmacologic methods to relieve pain in the postoperative period and their effects on pain were examined.
5. **Types of Studies (S):** Experimental studies in which nonpharmacologic methods were used to relieve postoperative pain were included in the systematic review.

Studies with unclear methodology, studies for which the full text is not available, systematic, traditional reviews and meta-analyses, non-experimental, case reports, and studies using non-pharmacological methods other than postoperative pain were excluded from this study. Only studies examining the effect of nonpharmacological pain management practices on postoperative pain in pediatric patients were included. The selection of studies in line with inclusion criteria was performed by three researchers independently. After the repeated studies were excluded, selections were made according to the title, abstract, and full text. The selection process of the current study is shown in Figure 1.

2.4. Selection Process

This systematic review is supported by studies in the literature covering non-pharmacologic methods used by nurses for pain management in the postoperative period. The study population consisted of 325 graduate theses. Of these studies, 297 theses were excluded from the study due to inconsistency between the title and abstract. Full texts of 28 theses were analysed.

2.5. Research Ethics

This study is a systematic review and is based on studies published in the literature with references cited. Therefore, approval from any institution or individual and ethics committee is not required. This study was conducted by the principles of the Declaration of Helsinki.

2.6. Methodological Quality Assessment

The methodological quality evaluation of studies included in this systematic review was conducted by the JBI-MAStARI critical appraisal control lists published by Joanna Brings Institute (JBI) According to these lists, quality evaluation of randomized controlled trials was performed with a checklist consisting of 13 items. Each item in the list was evaluated using the options "yes, no, unclear, and not applicable". The methodological quality level of the

studies included in the research is expressed as mediocre, medium quality, and good quality. Accordingly, when less than 50% of the items are marked as "yes", it is considered as "mediocre", when 51-80% of the items are marked as "yes", it is considered as "moderate quality" and when more than 80% of the items are marked as "yes", it is considered as "good quality". The evaluations were made by three researchers and the quality scores are given in Table 1 (JBI, 2021).

Table 1. JBI Critical Appraisal Checklist for Randomized Controlled Trials

Employment	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	Quality Score
Çiçek, B. (2021)	Y	N	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Moderate (69.2)
Metlek, S. (2021)	Y	N	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Moderate (69.2)
Tuncay, S. (2021)	Y	N	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Moderate (69.2)
Turgut, A. (2021)	Y	N	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Moderate (69.2)
Binay, Ş. (2019)	Y	N	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Moderate (69.2)
Çimke, S. (2019)	Y	N	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Moderate (69.2)
Akdağ, M. Y. (2019)	Y	N	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Moderate (69.2)
Gökağaç, E. (2019)	Y	N	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Moderate (69.2)
Karakaya, S. Ö. (2018)	Y	N	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Moderate (69.2)
Atak, M. (2018)	Y	N	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Moderate (69.2)
Kurt, A. (2017)	Y	N	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Moderate (69.2)
Question Quality Score	100%	0%	100%	0%	0%	0%	100%	100%	100%	100%	100%	100%	100%	

Q: Question; Y: Yes N: No; U: Unclear; NA: Not Applicable

2.7. Data Extraction

The statistical analyses of quantitative data have been performed using the SPSS (Statistical Package for the Social Sciences) 26 package program. When categorizing the studies examined, while the frequency of use (f) expresses the number of times the variable is used, the percentage value (%) gives the ratio to the number of all documents. All documents were simultaneously reviewed and tabulated according to the variable emphasized, and the frequency of use was accessed by counting them one by one.

The content analysis method was used to analyse the data obtained from the studies in the research. Content analysis is "a scientific method in which written materials are systematically examined and grouped with certain criteria and compiled to spread information and guide future research" (Dinçer, 2018). The subject to be researched is chosen based on certain criteria, concepts, and relationships are determined, data are processed, detailed information about the subject is obtained, and the data obtained are interpreted (Topkaya, 2013; Yılmaz, 2021). The primary aim of content analysis studies is to reveal the aims, theoretical framework, and methodology on which the academic

studies on the determined subject are based and the findings of the studies and to provide guidance for possible future academic studies and to determine the general trends on the subject (Bellibaş and Gümüş, 2018; Ültay et al., 2021).

