Review Paper

Investigating the Assessment Tools for Pain Severity During Venipuncture in Preschool-age Children: A Systematic Review

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ABSTRACT

Background: Improper use of standards for measurement instruments can impact the accuracy of study results.

Objectives: This study systematically reviews the Instruments for measuring pain intensity during venous catheter insertion in preschool children.

Methods: In this systematic review, conducted from October 2023 to January 2023, an open search was carried out for articles in domestic databases, such as scientific information database (SID), MagIran, and Iran Medex, and international databases, including PubMed, CINAHL, Web of Science, and Scopus using the following keywords: Preschool period, pain intensity, cannulation, vein removal, pain scale, pain relief, pain perception, and pain sensation. The objective of this search was to examine the measurement tools utilized to assess pain intensity during venipuncture in preschool-aged children without a time restriction. Duplicate articles were excluded, and other studies meeting the inclusion criteria were reviewed. Articles were assessed by two researchers, and any discrepancies were resolved by a third author.

Results: Among all the reviewed studies, 21 articles that were conducted between 2001 and 2023 met the inclusion criteria. The tools utilized in these studies to assess pain intensity during venous catheter insertion in preschool children included face, legs, activity, cry, and consolability (FLACC), Wong-Baker, Oucher scale, visual analog scale, and Poker Chip scale. The Wong-Baker instrument was a self-assessment, FLACC were assessed by both the researcher and a reviewer, Oucher was a self-assessment, the visual analog scale was assessed by parents and reviewers, and the Poker Chip scale was a self-assessment.

Conclusions: Researchers who do not adhere to tool standards often opt to utilize tools based on the methods of other studies or their requirements, which could potentially impact the outcomes of their studies

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Introduction

The insertion of a venous catheter is one of the most common invasive and painful procedures and is also one of the most important ways of administering medication or fluids to children who are admitted to hospital [1]. On the other hand, the pain associated with this procedure can lead to various complications, such as increased levels of anxiety, fear, prolonged medical examinations, and similar problems [2]. In this regard, the American Academy of Pediatrics (AAP) and the Pain Society have stated that medical procedures, such as blood sampling and insertion of a venous catheter should be performed with a minimal amount of pain and anxiety, as such procedures increase the child's pain and anxiety in addition to the challenges posed by the disease [3]. Self-report, behavioral observations, and physiological measures are used to measure pain in children, with self-report sometimes referred to as the gold standard because it is the only direct tool available [4, 5]. However, despite the availability of these instruments, there are debates about whether these instruments truly reflect the child's pain intensity [6]. Such doubts and uncertainties lead many studies to use these instruments without considering the perspective of the instrument's developer, allowing researchers to use them as they see fit, which can undermine the validity of study results [2, 3].

For example, the face, legs, activity, cry, and consolability (FLACC) instrument was developed to assess postoperative pain in children aged two months to seven years but has been used in many studies to assess pain other than postoperative pain [7-9]. The Wong-Baker instrument, on the other hand, is a self-report instrument but has been used as an assessment-based instrument in many studies [10]. In addition, preschool children can localize the site of pain. Given this assertion, the question arises, for example, whether children with 3 to 6 years of age can accurately assess the severity of pain enough to report it [11]? Can the use of the FLACC tool, which simultaneously requires the rater to assess 5 components, be reliable in measuring momentary pain during insertion of an intravenous catheter, which is considered momentary pain [12]? These and similar questions lead many researchers to use these tools inappropriately without considering the conditions and rules of the instruments, which may affect the accuracy of study results. Accordingly, given the above conditions, the present study provides a systematic review of the instruments used to measure pain intensity during the insertion of a venous catheter in children aged 3-6 years.

Methods

This systematic review study was conducted in 2023 to investigate the instruments used to measure pain intensity during the insertion of a venous catheter in preschool children. The preferred reporting items for systematic reviews and meta-analyses guidelines for systematic reviews and meta-analysis structuring were followed [13].

Search strategy

In the search phase, tools for measuring pain intensity during the insertion of a venous catheter in preschool children were searched using the relevant keywords in reputable national and international databases without time limitation. Articles in Persian or English language that were related to the research topic were considered for further investigation (Table 1) [14].

Inclusion and exclusion criteria

The inclusion criteria consisted of studies in Persian and English and the availability of full text with the presence of one or more keywords from the desired keywords in the title of the study. Meanwhile, the exclusion criteria included letters to the editor, newspaper articles, dissertations, conference papers, and unavailability of the full text of the article.

