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Original research article

Effect of BUZZY application on pain and anxiety in children with cancer during peripheral intravenous catheter intervention: a randomized controlled trial

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Abstract
Objective: The purpose of this study is to determine the effect of using the buzzy application on the level of the anxiety and pain in children with cancer during infusion.
Methods: This is a randomized control trial study comprising of a sample of 53 children with cancer (aged 3–18 years) scheduled to be given infusion. The study was conducted in a children's chemotherapy ward. Data were obtained using a patient biographical data questionnaire, the buzzy application, and an infusion needle. The Wong–Baker Faces Pain Scale instrument was used to measure pain and anxiety. The measurement of anxiety in the buzzy and control groups was carried out before and after the insertion while the pain was measured at the insertion of the infusion needle. The intervention group received buzzy 15 seconds before infusion, which is further maintained for 3 minutes after stabbing. Data analysis was used *T*-test, pain score used paired sample *T*-test and anxiety score used independent sample *T*-test significant at <0.05.
Results: Statistics showed a significant difference of $p = 0.001$ in anxiety and pain between the buzzy and control groups. The difference in mean anxiety in the buzzy group (4.37 ± 1.30) was greater than the control group (2.24 ± 0.77). Meanwhile, pain in the buzzy group was lower than the control group, the pain score was reported by the children and also observed by the nurse.
Conclusions: The use of buzzy during infusion effectively reduces anxiety and pain in children with cancer.

Keywords: Anxiety; Buzzy; Cancer; Children; Infusion; Pain

Introduction

According to the data, there are 36 types of cancer across 185 countries, with 18.1 million yearly new cases and 9.6 million deaths. 57.3% of these deaths occur in the Asian continent (Bray et al., 2018). Studies have shown that there are approximately 263,000 new cancer cases each year in children under 20 years, and 2–3 of these cases occur in those under 15 years (McCulloch et al., 2018). Basic Health Research data shows that the cancer rate in children in Indonesia increased from 1.4 per 1,000 population in 2013 to 1.8 in 2018, with 24.9% of these children undergoing chemotherapy (BPPK, 2018). Generally, children with cancer undergo chemotherapy, which tends to affect their psychology. 59.6% of children that undergo chemotherapy are unable to adapt to the process (Sherief et al., 2015). In Indonesia, most children are given infusions before chemotherapy.

Intravenous infusion in pediatric patients is a more challenging process than it is in adults due to various reasons, such as smaller veins, palpation difficulty, etc., which increases the risk of infusion failure. According to nurses, the inability to properly insert the infusion needle causes frustration, anxiety, and loss of self-confidence, thereby worsening the child's relationship with the nurse during treatment (Bayram and Topan, 2020; Shave et al., 2018; Twycross et al., 2015). Anxiety is the most common behavior seen in children with cancer when undergoing chemotherapy – and this can occur before or during the process (Dupuis et al., 2016; Geiger and Wolfgram, 2014). Apart from anxiety, pain is the most common thing felt by children during an infusion. A study of 256 children over 3 years showed that the most painful procedures were infusion (58.6%), wound dressing changes (20.7%), etc. (Crumm et al., 2020). Studies show that out of 4,026 cancer cases in 278 hospitals from 47 countries, most of the infusions in children (0–18 years) were performed by nurses, except in Australia and New Zealand, where doctors carried out 63% of infusions. 51.1% of infusions were carried out in the area of the child's hand (Ullman et al., 2020). During this process, anxiety and pain, which acts as an access to chemotherapy drugs in children with cancer, are certainly a special concern in author's country, where nurses carry out the infusion process. The

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nurses should assess the pain scale before and after infusion. However, there are various techniques used to reduce anxiety and pain during infusion.

For instance, non-pharmacological techniques are proven to reduce pain and anxiety during infusion. Furthermore, the distraction method using attractive toys before the infusion procedure can also reduce anxiety and pain (Abd-El-Gawad and Elsayed, 2015; Bennett and Cheung, 2020; Dastgheyb et al., 2018). A combination technique of cold sensation and vibration can also act as a distraction method. Hence the patient does not focus on the injection and pain, anxiety, thereby reducing fear. Buzzy is tool that combines vibration and cool sensation. Buzzy is common device used on children wards (Ballard et al., 2019; Lee et al., 2018). It can be used on children aged 3–18 years (Redfern et al., 2018). Based on interviews with nurses, the buzzy method has never been applied as a distraction strategy in reducing pain and anxiety in children with cancer and in need of infusion. Therefore, this study aims to determine the effectiveness of using buzzy during infusion in children with cancer as a way to reduce anxiety and pain.