3. FINDINGS

The population of this systematic review consisted of 325 postgraduate studies. Of the 325 studies analysed, 297 were excluded due to title and abstract inconsistency.

The full texts of 28 studies were analysed. Then, 17 studies were excluded due to content incompatibility. The sample of the study consisted of 11 experimental studies on non-pharmacologic methods used for pain management in the postoperative period.

Table 2. Publication Classification Form on Non-Pharmacological Methods Used for Pain Management in The Postoperative Period In Children

Author / Publication Year	Study Method (Design / Sample)	Intervention(s)	Scale(s) Used (For child's pain)	Main findings
Çiçek (2021)	It consisted of 52 children between the ages of 5-9 who underwent day-circumcision, undescended testicle and hernia surgery. **Control Group:** 26 **Experimental Group:** 26	**Distraction Technique** (Guided daydreaming technique)	Wong Baker Facial Pain Scale	In children, guided daydreaming technique is effective in reducing pain level in the postoperative period (p= 0.108).
Metlek (2021)	It consists of 120 circumcised children between the ages of 3-6. **Control Group:** 59 **Experimental Group:** 61	**Therapeutic Play** (Using Play Dough)	FLACC Postoperative Pain Scale	In children, therapeutic play method is effective in reducing pain level in the postoperative period (p= 0.126).
Tuncay (2021)	Consists of 90 children aged 4-6 years who underwent circumcision surgery. Control Group: 30 **Therapeutic Puppet Group:** 30 **Video Animation Group:** 30	**Distraction Technique** (Video Animation) **Therapeutic Play** (Puppet Play)	Wong Baker Facial Pain Scale	In children, therapeutic puppet play and video animation intervention were significantly effective in reducing the pain level in the postoperative period (p=0.007).
Turgut (2021)	It consists of 70 children between the ages of 4-10 who will undergo surgery for the first time. **Control Group:** 35 **Experimental Group:** 35	**Distraction Technique** (Virtual Reality Application)	Wong Baker Facial Pain Scale	In children, virtual reality application in the postoperative period is effective in reducing the pain level (p= 0.300).
Binay (2019)	It consists of 132 children aged 6-12 years who underwent surgical intervention. **Control Group:** 44 **Documentary Film Group:** 44 **Animation Education Film Group:** 44	**Distraction Technique** (With Virtual Reality Goggles; *Animation Education Movie *Documentary Film)	Wong Baker Facial Pain Scale	In the postoperative period in children, the intervention of virtual reality goggles and animated educational film and documentary film is significantly effective in reducing the pain level (p<0.001)
Çimke (2019)	Consists of 40 children aged 7-12 years who underwent abdominal surgery. **Control Group:** 20 **Experimental Group:** 20	**Massage Therapy** (Hand Massage)	Facial Expressions Pain Scale Revised	In children, the application of hand massage in the postoperative period was significantly effective in reducing the level of pain (p= 0.008).
Gökağaç (2019)	Consists of 70 children between the ages of 22-42 months who underwent heart surgery. **Control Group:** 35 **Experimental Group:** 35	**Music Therapy** (Children's Song Recital)	FLACC Postoperative Pain Scale	In children, listening to children's songs in the postoperative period is significantly effective in reducing the pain level (p<0.001)
Akdağ (2019)	Consists of 100 children aged 6-12 years who underwent acute appendicitis surgery. **Control Group:** 50 **Experimental Group:** 50	**Therapeutic Play** (Mobilization with Environment Game)	Visual Analog Skala	In children, peripheral game mobilization is significantly effective in reducing pain level in the postoperative period (p= 0.001).