Data extraction

In the first step, duplicate articles were removed using the Endnote software. In the second step, abstracts were reviewed and the full text of articles that met the inclusion criteria and contained the desired keywords in their abstracts was evaluated (Figure 1).

Quality analysis

To ensure the quality of the obtained studies, the strengthening of the reporting of observational studies in the Epidemiology checklist was used to assess the quality of quantitative studies [15]. Due to limitations in accessing non-free articles in journals, only free articles were used for data analysis in this study.

Results

After the final review of the articles, a total of 21 articles met the inclusion criteria, and the characteristics of the studies under investigation are provided in Table 2.

Table 1. Search strategy [14]

External Database	PubMed, CINAHL, Web of Science, Scopus
Internal database	IranDoc, IranMedex, Magiran, SID, Google Scholar
Keywords	Preschool, pain severity, cannulation, venipuncture, pain scale, pain relief, pain perception, pain perception
The concept of interest	Pain scale
Type of studies	Quantitative
Search strategy	Preschool* OR child* OR pediatric* AND pain severity OR cannulation* OR venipuncture* OR pain scale* OR pain relief OR pain perception* OR pain perception* AND preschool pain* OR preschool cannulation* OR cannulation pain scale* OR cannulation pain relief* OR preschool pain perception

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The findings of this study revealed that the tools used in the studies under investigation to assess pain intensity during venipuncture included FLACC, Wong-Baker, Oucher scale, visual analog scale (VAS), and the Poker Chip scale (PCS). The Wong-Baker tool was self-reported, FLACC was assessed by the researcher and evaluator, Oucher was self-reported, VAS was assessed by parents and evaluators, and PCS was self-reported.

FLACC scale

In 12 out of the 21 studies examined, the FLACC tool was used and was the most commonly used tool by researchers to control pain during venipuncture in children. This tool was initially designed by Merkel et al. in 1997 and is intended for the assessment of post-surgical pain in children aged 2 months to 7 years. Additionally, it can be used by evaluators, nurses, and researchers. This scale consists of 5 indicators, each of which is assigned a score of 0, 1, or 2. After observing the behavior for 5 min, the evaluator assigns a score based on Table 3, with a score ranging from 0 (indicating no pain) to 10 (indicating severe pain) [12].

The Wong-Baker scale

The Wong-Baker scale was used in 7 out of the 21 studies. It is one of the most widely used and popular pain assessment tools for children. The tool was initially created by Donna Wong and Connie Baker in 1983 for children aged 18 months to 3 years to help them express their pain more comfortably. It includes six faces, with each face having two scores, ranging from 0, indicating no pain, to 10, indicating severe pain [10, 36] (Figure 2).

The Oucher scale

The Oucher scale was used in 3 out of the 21 studies. It was developed by Beyer in 1984 to assess pain intensity in children aged 3-12 years and is one of the most reputable and oldest self-report scales for pain intensity that has been used with the real faces of children from various ethnic backgrounds. It includes six pictures representing different degrees of pain and is arranged from the least to the most severe pain from bottom to top [37] (Figure 3).

Table 2. Pain intensity tools in studies

Row	Title	Authors, Year	Study Design	Age Range (y)	Research Tools
1	The effects of an animation distraction intervention on pain response of preschool children during venipuncture	Yoo et al. 2011 [16]	A double-blind, single-blind clinical trial	3-7	1- PCS: Self-report (child); 2- Wong-Baker: Nurse
2	Effects of parent's presence on pain tolerance in children during venipuncture	Ozcetin et al. 2011 [17]	Prospective randomized controlled quasi-experimental	3-6	Wong-Baker: Evaluator
3	Effectiveness of animated cartoons as a distraction strategy on behavioral response to pain perception among children undergoing venipuncture	James et al. 2012 [18]	A two-group, single-blind clinical trial	3-6	FLACC: Evaluator
4	The effectiveness of distraction (cartoon patterned clothes and bubble-blowing) on pain and anxiety in preschool children during venipuncture in the emergency department	Lilik Lestari et al. 2017 [19]	A single-blind three-group clinical trial	3-6	FLACC: Evaluator