Materials and methods

Study design

This randomized controlled trial design was carried out to determine the effectiveness of using buzzy in reducing the scale of anxiety and pain during infusion in children with cancer.

Setting and sample

The study was carried out from 8 July – 14 August 2020 in one of the Central Hospitals in Indonesia. The study was conducted in the children's chemotherapy room. This is the largest ward for children's chemotherapy and has more than 20 beds. The sample selection used a purposive sampling technique with inclusion and exclusion criteria. The inclusion criteria were (a) children with cancer in need of intravenous insertion, (b) children who cannot point to a pain scale instrument, (c) children that have not received morphine or other analgesic therapy in the last 6 hours, (d) children not fitted with chemo port, (e) children without cold sensitivity disorders such as Reynaud's disease, (f) children not experiencing fever or dehydration, and (g) children that were not infused in the emergency room or clinic prior to hospitalization. Meanwhile, the exclusion criteria were difficulty in vein access, more than 3 failed intravenous insertion attempts, children with impaired skin integrity in the insertion area, those that suddenly showed symptoms of decreased consciousness during intravenous insertion, and those infused using buzzy.

Randomization

Based on previous research, the value of SD between the intervention and control groups was 2.62 and 2.22. The WBFPS instrument was used to measure the results. A sample of 53 was used in the study by utilizing the formula $N = (Z\alpha + Z\beta)^2 \times 2\ \sigma^2/\text{mean difference}^2$ with a power of 0.8 and a type 1 error margin of 0.05 (Moadad et al., 2016). A total of 53 children with cancer aged 3–18 years in need of intravenous insertion for chemotherapy were selected. To determine the sample included in the buzzy and control groups, the sample were given ID numbers of 1–53. Randomization was carried out, without repeated numbers. The results showed that 27 and 26 children were included in the buzzy and control groups, respectively. The research process is shown in diagram 1, in accordance with CONSORT (Consolidated Standards of Reporting Trials). This study used a single-blind method because the respondents did not know whether other children had buzzy intervention (carried out in the action room) during the infusion period.

Intervention

This study involved 2 enumerators. The first was as an observer who assessed the anxiety and pain scores, the other installed the infusion. The criteria for nurses as enumerators are at least having a nursing education (Registered Nurses). RN with experience in pediatric chemotherapy for more than 3 years and certified with chemotherapy training in children. The enumerators involved had no conflict of interest, and the authors obtained informed consent by demonstrating the use of buzzy. This research was carried out during the morning service on children that fulfilled the inclusion criteria by verbally agreeing to be respondents. Their parents' adherence was obtained by signing an informed consent. Demonstration of buzzy installation was carried out on an experimental group before infusion, as shown in the research flowchart (Fig. 1).