Karakaya (2018)	It consists of 81 circumcised children between the ages of 7-12. **Control Group:** 40 **Experimental Group:** 41	**Therapeutic Play** (Puppet Show)	Wong Baker Facial Pain Scale	Puppet show was significantly effective in reducing the pain level in the postoperative period in children (p= 0.000).
Atak (2017)	It consists of 100 children between the ages of 7-14. **Classical Music Recital Group:** 44 **Turkish Music Recital Group:** 44 **Storytelling Group:** 44	**Distraction Technique** (Different Auditory Distraction Techniques; *Classical Music Recital *Turkish Music Recital *Story Recital)	Visual Analog Scale Wong Baker Facial Pain Scale	Different auditory distraction techniques are significantly effective in reducing pain level in children in the postoperative period (p<0.001)
Kurt (2017)	It consists of 90 circumcised children between the ages of 1-5. **Control Group:** 40 **Experimental Group 1:** 40 **Experimental Group 2:** 40	**Distraction Technique** (Finger Puppet Games)	Wong Baker Facial Pain Scale Children's Hospital of Eastern Ontario Postoperative Pain Scale in Children	In children, finger puppet play is significantly effective in reducing pain level in the postoperative period (p=0.000)

3.1. The Characteristics of Studies and Participants

In this systematic review study, 11 studies published between 2017 and 2022 and meeting the inclusion criteria were reached. The eleven included studies are summarized and analysed in Table 2 including the author of the study, year of publication, type of thesis, method (design, sample) intervention(s), scale(s) used to evaluate pain, and main result(s).