Row	Title	Authors, Year	Study Design	Age Range (y)	Research Tools
5	Virtual reality environment using a dome screen for procedural pain in young children during intravenous placement: A pilot randomized controlled trial	Lee et al. 2021 [20]	Single-blind randomized clinical trial pilot sample	3-6	FLACC: Evaluator
6	Investigating the intensity of pain caused by venipuncture in children with thalassemia before blood transfusion	Bagherian et al. 2012 [21]	Cross-sectional-descriptive-analytical study	3-6	FLACC: Evaluator
7	The impact of massage on the pain and fear levels of children during venipuncture: A clinical trial	Neshat et al. 2022 [22]	A four-group single-blind clinical trial	3-6	Wong-Baker: Self-report (child), nurse and parents
8	The effect of video game play technique on pain of venipuncture in children	Kaheni et al. 2016 [23]	A two-group clinical trial	3-6	FLACC: Evaluator
9	Effects of distraction on physiologic indices and pain intensity in children aged 3-6 years undergoing intravenous injection	Vosoghi et al. 2010 [24]	Two-group clinical trial	3-6	Oucher: Self-report (child)
10	The impact of different methods of distraction on pain of venipuncture: A case study in children with 3 to 6 years of age	Rastgarian et al. 2020 [25]	Semi-experimental study	3-6	1- FLACC: Evaluator; 2- VAS: Self-report (child)
11	Effectiveness of distraction therapy on children's pain perceptions during peripheral venous cannulation at pediatric teaching hospital in Erbil City, Iraq	Shaker et al. 2018 [26]	Semi-experimental study	2-6	FLACC: Evaluator
12	Effect of using non-pharmacological methods on relief of pain and fear among children undergoing venipuncture	Ibrahim et al. 2017 [27]	A three-group clinical trial	3-6	Wong-Baker: Self-report (child)
13	Effectiveness of cartoon movies as distracter on pain among children undergoing venipuncture	Gandhar et al. 2016 [28]	Semi-experimental study	3-7	FLACC: Evaluator
14	Effectiveness of animated cartoon as a distraction strategy on level of pain among children undergoing venipuncture at a selected hospital	Maharjan et al. 2017 [29]	Semi-experimental study	4-6	FLACC: Evaluator
15	Effects of thermo-mechanical stimulation on pain associating venipuncture among children with leukemia	Basiouny & Hamed, 2019 [30]	Semi-experimental study	3-6	FLACC: Evaluator
16	The effect of foot massage on pain of preschoolers undergoing venipuncture: A clinical trial	Karamisefat et al. 2020 [31]	A similar clinical trial	3-6	FLACC: Evaluator
17	Effect of inhalation aromatherapy with lavender essence on pain associated with Intravenous catheter insertion in preschool children: A quasi-experimental study	Bikmoradi et al. 2017 [32]	Two-group semi-experimental study	3-6	Oucher: Self-report (child)
18	Comparing the effect of cold and warm vibration on pain caused by intravenous cannula insertion in children using a buzzy device	Sahebkar Moeini et al. 2020 [33]	Randomized clinical trial	3-6	Wong-Baker: Self-report (child)
19	Effect of Kaleidoscope on pain perception of children aged 4-6 years during intravenous cannulation	Kunjumon & Upendrababu, 2018 [34]	Experimental study of two groups	4-6	1- FLACC: Evaluator; 2- Wong-Baker: Self-report (child)
20	Reduction of topical anesthetic onset time using ultrasound: A randomized controlled trial before venipuncture in Young children	Zempsky et al. 2008 [3]	A two-group randomized controlled clinical trial	3-7	1- Wong-Baker: Self-report (child); 2- VAS: Parents
21	Parents as distraction coaches during intravenous insertion: A randomized study	Kleiber et al. 2001 [35]	A two-group, single-blind clinical trial	4-7	Oucher: Self-report (child)

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Abbreviations: PCS: Poker chip scale; FLACC: Face, legs, activity, cry, and consolability; VAS: Visual analog scale.