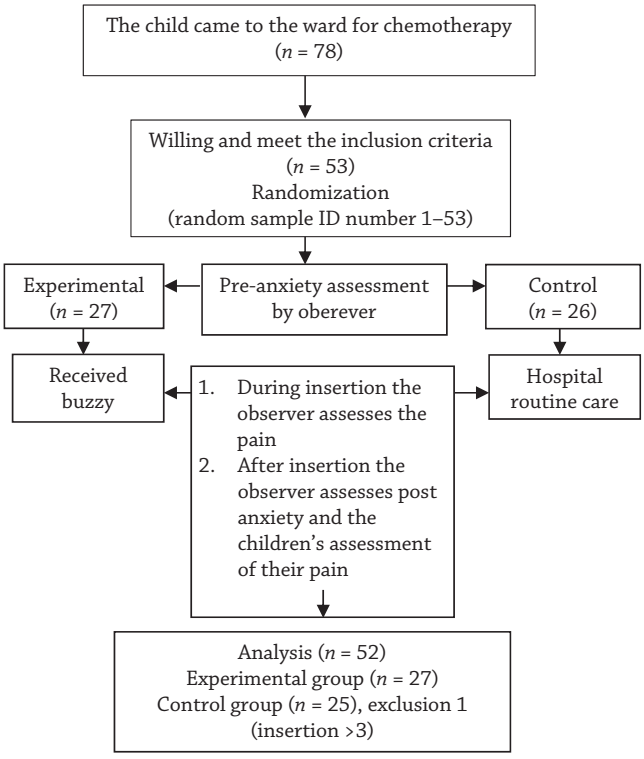

Fig. 1. Selection of respondents

Instrument

The instruments used in this study were infusion needle number 24 and buzzy, which is a device that combines cooling and vibrations from the external body. This instrument has two parts, namely the bee's body as a vibrator and the removable, reusable ice wings. The bee body tends to last for 20 hours using Alkali stone, and the tool vibrates with the press of a button. The wing has 18 grams of ice, which freezes for 10 minutes in an open space, and can be used 100 times (Ballard et al., 2019). Buzzy installation is proven to be effective at least 15 seconds before insertion and when placed 5 cm above the puncture area during the infusion process (Bergomi et al., 2018; Binay et al., 2019; Canbulat et al., 2015; Moadad et al., 2016; Redfern et al., 2018; Schreiber et al., 2016). In this study, ice wings were frozen in the freezer 30 minutes before infusion, with

the buzzy installation carried out 15 seconds before insertion, placed 5 cm above the puncture area, with the button pressed to activate the vibration. The buzzy was also used 3 minutes after the enumerator performed the infusion process. Buzzy installation during infusion is shown in Fig. 2.

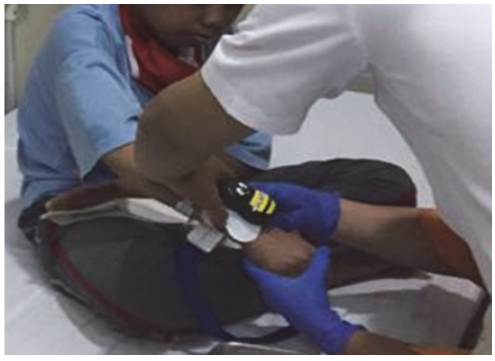

Fig. 2. Buzzy installation

Measurements

The WBFPS (Wong Backer Faces Pain Scale) tool, with a scale of 0–10, was used to measure the pain and anxiety levels in children with cancer. 0 denotes not hurt/not scared, 2 means hurts a little bit/a little scared, 4 means hurts a little more/a little more scared, 6 means hurts even more/even more scared, 8 means hurts a lot/really scared, and 10 means hurts the worst/most scared (Moadad et al., 2016; Redfern et al., 2018). WPFPS is effective in measuring anxiety and pain level in children aged 3–18 years (Redfern et al., 2018). In this study, WBFPS with a scale of 0–10 was chosen because nurses were accustomed to using it as an instrument to assess pain scores anxiety level in children aged more than three years as a standard protocol. Enumerators also assessed children's anxiety using the WBFPS instrument before and after infusion in the buzzy and control groups. Pain assessment was carried out by both, children and enumerator. The children's score during the infusion needle insertion and after the procedure was determined by speaking or pointing to a face image on the WBFPS instrument with a scale of 0–10.

This research used WBFPS instrument because the nurses had already used it for several years. Nurses used it based on the similarity of other instruments in measuring anxiety in children, such as FIS, VAS or CFS. The three instruments use pictures of facial expressions to show the level of anxiety in children.

The research used Facial Image Scale (FIS) to measured anxiety in Children. Children (2–12 years old) who had experienced during the circumcision procedure performed under Local Anesthesia (LA) (Güzelsoy et al., 2018). To evaluate the dental anxiety of children (4–14 years), FIS was used (Abbasi et al., 2021; Setty et al., 2019). The level of anxiety in children who got IV cannulation was measured using the Children's Fear Scale (CFS) (Gahlawat et al., 2021). To evaluate the anxiety of children during PIVC the visual analogue scale could be used (Gold et al., 2021).