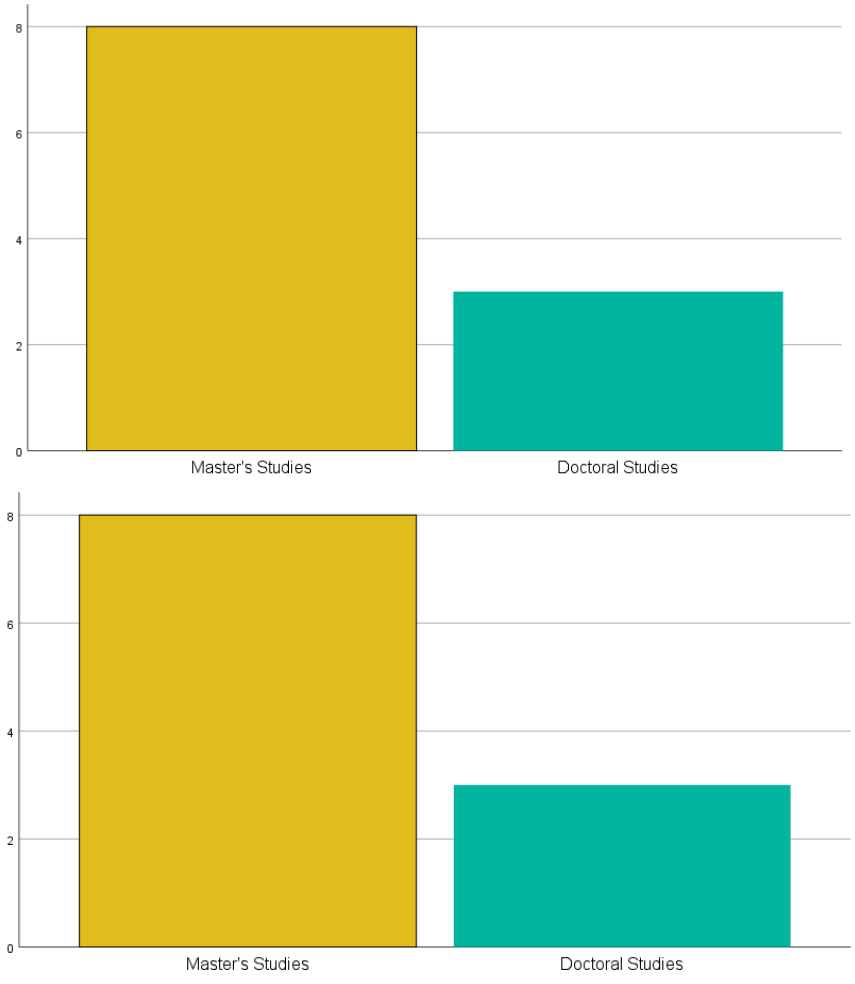

Figure 2. Comparison of Graduate Studies According to Thesis Types

Eight of the articles published on the subject were master's degree studies (see Figure 2). A total of 1185 people, including 905 children and 280 parents, participated in the 11 studies reviewed. The sample group in the studies included in this systematic review consisted of pediatric patients aged 0-18 years, with a mean age of 6.6 years.

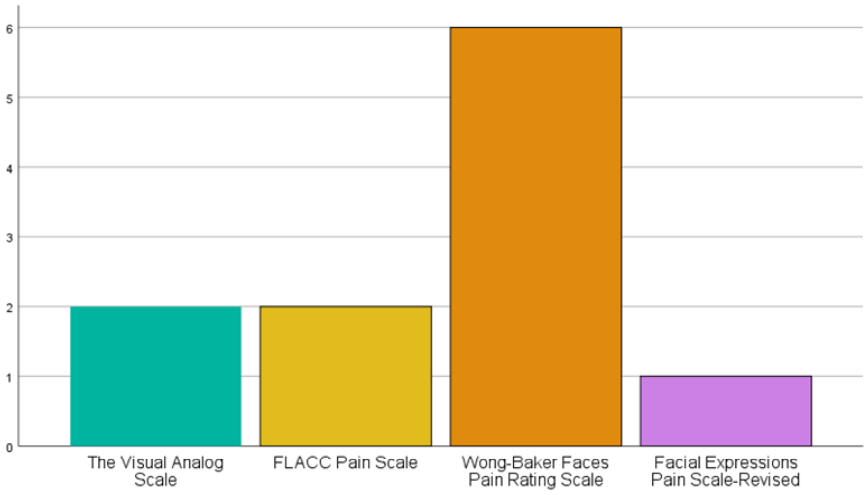

Figure 3. Comparison of Graduate Studies According to the Pain Scales Used

The Visual Analog Scale (VAS), FLACC Pain Scale, Wong-Baker Faces Pain Rating Scale (WBS), and Facial Expressions Pain Scale-Revised (FAS-R) scale were used to assess pain in the postoperative period, the most preferred scale is the Wong-Baker Facial Pain Scale (8 study) (see Figure 3).

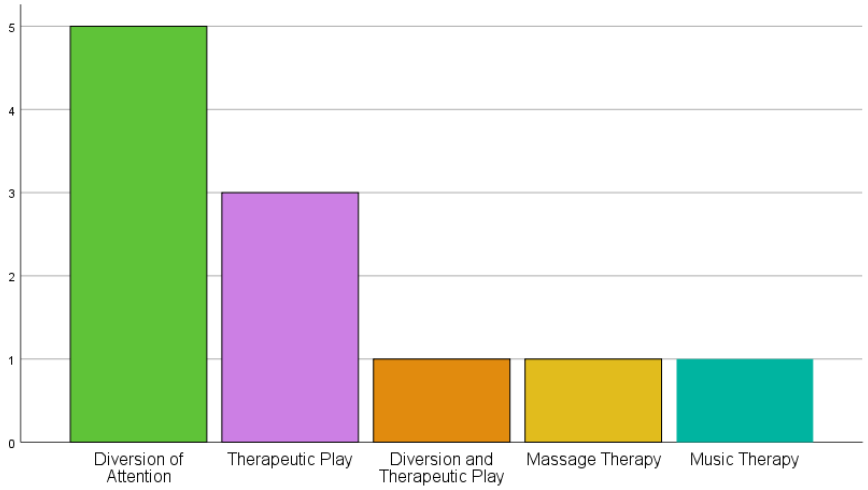

Figure 4. Comparison of Graduate Studies According to the Intervention Applied

Non-pharmacological methods used in the studies were diversion of attention (5 studies), therapeutic play (3 studies), diversion and therapeutic play (1 study), massage therapy (1 study), and music (1 study) (see Figure 4). The methods of diversion were as follows: virtual reality application (2 studies), guided daydreaming technique (1 study), different auditory techniques (1 study), and finger puppet play (1 study).