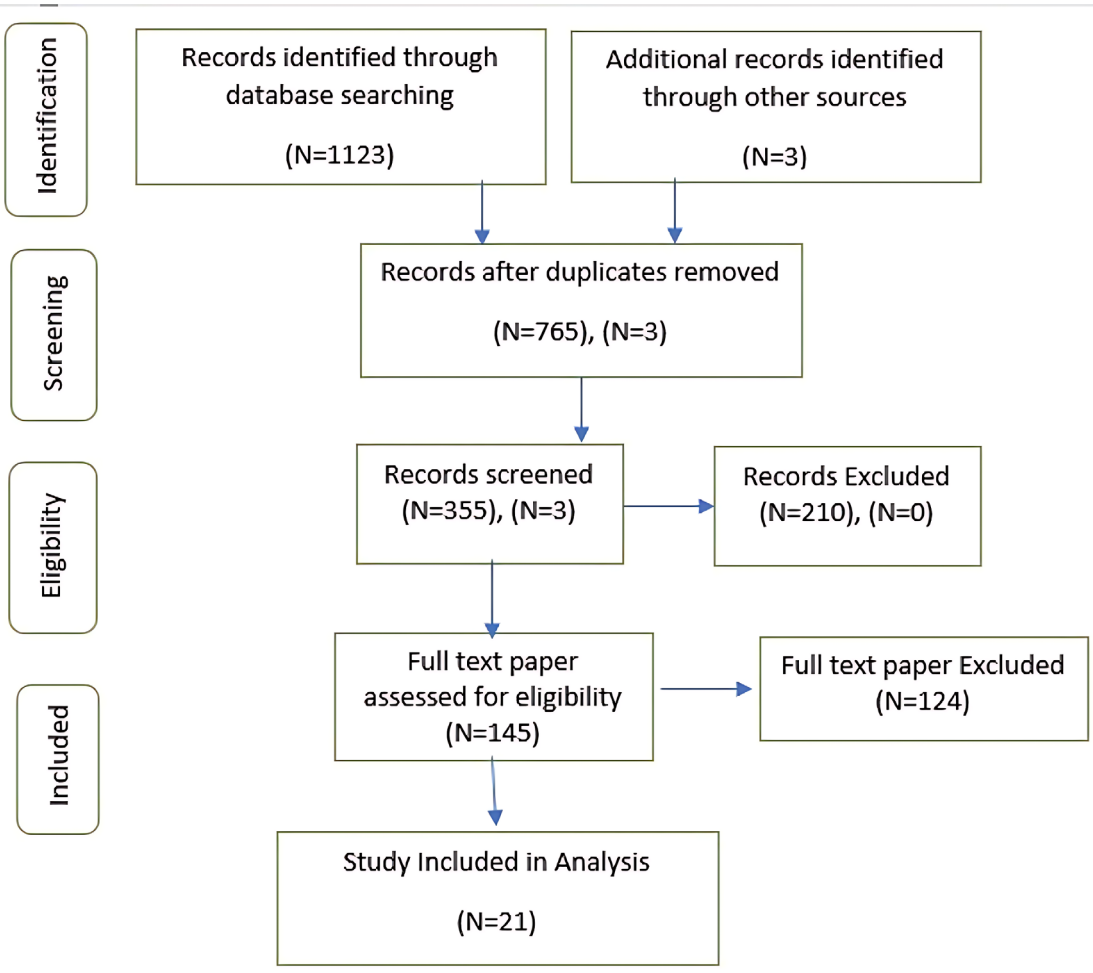

Figure 1. The preferred reporting items for systematic reviews and meta-analyses flowchart

VAS

This tool was used in 2 out of the 21 studies. Many attribute the introduction of this tool to Hayes and Patterson in 1921. Typically, this tool is presented as a 10-cm line, where zero on the left side represents no pain, and ten on the right side indicates severe pain. It is a self-report tool. There may be variations in this tool in terms of units (cm or mm) or the orientation of the line, whether vertical or horizontal [38] (Figure 4).

The Poker Chip scale

PCS tool was used in 1 out of the 21 studies. It was designed in 1990 by Hester, Foster, and Christensen to express self-reported pain in children aged 3-18 years. This tool is made up of 4 red poker chips. Initially, the

Figure 2. Wong-Baker faces pain rating scale criteria

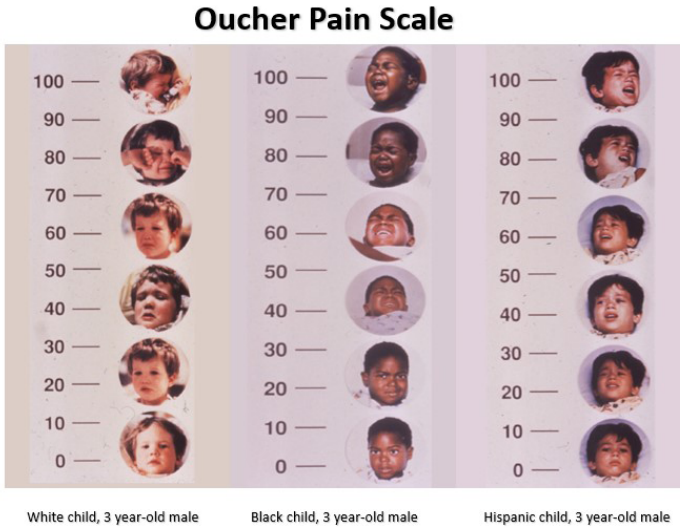

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Figure 3. Oucher scale criteria

child is asked if they have pain or not and if the answer is no, it is scored as zero. If they answer positively, 4 chips are given to them. The number of chips chosen by the child reflects their level of pain. Zero chips indicate no pain, and four chips indicate severe pain [39] (Figure 5).