Data collection

The enumerator collected data between 8 July – 14 August 2020 in the children's chemotherapy room. This research involves two nurses as enumerators. One enumerator is nurse who puts an IV in the children, and second enumerator who collect the pain and anxiety data by interviewing and asked the severity of pain to children after insertion.

Statistical analysis

The author ensured complete data was obtained by assisting the enumerators in performing infusions or completing questionnaires. Categorical demographic data, such as gender, diagnosis, regional origin, ethnicity, venous location, and frequency of insertion, were analyzed using distribution frequencies. Numerical demographic data, such as the age of a child, length of insertion, and anxiety before infusion, were also analyzed using mean and standard deviation. All demographic data were analyzed using the Kolmogorov–Smirnov to assess the homogeneity of the two groups. The *t*-test was used to determine the effect of buzzy on the scale of anxiety and pain in children with cancer. All analysis used SPSS version 21 software. *P*-value was set at <0.05 for statistically significant criteria.

Ethical consideration

The research was approved by the Faculty of Nursing at the author's university (number: SK-232/UN2.F12.D1.2.1/ETIK 2020). Request for informed consent was made in writing to the children's parents. Their consent was verbally obtained before being included in the study. During infusion, parents accompanied their children.

Results

A total of 53 children with cancer were included in the study. However, one child was excluded in the analysis phase because the infusion was successful after 4 insertions. Therefore, the sample used was 52 children with cancer, comprising 36 males and 16 females. The homogeneity test on the characteristics of children showed no significant difference ($p > 0.05$) in age, gender, diagnosis, regional origin, ethnicity, venous location, frequency, and duration of insertion, as well as anxiety before infusion. This indicates that the two groups are homogeneous. The children are installed IV as access for chemotherapy, with the most medical diagnoses found in 19 children with a mean age of 9.42 years. 65.4% of the children with cancer that underwent chemotherapy came from outside Jakarta, the remaining 36.5% were of Javanese ethnicity. Most infusions were performed in the vein of the arm area (75%), with an average duration of 10.23 seconds. 57.7% of infusions were successful in the first insertion. Anxiety before infusion in both groups ranged from more scared (scale 6) to really scared (scale 8), with an average of 7.48 and 7.68 in the control and buzzy groups, as shown in Table 1.

The scale of anxiety in children decreased in both groups. For instance, in the buzzy group, anxiety before infusion was 7.48 ± 1.05 and decreased to 3.07 ± 1.14. The anxiety scale in the control group before infusion with room procedures decreased from 7.68 ± 1.03 to 5.48 ± 0.91. The difference in the decreased anxiety scale before and after infusion in the buzzy group was greater than in the control group ($p < 0.05$), as shown in Table 2. Furthermore, the pain scale in the buzzy group, pain scale reported by children was lower (3.81 ± 1.44) than pain scale reported by nurse (3.63 ± 1.21).

Table 1. Comparison of patient characteristics (*N* = 52)

Characteristics	Groups		Total (*N* = 52) *n* (%) or mean ± SD	KSz *P*-value
	Buzzy (*n* = 27) *n* (%) or mean ± SD	Control (*n* = 25) *n* (%) or mean ± SD		
Age in years	9.89 ± 4.20	8.92 ± 3.60	9.42 ± 3.92	0.62
Sex				
Girl	9 (33.3)	7 (18)	16 (30.8)	0.51
Boy	18 (66.7)	18 (72)	36 (69.2)	
Diagnosis				
ALL	9 (33.3)	10 (40)	19 (36.5)	0.65
AML	9 (33.3)	4 (16)	13 (25)	
Others	9 (33.3)	11 (44)	20 (38.5)	
Place of origin				
Jakarta	8 (29.6)	10 (40)	18 (34.6)	0.52
Outside of Jakarta	19 (70.4)	15 (60)	34 (65.4)	
Tribe				
Sunda	7 (25.9)	7 (28)	14 (26.9)	0.86
Java	11 (40.7)	8 (32)	19 (36.5)	
Betawi	4 (14.8)	6 (24)	10 (19.2)	
Other	5 (18.5)	4 (16)	9 (17.3)	
Venous location				
Hand	9 (33.3)	4 (16)	13 (25)	0.24
Arm	18 (66.7)	21 (84)	39 (75)	
Insertion frequency				
1 prick	15 (55,5)	15 (60)	30 (57.7)	0.45
2 pricks	12 (44.5)	10 (40)	22 (42.3)	
Insertion time in seconds	10.11 ± 4.46	10.36 ± 6.32	10.23 ± 5.38	0.45
Pre-insertion anxiety	7.48 ± 1.05	7.68 ± 1.03	7.58 ± 1.03	0.86