The surgeries in which non-pharmacological methods were applied: circumcision, hydrocele, undescended testicle, hypospadias, hernia, appendicitis, tongue-tie, invagination, urethral distillation, and cardiac surgery, and the most common application was after circumcision.

When the results of the studies included in the systematic review were examined, it was determined that the non-pharmacologic methods used in eight studies reduced the pain levels statistically significantly, while the methods used in three studies were effective on pain but not statistically significant.

3.2. Methodological Quality of the Selected Studies

The results of the Quality Assessment of Studies showed that all included studies received a moderate quality assessment score (see Table 1).

DISCUSSION AND CONCLUSIONS

Most surgical patients experience acute postoperative pain, but there is little evidence that the level of pain is reduced in the postoperative period. There are many preoperative, intraoperative, and postoperative intervention strategies for the management of postoperative pain (Chou et al., 2016). Despite good progress in pain management, ineffective management of postoperative pain for children is still a worldwide problem (Sng et al., 2017; Twycross and Collis, 2013).

There is evidence supporting the use of non-pharmacologic methods for pain management in children (Díaz-Rodríguez et al., 2021; He et al., 2015a; Rantala et al., 2020a; Zieliński et al., 2020). These proven methods include aromatherapy, reflexology, therapeutic touch, massage, hot and cold applications, music, meditation, change of position, play, distraction methods, therapeutic games, and many other non-pharmacological methods (Bulut et al., 2020). In this study conducted to investigate and analyse the use of non-pharmacological methods by Turkish nurses to relieve postoperative pain in children, the most common practices used after pediatric surgery were as follows: "verbal encouragement" a cognitive-behavioural method (90.2%), "a change in the child's position" a physical method (85.3%), "touch" an emotional support method (82.5%), and "ventilation of the room" a method of organizing the environment (79.7%) (Çelebioğlu et al., 2015). In a study conducted with Finnish nurses, it was determined that the most frequently used pain management strategies were providing emotional support, assisting with daily activities, and creating a comfortable environment, while cognitive-behavioural and physical methods were less frequently used and less known (Pölkki et al., 2001).

The main aim of the distraction method, which is a nursing intervention, is to focus the child's attention elsewhere to better control and reduce pain (Bulut et al., 2020). Karakaya (2018) found that showing a puppet show to children during the circumcision procedure was effective in reducing procedure-related pain and anxiety. Kurt (2017) found that finger puppet plays were effective in relieving postoperative pain in children. Çiçek (2021) concluded that postoperative pain levels decreased with the guided daydreaming technique, which is one of the distraction methods, in his study with children undergoing a surgical operation. In the literature, it was found that distraction techniques were used in many studies on pain management (Crevatin et al., 2016; He et al., 2015a; Yayan et al., 2020). He et al. (2015b) concluded in their study that therapeutic plays are effective in reducing pain in the postoperative period (Dehghan et al., 2017). However, no study was found in which puppet play was used in postoperative pain management.

Play is an important part of the child's life. Therefore, play can help the child cope with the hospitalization process by expressing his/her feelings and anxiety, adapting to medical procedures, and being involved in the decision-making process (Godino-Iáñez et al., 2020). Tuncay (2021) found that even though the pain scores of children increased after circumcision surgery, the therapeutic puppet, game, and video animation intervention groups had lower pain scores than the control group. Díaz-Rodríguez et al. (2021) concluded that therapeutic play interventions are effective in reducing pain during the postoperative period with their systematic review study. Godino-Iáñez et al. (2020), in their systematic review study to analyse the effect of therapeutic play in hospitalized

children, similarly concluded that therapeutic play methods reduced pain in the postoperative period.