Discussion

This study examined the tools for measuring pain intensity during venipuncture in preschool children. The study findings revealed that in all the examined studies, FLACC was completed by the researcher alone, and the creators of this tool also acknowledged that it should be completed by the researcher. This practice was followed in all the studies that used this tool [12, 18-21, 23, 26, 28]. One criticism that can be made regarding this tool is that it is specifically designed to assess preoperative pain, has 5 items, and all 5 items must be carefully evaluated during the venipuncture, whereas the pain during venipuncture is momentary and checking all 5 items with the researcher during venipuncture is a difficult task with a high risk of error.

The Wong-Baker tool was developed as a self-report instrument by its creators, although in some studies, it was used as a self-report, and in others, it was completed by an evaluator. Therefore, it may be stated that full confidence in the results of these studies may not

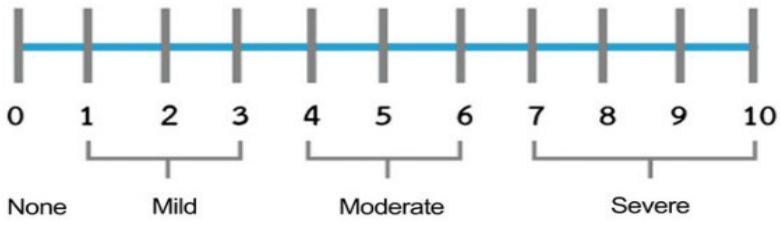

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Figure 4. Visual analog scale criteria

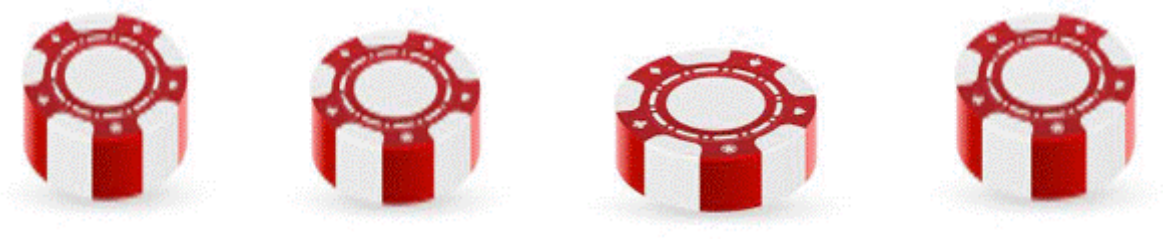

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Figure 5. Poker Chip scale criteria

Table 3. FLACC criteria

Criterion	Score 0	Score 1	Score 2
Face	Absence of a certain expression or smiling	Occasional smiles or frowns, flinching, disinterest	Constant and frequent shaking of the chin, clenched jaw
Legs	Normal or relaxed mode	Uncomfortable, restless, stiffness	Kicking, legs outstretched
Activity	Lying down comfortably, the natural position, moves easily	Twisting, unsteadiness, back and forth, stiffness	Bending, stiffening, or rapid movements
Crying	No crying (awake or asleep)	Moaning or wailing, occasional complaints	Constantly cries Screams or cries, complains frequently
Consolability	Content, relaxed	Reassured by occasional touching, hugging, or being talked to, distractible	Difficult to console or comfort

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be warranted due to users of this tool not considering the criteria set by the tool's creators. However, further studies can be conducted to examine the correlation between the accuracy of self-report and evaluator use of this tool [3, 10, 22, 27, 33, 36].

The Oucher tool, one of the most reliable and oldest tools to assess pain intensity in children, was used in measuring pain intensity during venipuncture in preschool children in only 3 out of the reviewed studies [24, 32, 35, 40]. Perhaps one of the reasons for the limited use of this tool is the issue of child self-reporting. When pain is assessed by an evaluator, there is greater accuracy and speed in accurately determining the pain score. Preschool-age children can indicate the location of pain [11]; however, this group of children, due to lacking abstract thinking, may not be able to distinguish between facial expressions and choose the one associated with their pain correctly. Therefore, the possibility of measurement error is high. This problem also exists for the VAS tool [3, 25, 38]. Preschool-age children are not yet familiar with numbers and cannot self-report their pain intensity using this tool during venipuncture. Hence, using this tool to determine pain during venipuncture in preschool children can be associated with a high margin of error.