Abbreviations: ALL – Acute Lympoblastic Leukaemia; AML – Acute Myelogenous Leukaemia; SD – standard deviation; KSz – Kolmogorov–Smirnov *Z* test.

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Table 2. Comparison of anxiety in the two groups (*N* = 52)

Pain scale	Groups		*t*-value	*p*-value
	Buzzy (*n* = 27) mean ± SD	Control (*n* = 25) mean ± SD		
Pre-insertion	7.48 ± 1.05	7.68 ± 1.03	0.99	0.490
Post-insertion	3.07 ± 1.14	5.48 ± 0.91	0.43	0.001
Different mean of pre-post insertion	4.37 ± 1.30	2.24 ± 0.77	0.17	0.001

Paired sample *t*-tests.

Meanwhile, the mean pain scale in the control group was higher, namely, 6.40 ± 1.15 (children) and 6.08 ± 0.81 (nurses). The scale of pain felt by the child during infusion and needle insertion in the buzzy group was lower than in the control group ($p < 0.05$). This applies to direct pain assessments from children and nurses, as shown in Table 3.

Table 3. Comparison of pain score on two groups (*N* = 52)

Pain score during insertion	Groups		*t*-value	*p*-value
	Buzzy (*n* = 27) mean ± SD	Control (*n* = 25) mean ± SD		
Child	3.81 ± 1.44	6.40 ± 1.15	0.14	0.001
Nurse	3.63 ± 1.21	6.08 ± 0.81	0.03	0.001

Independent sample *t*-tests.

Discussion

The most common types of cancer in children are Acute Lymphocytic Leukemia (ALL), Acute Myeloid Leukemia (AML), neuroblastoma in toddlers, and hepatoblastoma in those aged 11–15 years (Hubbard et al., 2019). In this study, 19 children were diagnosed with ALL (52.6% in the control group), 13 with AML (69.2% in the buzzy group), and 20 with other cancers (10 lymphomas, 6 osteosarcomas, 2 neuroblastoma, and 2 hepatoblastomas). Therefore, chemotherapy was used to improve their quality of life. The side effects caused by the therapy regimen in children with cancer are physical problems, such as fatigue or pain. This often arises during chemotherapy in the form of acute pain. One of the invasive procedures in children undergoing chemotherapy is an infusion.

This study indicates that children who met the criteria were evaluated early based on their characteristics, namely age, sex, diagnosis, regional origin, ethnicity, venous location, frequency and duration of insertion, anxiety before infusion, and differences between the two groups. Therefore, it can be stated that the bias of the factors that influence anxiety after the action and the pain felt by children is not from this process. Infusion pain in the two groups showed a significant difference, with those in the buzzy group showing less pain than those in the control group – as reported by children and observed by nurses ($p < 0.001$). This study's results are in line with RCT research carried out by Redfern et al. (2018), where fifty children between the age 3–18 years were included. Mean of pain was significantly lower in the buzzy group than control group (3.56 vs 5.96, $p = 0.015$). The mean of anxiety anxiety score was not different. But, the mean of anxiety score in buzzy group lower than control group (3.18 vs. 4.48, $p = 0.12$).

Other research conducted by Canbulat et al. (2015) involving 176 children aged 7–12 years, used the WBFC and Visual Analogue Scale (VAS) to determine the level of pain and fear. The buzzy group's average pain was lower than in the control group ($p < 0.001$). The pain in the buzzy group was 2.75 ± 2.66, and in the control group 5.70 ± 3.31. Schreiber et al. (2016) carried out a study that measured infusion pain using the Children's Pain Checklist – postoperative version (NCCPC-PV) scale on 35 and 36 children in the buzzy and control groups. The results showed that the median pain in the buzzy and control groups was 3 and 8. In the buzzy group, the pain was mild and moderate at 91.4% and 8.6%. In the control group, 61.1% and 38.9% of children's pain was absent to mild and moderate to severe, respectively.