Erickson (1958), a pioneer in the development of therapeutic play with hospitalized children, noted the benefits of using playing and dolls to prepare hospitalized preschool children for interventional medical procedures. Experimental studies have concluded that therapeutic play is effective in reducing postoperative pain in children undergoing surgical intervention (Li et al., 2007; Li and Lopez, 2008). Some studies report that therapeutic play in different modalities reduces the pain experienced after surgery in children (He et al., 2015b; Kiche and Almeida, 2009; Ullán et al., 2014; Yayan et al., 2020). Akdağ (2019) concluded that the environmental play applied to children after acute appendicitis surgery significantly reduced pain levels. Metlek (2021) found that the therapeutic play method was effective in reducing the pain levels of children and parental anxiety levels in the preoperative and postoperative periods. In a study conducted to determine the effect of a program that encourages playing games in the hospital on postoperative pain in pediatric patients, it was concluded that the game reduced the pain score in the postoperative period (Ullan et al., 2014). When the literature was examined, it was also found that play therapy did not affect pain in the postoperative period (Buffel et al., 2019; Matthyssens et al., 2020).

Since play as a care strategy for hospitalized children can have numerous advantages, pediatric nurses need to know and use play in childcare. Play activities carried out by health professionals can improve the relationship between the child and the nurse and increase trust in the nurse (Godino-Iáñez et al., 2020).

Pediatric cardiac surgery is a significant life event that causes both physical and psychological distress. Necessary hospital activities such as ambulation, invasive catheters, and chest tubes exacerbate pain. Unrelieved pain may prevent patients from participating in the postoperative recovery process and may have detrimental physiologic and psychosocial effects, such as activating the stress response (Godino-Iáñez et al., 2020). Music therapy stimulates the pituitary gland and affects the limbic system, the brain's centre of emotion and excitement. This increases the capacity to regulate uncomfortable emotions caused by neural transmission. In this way, it releases endorphins and enkephalins, the body's natural painkillers and mental state regulators. As a result of activating the parasympathetic nervous system, vital signs such as pulse, blood pressure, and respiration decrease. As a result, pain and anxiety levels decrease (Bulut et al., 2020). Gökağaç (2019) found that listening to children's songs applied to the experimental group decreased the pain levels of children after cardiac surgery and increased their sedation scores. When the relevant literature was examined, it was similarly concluded that music therapy methods applied to children having cardiac surgery reduced pain in the postoperative period (Huang 2021a; Huang 2021b; Huang et al., 2022). Similarly, Atak (2018) found that different auditory distraction methods had a reducing effect on postoperative pain in children. These results are consistent with the literature and studies have concluded that music therapy practice in the postoperative period is effective in reducing pain levels in children (Bulut et al., 2020; Huang et al., 2022; Nelson et al., 2017).

Mobile health applications are a new healthcare service area used to empower sick children in self-care (Rantana et al., 2020a). Multimedia applications/games used as active or passive distracters help to reduce anxiety and pain in children in surgical situations (Rantala et al., 2020b). Informing children in the preoperative period is important to increase their sense of control and effectively reduce pain and fear (Binay and Yılmaz, 2022). Binay (2019) concluded in his study that the application of animated educational films and documentary films in the postoperative period significantly reduced the pain levels of children. When the literature was examined, Gezginci et

al. (2021) examined the effect of tablet-based interactive distraction on pain during circumcision in children and found that this non-pharmacological method had a positive effect on pain.