The PCS tool claims that the child is told that based on their understanding of pain intensity, they can request more poker chips [16, 39], but is the child's perception of pain intensity accurate? Does the child have abstract thinking to establish a logical connection between their pain intensity and the number of poker chips? What is the score assigned to each poker chip? These issues, as well as similar ones, can pose challenges to the use of this tool for estimating the child's pain level.

Therefore, even though in the studies reviewed, FLACC was used more often than Wong-Baker for pain control during venous catheterization, and FLACC is reported by the evaluator, this tool may not provide a more accurate score than Wong-Baker. This is because in Wong-Baker, only the facial expression needs to be assessed, and this single item is easily examined both in self-report and evaluator-report during venous catheterization. However, in the FLACC tool, all five items must be assessed simultaneously during venous catheterization, requiring precision in each of the 5 items, which may introduce a higher likelihood of error in estimating the pain score during venous catheterization.

For this reason, this criticism applies to the FLACC tool, and it is felt that further studies are needed to evaluate the accuracy and validity of the FLACC tool. On the one hand, do preschool children truly have a correct understanding of the facial expressions described in the tool corresponding to the pain during the entry of the angiocath into their veins? Therefore, this question and similar questions suggest the need for further research on the effectiveness of the Wong-Baker tool in self-reporting by children and, despite the recommendation for self-reporting by the tool creators, there is a need to support both self-report by the child and a researcher-centric approach to this tool.

Conclusion

The main instruments used to assess pain intensity during the insertion of a venous catheter in preschool children include FLACC, Wong-Baker, Oucher, VAS, and PCS. These instruments are utilized either in the form of child self-report or in an evaluator-centered approach. However, most of these instruments are not used following the methods specified by their developers. Researchers might not be fully aware of the guidelines for using these instruments, or they decide on their usage based on their study methodology and preferences.

Additionally, there is a belief that self-assessment of pain during venous catheter insertion by preschool

children may not accurately represent the pain score. Therefore, researchers are attempting to determine the pain score using the same instruments but, in an evaluator, and centered manner.

Considering these points, it is recommended that studies be conducted to explore the correlation between children's self-reported pain scores and the pain scores determined by evaluators using these instruments. This would allow researchers to express their findings with greater confidence.

Study limitations

The main limitation of the current study was the lack of access to full-text versions of some required articles. To address this limitation, an attempt was made to utilize the resources of the college's central library as much as possible to solve this problem.

Ethical Considerations

Compliance with ethical guidelines

This study was approved by the Ethics Committee of Hamadan University of Medical Sciences (Code: IR.UMSHA.REC.1402.511).

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Authors contributions

All authors equally contributed to preparing this article.

Conflicts of interest

The authors declared no conflict of interest.

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References

1. Díaz-Rodríguez M, Alcántara-Rubio L, Aguilar-García D, Pérez-Muñoz C, Carretero-Bravo J, Puertas-Cristóbal E. The effect of play on pain and anxiety in children in the field of nursing: A systematic review. J Pediatr Nurs. 2021; 61:15-22. [DOI:10.1016/j.pedn.2021.02.022] [PMID]

2. Koç Özkan T, Balcı S. The effect of acupressure on acute pain during venipuncture in children: Implications for evidence-based practice. Worldviews Evid Based Nurs. 2020; 17(3):221-8. [DOI:10.1111/wvn.12437] [PMID]

3. Zempsky WT, Robbins B, McKay K. Reduction of topical anesthetic onset time using ultrasound: A randomized controlled trial prior to venipuncture in young children. Pain Med. 2008; 9(7):795-802. [DOI:10.1111/j.1526-4637.2008.00421.x] [PMID]

4. Düzkaya DS, Bozkurt G, Ulupınar S, Uysal G, Uçar S, Uysalol M. The effect of a cartoon and an information video about intravenous insertion on pain and fear in children aged 6 to 12 years in the pediatric emergency unit: A randomized controlled trial. J Emerg Nurs. 2021; 47(1):76-87. [DOI:10.1016/j.jen.2020.04.011] [PMID]

5. Herr K, Coyne PJ, Ely E, Gélinas C, Manworren RC. Pain assessment in the patient unable to self-report: Clinical practice recommendations in support of the ASPMN 2019 position statement. Pain Manage Nurs. 2019; 20(5):404-17. [DOI:10.1016/j.pmn.2019.07.005]