The study indicated that the mean pain of the buzzy group was 3.81 ± 1.44 in children, and 3.63 ± 1.21 in those observed by nurses. On the other hand, the mean pain in the control group reported by children and nurses were 6.40 ± 1.15 and 6.08 ± 0.81, respectively. This study is in agreement with the research carried out by Moadad et al. (2016), which compared pain scales based on children's and nurses' responses, thereby indicating the pain in the buzzy group was lower than in the control. In the buzzy group, children reported mean pain relief of 2.31 ± 2.46, while the pediatric nurse observation of pain was 3.04 ± 2.62. In the control group, the children and nurses reported a mean pain of 4.38 ± 2.93, 4.90 ± 2.22, respectively. The results of the study carried out by Bergomi et al. (2018) showed that the average pain reported by children and nurses in the buzzy group was 0.61. The mean pain in the control group reported by children and nurses were 1.59 and 0.87, respectively.

The results showed that buzzy is effective in reducing needle insertion anxiety in children with cancer. This is because the average anxiety after the buzzy group's action was 3.07 ± 1.14, whereas it was 5.48 ± 0.91 in the control group. The difference in anxiety before and after infusion in the buzzy group (4.37 ± 1.30) was greater than in the control group (2.24 ± 0.77). This proves that there is a significant difference in anxiety between the two groups ($p < 0.05$). The research carried out by Canbulat et al. (2015) showed that the mean anxiety with the WPFC measurement in the buzzy and control groups are 0.92 ± 1.03 and 2.14 ± 1.34, respectively. Bergomi et al. (2018) research showed that the mean anxiety on the Children's Emotional Manifestation Scale (CEMS) was better in the buzzy group (2.52 ± 1.2) compared to the control group (2.15 ± 1.2).

Several studies have shown that the use of buzzy can reduce pain and anxiety during insertion, with the scale of pain and anxiety in the buzzy group lower than the control. Research carried out by Sanbulat Sahiner et al. (2018) showed that buzzy effectively reduces pain and anxiety during insulin injection in children with Type 1 Diabetes Mellitus (DM). According to Alanazi et al. (2019), the buzzy application effectively reduces anxiety and pain in children when inserting needles in the teeth and mouth area. Meanwhile, Binay et al. (2019) reported that buzzy effectively reduces insertion pain when drawing blood.

The process of administering therapy intravenously provides many benefits. However, with failure of insertion, there is the possibility of inappropriate procedures and repeated insertions, thereby causing discomfort to the child (de Lima Jacinto et al., 2014). Discomfort can include acute pain during needle insertion or anxiety before and after the infusion. Children's anxiety during hospitalization increases during infusion or invasive procedures (Gomes et al., 2016; Tunç-Tuna and Açikgoz, 2015). One of the factors that influence children's anxiety and fear when puncturing is the puncture process's success during the first trial. Failure to insert a single puncture infusion negatively affects the child and causes anxiety, pain, delayed therapy, and potential venous loss (Gerçeker et al., 2018; Tran et al., 2019). In this study, 57.7% of the children who were given the infusion were successful in one puncture. 55.5% and 60% were successful in the first trial in the buzzy and control groups, respectively. In this study, the infusion was carried out by nurses who had at least 3 years' experience in the children's chemotherapy room and a chemotherapy training certificate. This is intended to reduce bias and increase the likelihood of a successful one-puncture infusion. This study is in agreement with the research carried out by Moadad et al. (2016), which stated that 81% of 266 children received more than three infusions before training, while 42% obtained extravasation. Different results were seen after chemotherapy training, the incidence of failed insertion was decreased. Insertion more than three times was 1% of 153 children and the incidence of extravasation was 4%. This shows that the ability and proficiency of nurses are important to reduce the rate of infusion failure.