Massage is one of the oldest and most widely used non-pharmacological methods to reduce feelings such as pain and anxiety. Hand massage, which can be easily included in patient care activities, is an easy intervention to learn and apply. In addition, it improves communication between the child and the nurse, reduces anxiety, and provides comfort (Bulut et al., 2020; Harrison et al., 2020). Çimke (2019) concluded that hand massage significantly reduced the pain level of children after abdominal surgery. When the literature was examined, it was found that massage application decreased the pain level in the postoperative period in pediatric cardiac surgery patients in similar studies and concluded the safety and applicability of massage (Harrison et al., 2020; Staveski et al., 2018). Similarly, Harrison et al. (2020) proved in their study that postoperative massage can improve pain in infants with congenital heart disease.

Today, when science and technology have made significant advances, hospitalized children are still exposed to serious pain trauma. Pain may be underestimated because children's concrete perceptions are not sufficiently developed according to their age periods, their poor self-reporting, etc. However, children are exposed to many traumatic pain practices and experience severe pain during hospitalization. Unrelieved or inadequately treated pain causes unnecessary distress and suffering. Additionally, it can lead to long-term consequences, including fear of future painful situations and exacerbation of pain, weakened efficacy of analgesics, and increased risk of developing chronic pain conditions. Furthermore, overestimation of pain may lead to unnecessary treatments, increasing the risk of short- and long-term adverse effects (Andersen et al., 2021).

Pain is experienced differently by each child. As a result, pain should be assessed individually for each child. The main problem with pain management in children is the difficulty in assessing pain (Zielinski et al., 2020). For children older than six years, pain evaluation is based on a self-report. In children younger than six years, behavioural pain scales are required to evaluate pain (Harrison et al., 2020). Many pain scales have been developed for the evaluation of pain, both verbal for children who can express themselves and behavioural for those who cannot self-report pain due to age, illness, or cognitive-mental impairments. These developed scales are used in clinics within the scope of quality and accreditation evaluations of hospitals. What is important here is not only the evaluation of pain but also the provision of adequate pain management and benefits in the future (Andersen et al., 2021).

During hospitalization, children frequently rely on their parents for pain relief. Parents are seen as a channel of communication with nurses because children are unlikely to interact with nurses on their own (Sng et al., 2017). Previous studies have found that cognitive and behavioural techniques such as distraction, emotional support strategies such as parental presence and parental support in activities of daily living are effective in reducing children's pain in the postoperative period (Chng et al., 2015; Jenkins et al., 2019; Pölkki et al., 2002). Kurt (2017) conducted a study to determine the ability of puppet play to reduce the pain of a child undergoing day-case surgery and to determine the satisfaction of parents with this situation, included parents in the intervention, and concluded that their satisfaction levels were positively affected. In addition to nurses, parents play an important role in the optimal management of postoperative pain in children. Parents can assist in evaluating their children's pain and managing their children's pain in the postoperative period by employing various strategies such as relaxation and distraction (Sng et al., 2017).

In this systematic review, the effects of non-pharmacologic interventions on postoperative pain were examined. When the studies included in the systematic review were examined; among the non-pharmacologic methods used, the diversion of attention method (3 studies), therapeutic play method (2 studies), the method in which diversion of attention and therapeutic play were used jointly (1 study), music therapy method (1 study) and massage therapy method (1 study) were found to be statistically significant in reducing pain in the postoperative period. Distraction methods used in the studies included in the systematic review (3 studies) were virtual reality application, different auditory techniques, and finger puppet play. Therapeutic gaming method (1 study), virtual glasses application (1 study), and guided daydreaming technique (1 study) were found to be effective in reducing pain in the postoperative period but not significant. As a result, it was concluded that non-pharmacologic interventions are effective in reducing pain. In studies, it was found that non-pharmacological methods used in the postoperative period in pediatric patients were effective in reducing pain, anxiety, and parental stress, but not significant for each study. Therefore, it is seen that studies with a high level of evidence with a large sample size are needed.

AUTHOR CONTRIBUTION STATEMENT

All authors have contributed equally.

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CONFLICT OF INTEREST STATEMENT

There is no conflict of interest with any institution or person within the scope of the study.

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