6. Miglio N, Stanier J. Beyond pain scales: A critical phenomenology of the expression of pain. Front Pain Res (Lausanne). 2022; 3:895443. [DOI:10.3389/fpain.2022.895443] [PMID]

7. Mohammed Abu Elela ME, Hussein HA, Rashad HM, Ebeid EN. Effect of distraction strategies on pain intensity and fear among children with leukemia undergoing venipuncture. J Pharm Negat Results. 2023; 14(3):7-18. [Link]

8. Abu-Elenen NRM, Abouzeid MIM, Omar AA, Ismail GM. Impact of distraction techniques on pain and fears indicators among hospitalized children undergoing selected invasive procedures. World J Med Sci. 2018; 15(4):198-204. [Link]

9. Mishra TA, Subedi A. Effectiveness of video-assisted distraction technique in reduction of pain among preschool children undergoing vein puncture. J Nepal Paediatr Soc. 2023; 43(1):22-7. [DOI:10.60086/jnps484]

10. Wong-Baker FACES Foundation. Wong-Baker FACES History. Oklahoma: Wong-Baker FACES Foundation; 2023. [Link]

11. Hockenberry MJ. Wong's nursing care of infants and children-E-Book. Amsterdam: Elsevier Health Sciences; 2022. [Link]

12. Merkel SI, Voepel-Lewis T, Shayevitz JR, Malviya S. The FLACC: A behavioral scale for scoring postoperative pain in young children. Pediatr Nurs. 1997; 23(3):293-7. [PMID]

13. Moher D, Altman DG, Liberati A, Tetzlaff J. PRISMA statement. Epidemiology. 2011; 22(1):128. [Link]

14. Aromataris E, Riitano D. Systematic reviews: Constructing a search strategy and searching for evidence. Am J Nurs. 2014; 114(5):49-56. [Link]

15. Yoosefee S, Cheraghi MA, Asadi Z, Bahramnezhad F. A Concept analysis of spiritual pain at the end-of-life in the Iranian-Islamic Context: A qualitative hybrid model. J Relig Health. 2023; 62(3):1933-49. [DOI:10.1007/s10943-022-01654-x] [PMID]

16. Yoo H, Kim S, Hur HK, Kim HS. The effects of an animation distraction intervention on pain response of preschool children during venipuncture. Appl Nurs Res. 2011; 24(2):94-100. [DOI:10.1016/j.apnr.2009.03.005] [PMID]

17. Ozcetin M, Suren M, Karaaslan E, Colak E, Kaya Z, Guner O. Effects of parent's presence on pain tolerance in children during venipuncture: A randomised controlled trial. HK J Paediatr. 2011; 16(4):247-52. [Link]

18. James J, Ghai S, Rao K, Sharma N. Effectiveness of "Animated Cartoons" as a distraction strategy on behavioural response to pain perception among children undergoing venipuncture. Nurs Midwifery Res J. 2012; 8(3):198-209. [DOI:10.1177/0974150X20120303]

19. Lilik Lestari MP, Wanda D, Hayati H. The effectiveness of distraction (cartoon-patterned clothes and bubble-blowing) on pain and anxiety in preschool children during venipuncture in the emergency department. Compr Child Adolesc Nurs. 2017; 40(sup1):22-8. [DOI:10.1080/24694193.2017.1386967] [PMID]

20. Lee HN, Bae W, Park JW, Jung JY, Hwang S, Kim DK, et al. Virtual reality environment using a dome screen for procedural pain in young children during intravenous placement: A pilot randomized controlled trial. Plos One. 2021; 16(8):e0256489. [DOI:10.1371/journal.pone.0256489] [PMID]

21. Bagherian S, Borhani F, Abbaszadeh A, Tehrani H, Pashandi S. [The severity of pain in children with thalassemia during venipuncture and prior to blood transfusion (Persian)]. Health Dev J. 2012; 1(2):138-46. [Link]

22. Neshat H, Jamshidi M, Aslani K, Abbasi M, Kianian T. The impact of massage on the pain and fear levels of children during venipuncture: A clinical trial. Int J Pediatr. 2022; 10(7):16291-301. [Link]

23. Kaheni S, Bagheri-Nesami M, Goudarzian AH, Rezai MS. The effect of video game play technique on pain of venipuncture in children. Int J Pediatr. 2016; 4(5):1795-802. [Link]