The first infusion was developed by Dr. Thomas Latta in Scotland in 1831. This was followed by other developments from the 1930s to the present. IV insertion is one of the most painful procedure in children, it causes anxiety (Kelly et al., 2017). Anxiety and pain contribute to the continuation of chemotherapy therapy in children (Walter et al., 2015). The nursing intervention procedure aimed at reducing fear and anxiety has a pain-reducing effect (Shave et al., 2018). Every child has a different experience of pain and anxiety, which

is influenced by the child's developmental age, previous experiences, and sociocultural beliefs. Withdrawal is considered a universally applicable method. Distraction is part of a non-pharmacological technique, therefore, it is important for nurses to plan for disruption before painful medical procedures (Boles, 2018). Data from 415 hospitals in 51 countries showed that in 406 hospitals, 71% of the infusion process was carried out by nurses (Alexandrou et al., 2018). In this study, the buzzy group demonstrated the buzzy installation process to reduce anxiety in children.

Conclusions

This research has shown that the use of Buzzy, a device that combines external cold stimulation and vibration, is effective in reducing pain in children with cancer during intravenous insertion. Pain in children during infusion was observed by nurses and reported by children, both of which showed lower results in the buzzy group than in the control group. This reinforces the notion that buzzy is an effective method. Children who used buzzy during the infusion were also more likely to have less anxiety than those in the control group. The buzzy application has shown to be effective in reducing anxiety and pain in children with cancer and receiving infusions. Buzzy is an easy and safe non-pharmacological disorder method. Therefore, it is recommended as a routine distraction that can be applied during infusions in children's wards, especially for those living with cancer.

Limitations

The drawback of this study is its inability to carry out the double-blind process. This is because the researcher knew that when children used buzzy, the children included to intervention group. Therefore, to reduce bias, the assessment of pain and anxiety was not carried out by enumerators, and the children also directly reported their pain levels. The instrument for measuring pain and anxiety is the Wong–Baker Faces Pain Rating Scale (WBFPS) on a scale of 0–10. This strengthens the results because the instrument is routinely used on a daily basis in the room by all nurses, but further research could used different instrument to measured anxiety scales and pain scale. The instrument of pain scale such as FIS, VAS, or CFS. In this study, the sample was children between aged 3–18 years. Further research is expected to use a sample according to the aggregate age of children, or in the same age category.

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Ethical aspects and conflict of interests

The authors have no conflict of interests to declare.

Vliv aplikace BUZZY na bolest a úzkost u dětí s rakovinou během intervence periferního intravenózního katétru: randomizovaná kontrolovaná studie

Souhrn

Cíl: Účelem této studie je určit účinek použití aplikace buzzy k analýze úzkosti a bolesti u dětí s rakovinou během infuze.
Metodika: Toto je randomizovaná kontrolní studie zahrnující vzorek 53 dětí s rakovinou (ve věku 3–18 let), u kterých je plánována infuze. Studie byla provedena v dětské chemoterapeutické místnosti. Data byla získána pomocí dotazníku s biografickými údaji pacienta, aplikace buzzy a infuzní jehly. K měření bolesti a úzkosti byl použit nástroj Wong–Baker Faces Pain Scale. Měření úzkosti u skupiny buzzy a kontrolních skupin bylo prováděno před a po zavedení, zatímco bolest byla měřena při zavádění infuzní jehly. Intervenční skupina dostala aplikaci buzzy 15 sekund před infuzí, která se dále udržovala po dobu 3 minut po bodnutí. K analýze dat byl použit *T*-test, pro stanovení skóre bolesti bylo použito párového vzorku *T*-testu a pro stanovení skóre úzkosti bylo použito nezávislého vzorku *T*-testu na úrovni <0,05.
Výsledky: Statistiky ukázaly významný rozdíl $p = 0{,}001$ v úzkosti a bolesti mezi aplikací buzzy a kontrolní skupinou. Rozdíl v průměrné úzkosti ve skupině buzzy (4,37 ± 1,30) byl větší než v kontrolní skupině (2,24 ± 0,77). Mezitím byla bolest v buzzy skupině nižší než v kontrolní skupině, skóre bolesti bylo hlášeno dětmi, které také pozorovala sestra.
Závěr: Použití aplikace buzzy během infuze účinně snižuje úzkost a bolest u dětí s rakovinou.

Klíčová slova: bolest; buzzy; děti; infuze; rakovina; úzkost

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