24. Vosoghi N, Chehrzad M, Abotalebi G, Roshan ZA. [Effects of distraction on physiologic indices and pain intensity in children aged 3-6 undergoing IV injection (Persian)]. Hayat. 2010; 16(3/4):105. [Link]

25. Rastgarian A, Saniejahromi MS, Sadeghi SE, Kalani N, Eftekharian F, Damshenas MH, et al. [The impact of different methods of distraction on pain of venipuncture: A case study in children 6-3 years old (Persian)]. Med J Mashhad Univ MedSci. 2020; 62(6):1812-22. [DOI:10.22038/MJMS.2020.15328]

26. Shaker NZ, Taha AA. Effectiveness of distraction therapy on children's pain perceptions during peripheral venous cannulation at pediatric teaching hospital in Erbil City. Erbil J Nurs Midwifery. 2018; 1(2):75-84. [DOI:10.15218/ejnm.2018.10]

27. Ibrahim H, Elsayed Yousef Y, Ezz Elrigal E, Mohamed Ahmed Ayed M. Effect of using non pharmacological methods on relief of pain and fear among children undergoing venipuncture. Egypt J Health Care. 2017; 8(1):244-52. [DOI:10.21608/EJHC.2017.19530]

28. Gandhar SS, Deshpande J, Borude S. Effectiveness of cartoon movies as distracter on pain among children undergoing venipuncture. Int J Sci Res. 2016; 5(6):2241-4. [Link]

29. Maharjan S, Maheswari BU, Maharjan M. Effectiveness of animated cartoon as a distraction strategy on level of pain among children undergoing venipuncture at selected hospital. Int J Health Sci Res. 2017; 7(8):248-52. [Link]

30. Basiouny N, Hamed N. Effect of thermo-mechanical stimulation on pain associating venipuncture among children with leukemia. IOSR J Nurs Health Sci. 2019; 8:88-98. [Link]

31. Karamisefat M, Cheraghi F, Soltanian A, Hasan Tehrani T. The effect of foot massage on pain of preschoolers undergoing venipuncture: A clinical trial. Evid Based Care. 2021; 10(4):49-58. [DOI:10.22038/ebcj.2021.55893.2462]

32. Bikmoradi A, Khaleghverdi M, Seddighi I, Moradkhani S, Soltanian A, Cheraghi F. Effect of inhalation aromatherapy with lavender essence on pain associated with intravenous catheter insertion in preschool children: A quasi-experimental study. Complement Ther Clin Pract. 2017; 28:85-91. [DOI:10.1016/j.ctcp.2017.05.008] [PMID]

33. Sahebkar Moeini M, Sadeghi T, Sezavar M, Mohammadi R. [Comparing the effect of cold and warm vibration on pain caused by intravenous cannula insertion in children using a buzzy device (Persian)]. J Mazandaran Univ Med Sci. 2020; 30(189):48-60. [Link]

34. Kunjumon D, Upendrababu V. Effect of kaleidoscope on pain perception of children aged 4-6 years during intravenous cannulation. Am J Nurs Sci. 2018; 7(4):137. [DOI:10.11648/j.ajns.20180704.14]

35. Kleiber C, Craft-Rosenberg M, Harper DC. Parents as distraction coaches during IV insertion: A randomized study. J Pain Symptom Manage. 2001; 22(4):851-61. [DOI:10.1016/S0885-3924(01)00316-5] [PMID]

36. Wong DL, Baker CM. Pain in children: Comparison of assessment scales. Pediatr Nurs. 1988; 14(1):9-17. [PMID]

37. Beyer JE, Knott CB. Construct validity estimation for the African-American and Hispanic versions of the Oucher Scale. J Pediatr Nurs. 1998; 13(1):20-31. [DOI:10.1016/S0882-5963(98)80065-1] [PMID]

38. Delgado DA, Lambert BS, Boutris N, McCulloch PC, Robbins AB, Moreno MR, et al. Validation of digital visual analog scale pain scoring with a traditional paper-based visual analog scale in adults. J Am Acad Orthop Surg Glob Res Rev. 2018 Mar; 2(3):e088. [DOI:10.5435/JAAOSGlobal-D-17-00088] [PMID]

39. Hester N. Measurements of pain in children: Generalizability and validity of the pain ladder and the poker chip tool. Pediatr Pain. 1979; 79-94. [DOI:10.1037/t05332-000]

40. Beyer JE, Villarruel AM, Denyes MJ. [The Oucher: User's manual and technical report Internet]. 2009 [Updated September 2009]. Available from: [Link]